UNIVERSITY OF NAMIBIA

DEPARTMENT OF COMPUTING

ELECTRONIC COMMERCE IN NAMIBIA:

ITS GROWTH, PRESENT STATUS AND POTENTIAL

BY:
JOHN J. MAGENYA

MAY 2004

ELECTRONIC COMMERCE IN NAMIBIA:

ITS GROWTH, PRESENT STATUS AND POTENTIAL

By

John J. Magenya

A thesis submitted to the Department of Computing

University of Namibia
Windhoek, Namibia

In fulfillment of the requirement for the award of the degree of Master of Science in Computer Science

May 2004

Supervisors:

Prof. G.E. Kiangi

Prof. J.E. Odada

Declaration:

This research work was conducted in fulfillment of the requirements of the award of Master of Science Degree in Computer Science.

The study was conducted by:

John Joxey Magenya

Signature:

Date:

Supervised by:

Professor G.E. Kiangi

Signature:

Date:

And

Professor J.E. Odada

Signature:

Date:

Dedication

I dedicate this research work to my wife Joyce and children William, Sheena and Olivia.

Acknowledgement

Few projects, indeed very few, are entirely a one-man affair, and this one is no exception. I would like to thank those who have written the many books on e-commerce from which my own knowledge and understanding of e-commerce, and more importantly, attitude towards e-commerce are founded.

My individual thanks go first and foremost to my project Supervisors, Professors G.E. Kiangi and J.E. Odada who in spite of their other numerous duties, still found time to attend to my many requests for appointments with them. Their co-operation and generous sharing of ideas I enjoyed during the production of this project. Without them, it is likely that this work would not be in its present form.

Secondly, I wish to extend my sincere gratitude to Mr. Daliso Zuze and Mr. J.K. Lukusa for their invaluable advice and support during the development of this work. More importantly Mr. Zuze found some of the blunders I had not noticed! Special thanks also go to Mr. Emmanuel Mkusa who assisted with the formulation of the initial project proposal and proofreading of the final draft and general encouragement to undertake the study.

All the lab technicians and other Lecturers in the Department of Computing at the University of Namibia need a tap on their backs for all the support and patience they extended to me during the project work. My sincere appreciation to all the people who played a role in whatever capacity, and who assisted me willingly in the course of working on the project.

Last but not the least, members of my family who at times have had to do without me because of this research work, need to be appreciated for their tireless patience and understanding. I single out Sheena who assisted with typing of the manuscript. Thanks to you all.

List of Figures

Figures in the User Manual are labeled as follows

List of Tables

List of Abbreviations

ARPANET	- Advanced Project Agency Network
ASP	- Active Server Pages
B2B	- Business to Business
B2C	- Business to Consumer
CERN	- Center for European Nuclear Research
C2B	- Consumer to Business
C2C	- Consumer to Consumer
CGI	- Common Gateway Interface
DOT	- Digital Opportunity Task Force
EC	- Electronic Commerce
EDI	- Electronic Data Interchange
EFT	- Electronic Funds Transfer
GUI	- Graphical User Interface
HTML	- Hypertext Mark up Language
HTTP	- Hypertext Transfer Protocol
ICT	- Information and Communication Technology
IP	- Internet Protocol
IT	- Information Technology
LAN	- Local Area Network
MEMB	- Mushroom Electronic Micro Business
MIS	- Management Information System
OECD	- Organization for Economic Co-operation and Development
SME	- Small and Medium Enterprise
SQL	- Structured Query Language
TCP	- Transmission Control Protocol
USA	- United States of America
URL	- Uniform Resource Locator
WWW	- World Wide Web
ZERI	- Zero Emissions Research Initiative

Abstract

Wide varieties of trading methods are rapidly being replaced by the use of computers and communications networks the world over. This new concept of trading is known as Electronic Commerce (e-commerce). Great potentials exist for saving costs and improving services by utilizing this technology. Examples of phenomenal successes and staggering cost savings are just too many. Profits in millions of dollars are mentioned with ease, as a result of applying e-commerce.

It is apparent that the industry is trading a few paces ahead of the academics in the area of e-commerce. A research study on e-commerce trends in the Namibian industry was therefore found necessary. This research work is intended to make a contribution on the knowledge of e-commerce status in Namibia and help in the socio/economic development in the country, especially to the small business community. Key technological inhibitors and drivers of business-to-business and business-to-customer e-commerce have been identified and presented in this research.

Electronic Commerce offers an opportunity for business development. In Namibia, we are being left behind by the developed world mainly because of lack of awareness of the existence of e-commerce and its potential advantages. Even in cases where we may be aware of its existence, the application software, which is used in this area, is expensive and not easily affordable by small businesses. Another problem is that some small businesses cannot be able to use e-commerce when they are struggling to sustain themselves economically.

The specific case presented in this thesis is that of mushroom growers in Namibia. This research develops a trading software package that is used by trading partners in the country to improve their trading practices, and thereby benefit from the advantages that e-commerce offers. Although applied to mushroom growers, however, the concept is applicable to any other group of commodity producers.

The hypotheses that there exist poor knowledge and poor use of e-commerce in Namibia; that companies in Namibia can improve their efficiency and cut on costs by using e-commerce; and that the existing infrastructure in the country is good enough to support e-commerce activities have been assessed and analyzed in this work. This was accomplished by administering questionnaires, personal interviews, and developing a computerized software.

The computerized system, which consists of a Web site supported by a database management software and other networking technologies, has been created and used by a number of students in a computer laboratory simulating trading among each other. The effect of this method of trading has been observed and recommendations made to extend the technology to other businesses. The research was conducted in Windhoek.

Table of Contents

Chapter 1 Introduction

1.1 Background Information

Electronic Commerce (e-commerce) is a modern business methodology that addresses the needs of organizations, merchants and consumers to cut costs while improving the quality of goods and services and increasing the speed of service delivery using computers and communications networks.[Kiangi, (1998)]. E-commerce encompasses e-mail, e-messaging, electronic bulletin boards, groupware, electronic forms, electronic publishing, etc.

E-commerce can be regarded as a commercial activity that takes place by means of connected computers. It can occur between a user and a vendor through an online information service, the Internet or between vendor and customer computers through Electronic Data Interchange (EDI) [Kiangi (1998)]. Its implementation is through computerized structured documents with spaces reserved for entering information, which is exchanged between the vendor and the customer.

Trading partners need electronic commerce if they want to improve the way they trade by eliminating exchange of paper orders between them. Exchange of paper orders between two trading partners is both costly and time consuming. The introduction of electronic ordering provides a number of mutual benefits for the trading partners, some of which are listed below

1) E-commerce can increase sales and reduce costs.

2) A business can reduce the costs of handling sales inquiries, providing price quotes, and determining product availability by using e-commerce in its sales support and order processes.

3) Just as e-commerce increases sales opportunities for the seller, it also increases purchasing opportunities for the buyer.

4) E-commerce increases the speed and accuracy with which businesses can exchange information, which reduces costs on both sides of transactions.

5) E-commerce provides consumers with a wider range of choices than traditional commerce because consumers can consider many different products and services from a wider variety of sellers.

6) E-commerce provides consumers with an easy way to customize the level of detail in the information they obtain about a prospective purchase.

7) Consumers can have instant access to detailed information on the Web. Some products, such as software, audio clips, or images can even be delivered via the Internet, which reduces the amount of time customers must wait to begin enjoying their purchases [Schneider and Perry (2001)].

8) The costs of electronic payments of tax refunds, public retirement and welfare support can be significantly reduced, while transactions are made more secure and faster when transmitted via the Internet.

9) Electronic payments can be easier to audit and monitor than payments made by cheque.

10) E-commerce provides protection against fraud and theft losses by providing authentication methods like data encryption, electronic signatures, etc.

11) E-commerce can make products and services available in remote areas. For example, distance education is making it possible for people to learn

skills and earn degrees no matter where they live or which hours they have available to study.

12) The use of e-commerce can result in the elimination of large quantities of paper, and therefore reduce the number of trees felled to make paper, and thereby contribute to the efforts in environmental protection.

13) Use of e-commerce can reduce costs by eliminating human manual handling, thereby reducing overheads.

14) Use of e-commerce can reduce administrative and postage costs because all transactions are on line. Product delivery may be the only area that may incur administrative and postage costs.

15) Because e-commerce is transacted over telecommunications networks, its use results in increased processing speeds, efficiency and accuracy.

16) In traditional commerce, mislaid paperwork can be a problem. When e-commerce is used, end-to-end audit trails can be performed, thereby eliminating mislaid paperwork.

17) E-commerce enables improved quality of information concerning trading data because both the seller and the buyer have access to detailed information about their transactions.

18) In traditional commerce, invoices are either hand delivered or sent by post. When e-commerce is used, invoices arrive instantaneously, thereby saving time.

Generally, e-commerce helps an organization to become more cost effective, competitive and customer responsive. Although consumer shopping on the Web is expected to exceed $300 billion by 2004, electronic commerce is much broader and encompasses many more business activities than just Web shopping. In fact, the total volume of all business activities on the Web is expected to exceed $ 4 trillion by 2004 [Schneider and Perry (2001)]. Some of the companies that are contributing to this high volume of electronic commerce trade are

(i) Amazon.com - they deal in books, music, videos, toys, etc. and have enjoyed a lot of success by selling their products over the Internet. Annual sales over the Internet in the year 2000 were $2 billion [Schneider and Perry (2001)].

(ii) Cisco Systems, dealers in Computer equipment, sold 72% of its computer equipment over the Internet in 1998. Because no customer service representatives were involved in these sales, Cisco estimates that it avoided handling 500,000 calls per month resulting in an annual saving of over $500 million [Perry and Schneider (2001)]. This percentage is estimated to have risen to over 90% in 2003.

Other examples of success in the use of computers in trading include

(1) Avon cosmetics, which makes cost savings of more than $700 million a year through the use of e-commerce. Source - Avon Web site
http//www.findarticles.com/cf_dls/m0HWW/46_3/77033858/p2/article.jhtml?term

(2) The Dell company, which sells about $2million worth of computers a day on the Internet. Source - Dell Company Web site
http//www.fastsearch.com/us/success_stories/dell

(3) General Electric, which saves $500 million annually after implementing Internet-based e-commerce. Source - General Electric Company Web Site
http//www.fool.com/research/2000/foolsden000808.htm

(4) Companies in retail business such as Tesco - chain of Supermarkets in the UK; AAH Pharmaceuticals Ltd. - dealers in pharmaceutical products; Dixon's chain of supermarkets; British Marks and Spencer, and many more from all over the world.

These examples of success provide lessons for African countries to emulate. However, in order for one to participate in electronic commerce activities, one must be connected to the Internet. We shall therefore discuss what the Internet is, the services it can offer and how we can take advantage of these services.

1.1.1 The Internet

The Internet is a global system of interconnected computer networks. It was launched in 1969 when the Unites States of America (USA) funded a project that developed a national computer network called Advanced Project Agency Network (ARPANET) [O'Leary and O'Leary (2002)]. Using the Internet you can communicate with other people throughout the world by means of electronic mail; read online versions of newspapers, magazines, academic journals and books and join discussion groups on almost any conceivable topic.

1.1.2 The Web

The Web, also known as the World Wide Web (WWW), was introduced in 1992 at the Center for European Nuclear Research (CERN) [O'Leary and O'Leary (2002)]. Prior to the Web, the Internet was all text – no graphics, animations sound or video. Today, the Web provides a multimedia interface to resources available on the Internet. From these research beginnings, the Internet and the Web have evolved as tools for all of us to use.

The Web has a lot of unique characteristics. Open, interactive, immediate, dynamic, convenient, extensive, powerful, increasingly authoritative, etc. Those

who would like to conduct business online should keep in mind the nature of the Web, as this will affect the nature of their business. For example, Internet is an open Network and this implies a Global Open Market. The Internet is offering an instant and versatile communication across the world.[Kiangi (1998)].

There are five fundamental concepts that make the Internet so popular. These are reviewed here and a description of how they translate to Electronic Commerce is briefly provided

1.1.2.1 Communication

Customer Service is crucial in any business. This has been overlooked in many e-commerce applications, yet it is a very important part of the on-line business model. Those who use it wisely by ensuring feedback and support mechanisms for their customers will guarantee themselves that their customers will come back and therefore increase their sales [Schneider and Perry (2001)].

1.1.2.2 Collaboration

The web is gradually supporting collaboration among people in new ways. The web is forcing a change in companies from the inside out by cultivating an extended enterprise and a more open, forward-looking corporate culture, and by transforming the social structure from the traditional hierarchical chain of command to a more collaborative environment [Rayport and Jaworski (2001)].

1.1.2.3 Co-operation

Companies need to look beyond their traditional boundaries. Winning in Electronic Commerce often requires multi-company co-operation within and across industry boundaries. New ways to distribute products across the web with affiliate programs or associate programs are emerging [Whiteley (2000)].

1.1.2.4 Community

Cooperative communities are being created among online consumers. Unhappy customers can voice their frustrations publicly and this may have a negative impact on your business [Greenstein and Feinman (2000)].

1.1.2.5 Communalism

To benefit fully, a business should partner up with other related companies in the product chain in addition to e-commerce services for products, and services to new and existing clients. Rather than simply linking to a site, the idea is to actually try to build a business community of sites and services. This is a form of business communalism [Whiteley (2000)].

All these fundamentals should be upheld in the quest for Electronic Commerce success.

1.1.3 Other services provided on the Internet

Apart from the Web, the Internet provides numerous other services. Let us mention three of these that are of interest to e-commerce. These are Telnet, File Transfer Protocol (FTP) and Gopher.

1.1.3.1 Telnet

This is the Internet service that helps you to connect to another computer (host) on the Internet and log onto that computer as if you were on terminal in the next room. [Shelly, Cashman, and Vermaat (2003)].

1.1.3.2 File Transfer Protocol (FTP)

This Internet service is used for transferring files. Many computers on the Internet allow you to copy files from your computer. This is called downloading. You can also use FTP to copy files from your computer to another computer on the Internet. This is called Uploading [O'Leary and O'Leary (2002)].

1.1.3.3 Gopher

Gopher is a software application that provides menu-based search and retrieval functions for a particular computer site. Internet Gopher sites are computers that provide menus describing their available resources and direct links to the resources. Essentially these menus are a "table of contents" for organizing and locating information [Williams and Sawyer (2001)].

1.1.4 Implications and Resolution

The implication of the availability of the Internet and the services that it can offer is that Namibia is not fully enjoying the benefits of the Internet and its services. It was, therefore, necessary to find ways and means by which Namibia can benefit from the Internet technologies. One other implication of e-commerce is that if e-commerce is implemented, then middlemen who would normally come between the producer and the buyer will be eliminated. In this regard, a resolution that trading software that will serve specifically the Namibian small-scale business audience be created was arrived at.

1.2 Aim and Objectives

1.2.1 Overall Objective

The overall objective of this research is:

To examine factors and conditions, which inhibit the growth of e-commerce in Namibia, and develop a suitable business model for trading that will be adopted to the Internet using electronic commerce technologies, as an example on how to boost e-commerce in Namibia.

1.2.2 Specific Objectives

The specific objectives related to this research are

a. To determine how much Namibian companies use the Internet and web hosting technologies in conducting their businesses.
b. To study the methods of advertising in use.
c. To show that the Computer Science System Analysis and Design methodology can be applied to develop a software system that combines programming, Internet web technology, Active Server Pages (ASP) scripting, and database systems, that can be utilized for e-commerce transactions in Namibia.
d. To use the software developed to show that small-scale Namibian companies could increase their efficiencies by utilizing e-commerce.

1.3 Research Methodology and Organization

1.3.1. Methodology

1.3.1.1 Hypothesis: A hypothesis is a tentative assumption or preliminary statement about the relationship between two or more things that needs to be tested. [Welman and Kruger (1999)]. In other words, a hypothesis is a tentative solution or explanation of a research problem and the purpose for which research is to investigate.

The research work was divided into three hypotheses

1. Hypothesis 1 (H1) stated that: There is little use of e-commerce and related Internet technologies within the Small and Medium Enterprise (SME) sector in Namibia.

2. Hypothesis 2 (H2) stated that: It is possible, using Computer Science Systems Analysis and Design Methodology, to develop computer software as an e-commerce tool for SME sector in Namibia.

3. Hypothesis 3 (H3) stated that: E-commerce can improve efficiency of the business of small-scale entrepreneurs in Namibia [Riley, Wood, Clark, Wilkie, and Szivas (2000)].

1.3.2 Sample and Sampling Procedure

In Namibia, a business is designated as an SME if it meets the criteria shown in the table 1.1.

CRITERIA			
Sector	Employment	Turn over less than N$ 000	Capital Employed less than N$ 000
Manufacturing	Less than 10 persons	1,000	500
All Other Businesses	Less than 5 persons	250	100

Table 1.1 Definition of an SME in Namibia

To qualify as an SME, businesses must meet the employment criteria and one of the other two. This is Namibia's official definition of SME obtained from *Namibia Policy and Programme on Small Business Development paper by the Ministry of Trade and Industry (1997) pp 2.*

The method of simple random sampling was used to select a sample of SMEs to be visited. A finite population of 100 SMEs (Appendix II/3) was obtained from Namibia's Ministry of Trade and Industry . From this, a simple random sample of 36 SMEs was selected using a table of random numbers *[Anderson, Sweeney and Williams, (1994) pp 238].*

1.3.3 Methodologies for testing hypotheses

1.3.3.1 Methodology for Hypothesis 1 (H1)

To test this hypothesis, it is necessary to break it down into a Null hypothesis and an Alternative Hypothesis, i.e.

$H1_0$ SME sector in Namibia use e-commerce to an appreciable extent. (Null hypothesis)

$H1_a$ SME sector in Namibia does not use e-commerce to an appreciable extent (Alternative hypothesis).

Data was collected from a random sample of SME businesses by means of a questionnaire [Appendix III]. Using a number of factors, criteria were set to determine whether a company uses e-commerce to an appreciable extent [Appendix II]. A number of standard business transactions were identified and the survey checked whether or not a given company used e-commerce for each of those transactions. If less than 20% of the standard documents used e-commerce, then the company was considered not to be using e-commerce to an appreciable extent, otherwise the company was considered to be using e-commerce to some extent.

Following this, the proportion of companies not using e-commerce was used to test the Null hypothesis. If the proportion is large at 5% significance level, the Null hypothesis is to be rejected and the Alternative Hypothesis, $H1_a$ is to be adopted, that is, the SME sector in Namibia did not use e-commerce to an appreciable extent.

1.3.3.2 Methodology for Hypothesis 2 (H2)

Using Computer Science Systems Analysis Methodology, software was developed for use in the SME sector in Namibia. The following are the steps in Systems Analysis and Design Methodology that were adopted [Kendall and Kendall (1999)]

a) System Planning

This first phase of Systems Analysis and Design Methodology involved a preliminary investigation of the proposed project to determine the need for a new system. Two stages were involved here and which are:

1. Defining the problem
2. Suggesting Alternative Systems.

b) System Analysis

In the Systems Analysis phase, the present system was studied in depth, and new requirements specified. To accomplish this, data were collected about the present system and analyzed to determine the new requirements. Based on the interviews and other observations, from the survey, the following was developed

1) A business process model
2) System requirements comprising of Management and user requirements.

c) System Design

In the System Design phase, a new or alternative system was designed. To accomplish this, the following Computer Science tools were used

- Structured Query Language (SQL) Server (MS-Access) – database [Vaughn, W. (1998)].
- Active Server Pages (ASP) scripting – to link the database to the web page [Morneau, H. and Batistick, J. (2001)].
- Hypertext Mark-up Language (HTML) – to create Web pages [Design Team, H.O. Mumbai, (2000].
- Macromedia DreamWeaver – Web site development software.

d) System Implementation

The new application software was implemented using forty computers located in the computer science laboratory to determine the system's ability to handle many concurrent users.

1.3.3.3 Methodology for Hypothesis Three (H3)

To test this Hypothesis, a Null Hypothesis and an Alternative Hypothesis was formulated as follows

- Null Hypothesis $H3_0$

The Null hypothesis states that use of e-commerce (Software developed in this research) cannot improve the efficiency of SME businesses in Namibia.

- Alternative Hypothesis $H3_a$

This states that use of e-commerce can improve efficiency of SME businesses in Namibia.

A questionnaire was designed and used to test these hypotheses [Appendix III]. The results of the questionnaire were augmented by the little literature available on e-commerce in Namibia.

1.3.3.4 Design of the questionnaire

The problem in question targeted the small-scale business community. The design of the questionnaire sought to address the types of business documents in use, their mode of delivery, and how long they take to be delivered. Advertising is an inevitable component of trading. Several methods of advertising were used. Advertising via the Internet revolutionizes the way products are introduced to the market. This was exhibited by examples from the Internet.

The level of computer and Internet usage was of great interest. Hence, it was necessary to find out whether some companies already have Web sites and what they do with the Web sites. The questionnaire was also able to determine in general terms how an average Namibian company transacts business.

The questionnaire [Appendix III] was also used to determine whether there existed willingness by the small-scale companies to use e-commerce, if it was made available to them. For the companies which were already involved in some form of electronic trade, it was necessary to know what type of activities were going on, by which company and to what extent. It was also possible to determine which activities could be used to increase a particular company's output and efficiency, and hence generate more profits. The bottlenecks to e-commerce, known and unknown, were also observed.

The method by which a company gets paid for its goods and or services is very important. Some companies would prefer cash payments; others prefer many different types of payments like credit cards, cheques, electronic cash and so on. These methods of payment were looked at in the questionnaire.
The attitudes of the company's workers towards changes greatly influence the general performance of a company. The attitude of workers and customers towards the use of electronic transactions was therefore investigated.

With these concerns addressed, it was possible to establish the extent of e-commerce, its impact, and future as detailed in the following chapters.

1.3.3.5 *Administration of the questionnaire*

The researcher visited about thirty six different companies in Windhoek [Appendix V] at random and personally interviewed responsible people in each establishment and gathered information as detailed in appendix II. An attempt to collect data from areas outside Windhoek was not necessary because telephonic interviews revealed that there was practically no e-commerce activities in outlying areas to Windhoek, and therefore, there was

no need to visit the areas because no new additional data would be gathered from there.

In the course of administration of the questionnaire, it was borne in mind that people use the web for various reasons. Thus, an understanding of how people interact with computer interfaces was required, why they use the Internet, what level of technological sophistication they were at, what hardware and connection speed they had, and that their state of mind and patterns changed depending on the time of day, the day of the week, their job role, their gender, and various other characteristics. This information formed the archetype of "Using the Web" and was the key to understanding a web audience.

1.4 Scope of study

The scope of this study was as follows

1.4.1 Current Status of e-commerce in Namibia

Computers have completely revolutionized the way we live by changing many manually operated systems to fully electronic and computerized processes. Development of the Internet has made the use of computers even more popular. With the rapid growth of the Internet, Electronic commerce has evolved and is still growing. Scholars view Electronic commerce as a major potential in the trading area for the future. Figure 1.1 shows the projected growth of Internet based business-to-business electronic commerce for Japan and USA.

Fig 1.1 Projected growth of Internet based business-to-business electronic commerce for the USA and Japan [Kiangi and Mshigeni (2002)].

Electronic Commerce activities in Namibia have not been readily noticeable. However, a research to establish the status of e-commerce in Namibia in the

banking industry was carried out and completed in July 2003 [Bank of Namibia (2003)].

1.4.2 Models of e-commerce available on the Internet

The basic ingredients of e-commerce are secure and robust network protocols, electronic authentication, payment and delivery chains, and scalable web servers for product offering and ordering [Rayport and Jaworski 2001)]. These technologies are readily available and mature. They do not therefore form the basis of this research.

1.4.3 Methods of implementing e-commerce for small-scale businesses in Namibia

What however was of interest to this research, was the speed in identifying a buyer and an appropriate market for a particular product. In implementing this research, a software package was built and tested for mushroom trading. The concept, however, can be applied to any other product. An aspect of mushrooms that makes them ideal as a first consideration is that they are perishable by nature. Therefore, speed in identifying a buyer and an appropriate market can greatly reduce loses that may arise if the mushrooms are not bought on time. A website speeds business transactions and cuts costs by avoiding having to physically search for a market.

1.5 Outline of the Thesis

The thesis is presented in five (5) chapters as follows:
Chapter one presents the background information about e-commerce, the advantages of using e-commerce in comparison with the traditional commerce, the aim, objectives and scope of the study, and the outline of the thesis, chapter by chapter.

Chapter two presents the literature review that was undertaken for this project, which includes the beginnings of e-commerce, its history, and the different categories of e-commerce. The chapter also looks at the current status of e-commerce globally and a discussion of the areas of current concern and research. The chapter concludes by looking at e-commerce security and how e-commerce has been integrated into the Zero Emission Research Initiative (ZERI) project.

Chapter three deals with a discussion of the research findings by first looking at the preliminary analysis of the research problem, then the answers to the hypotheses and finally the use of the Trading software.

Chapter four deals with the Design and implementation of an e-commerce model named Mushroom Electronic Micro Business (MEMB). It starts by introducing what MEMB, is then goes into the actual analysis and design details using computer science System Analysis and Design approach. The chapter goes through the six stages of System Analysis and Design by defining the problem, generating alternatives, choosing the best alternative, designing a new system, followed by system Implementation and Testing.

Chapter five looks at the problems encountered during research work and self-evaluation of the work done. This is for the purpose of ascertaining whether the stated objectives of the research were achieved or not. The thesis presentation is then concluded by listing the original objectives, the hypotheses set, and discussions of the results against each Hypothesis. It also enumerates the limitations and constraints that were encountered. The chapter concludes with suggestions for future work related to this research work.

The References section at the end shows the sources of information that were used for this research. The references are listed in alphabetical order of the author(s).

A list of Appendixes is included to provide additional information as follows

- Appendix I - The questionnaire that was used for data collection
- Appendix II/1 and II/2 – Summary of e-commerce questionnaire
- Appendix III - MEMB user manual - a detailed explanation of how to use the MEMB software.
- Appendix IV - Selected Source Code - Some of the program code that was written to perform certain tasks in Web site design.
- Appendix V - A list of the companies visited for this research.

Chapter 2 Literature Review

2.1 What is e-commerce?

E-commerce is, like so much in the areas of business and information systems, the subject of numerous discussions with an ensuing plethora of definitions. Some authors see e-commerce as largely or entirely an Internet phenomenon. David Whiteley [Whiteley (2000)], says “Seddon … has suggested that ‘the world has just entered a third new phase in the evolution of Information Technology (IT) capabilities the Internet era’. The suggestion divides the evolution of IT into 20-year periods

- 1955 – 1974 The Electronic Data Processing (EDP) era.
- 1975 – 1994 The Management Information System (MIS) era.
- 1995 – Unknown? The Internet era”.

Seddon (1997) goes on to say

> “If you accept the proposition that IT capability is dramatically different in each of these 20 year steps, and that the third step is distinguished by world-wide access to the Internet by millions of firms and individuals, the definition of Electronic commerce is easy: e-commerce is commerce enabled by Internet-era technologies”.

It is the commercialization and popularization of the Internet that has put e-commerce towards the top of the public and political agenda, but e-commerce using electronic markets and Electronic Data Interchange (EDI) has been an established part of the business scene for at least a decade prior to the ‘Internet era’. A more general definition of e-commerce as quoted by David Whiteley (2000). is given by Wigand (1997) as:

> “ … the seamless application of information and communication technology from its point of origin to its endpoint along the entire value chain of business processes conducted electronically and designed to enable the

> accomplishment of a business goal. These processes may be partial or complete and may encompass business to business as well as business to consumer and consumer to business transactions."(pp 5)

This definition introduces the value chain, which is an important point because e-commerce technologies can be applied in transactions between manufacturer and supplier, manufacturer and retailer and/or retailer/service supplier and consumer.

A further definition of e-commerce is provided at a *European Union website (Esprit, 1997) as quoted by* Whiteley (2000)

> "E-commerce is a general concept covering any form of business transactions or information exchange executed using information and communication technology, between companies, between companies and their customers, or between companies and public administrations. It includes electronic trading of goods, services and electronic materials". (pp 6)

Schneider and Perry (2001) define e-commerce simply as shopping on the part of the Internet called the World Wide Web (the Web). However, he further expands the definition as "Business activities conducted using electronic data transmission via the Internet and the World Wide Web (WWW)".(pp 8)

Greenstein and Feinman (2000) define e-commerce as "The use of electronic transmission mediums (telecommunications) to engage in the exchange, including buying and selling of products and services requiring transportation, either physically or digitally, from location to location". (pp 2)

Rayport and Jaworski (2001) provide us with a formal definition of e-commerce as "… technology-mediated exchanges between parties (individuals, organizations, or both) as well as the electronically based intra – or interorganizational activities that facilitate such exchanges". (pp 3)

David Whiteley (2000) proposes that e-commerce is “Formulating commercial transactions at a site remote from the trading partner and then using electronic communications to execute that transaction”. (pp 6)

Some of the texts from which the above definitions have been extracted, cover the business use and implications of e-commerce and its technical requirements. The texts are supported by comprehensive Websites containing materials on e-commerce, software to support e-commerce projects and technical information on Hypertext Mark-up Language (HTML) and EDI standards.

The Web has a lot of unique characteristics. It is open, interactive, immediate, dynamic, convenient, extensive, powerful, increasingly authoritative, and provides an extremely competitive marketplace. Those who would like to conduct business online should keep in mind the nature of the web, as this will affect the nature of their business. For example, Internet is an open Network and this implies a Global Open Market. The Internet is offering an instant and versatile communication across the world [Schneider and Perry (2001)].

There is overwhelming literature available on e-commerce over the Internet. The important point here is to know what information is relevant for this research. The Internet was therefore a major source of information in the research.

2.2 History of e-commerce

According to David Whiteley (2000), car companies have been doing e-commerce for many years; their e-commerce technology is called electronic data interchange (EDI). Airline seats have also been sold using e-commerce systems; that technology is called an electronic market. The French have been doing e-commerce using the Internet since 1983; they do it exclusively in French with a system called Teletel.

The first actual implementation of e-commerce happened in 1994 [Schneider and Perry (2001)], when the founder of Amazon.com, Jeff Bezos, became intrigued by the rapid growth of the Internet. Looking for a way to capitalize on this new marketing tool, he made a list of 20 products that might sell well in the Internet. After some intense analysis, he determined that books were at the top of that list. By the year 2000, Amazon.com had an annual sale of over $2 billion and a list of over 20 million customers.

When communications networks first became available, entrepreneurs were quick to recognize their value and use them to create business opportunities [Schneider, Gary P. and Perry, James T. (2001)]. Recent advances in telecommunications and computer technologies have moved computer networks to the center of the international economic infrastructure. Most prominently, the meteoric rise of the Internet and the World Wide Web has transformed global commerce by facilitating instantaneous, inexpensive contact among sellers, buyers, investors, advertisers and financiers anywhere in the world. The rapid integration of Internet and other telecommunications-based functions into nearly every sphere of business has led to an international focus on the new world of e-commerce [Whiteley (2000)].

These technological developments have gone hand in hand with a trend, predominantly in the developed world, towards a post-industrial knowledge economy. This new paradigm, which is already having a significant impact on the way in which people lead their lives, is difficult to define but is characterized by:

- an emphasis on the human mind, rather than merely physical automation;
- being information- rather than energy intensive;
- sustainability through networks, not single organizations;
- supporting distributed rather than centralized intelligence;
- requiring multiple skills and continuous learning;
- replacing lifetime employment with labor market flexibility;
- customized rather than standardized products; and

- being enabled by Information and Communications Technologies (ICTs), whilst simultaneously driving the development of new ICTs [*http//docweb.pwv.gov.za/Ecomm-Debate/myweb/docs/discuss01.html* (November 2002)].

Just as the industrial society was built on, and then dominated by the agricultural society, the knowledge society is now building on the platform provided by the industrial society. It can be argued that e-commerce and other types of Web applications like e-learning, including the technologies and knowledge required to effect them, is the first real manifestation of the knowledge society. The question for the less industrialized developing countries is whether they can use appropriate technologies to leapfrog into the knowledge society, by-passing some of the stages of the industrial paradigm. The view of the author is that, we in the developing world embrace technology as it comes without regard to how it has evolved. For example, a peasant farmer in a remote African village will make use of a cellular phone without knowing how an open wire telephone looks like. This is because technology is changing so fast that it is virtually impossible to keep up with these changes. Likewise, e-commerce is permeating every sphere of life and we can identify activities that contribute to this proliferation of e-commerce worldwide.

As stated in the e-commerce policy paper for South Africa,

[*http//docweb.pwv.gov.za/Ecomm-Debate/myweb/docs/discuss01.html*] among the principal activities that can be identified as contributing to global e-commerce are –
:

- government services and information;
- business-to-business wholesale and retail services and sales;
- business-to-consumer (and consumer-to-consumer) retail sales and transactions;
- financial services and transactions;
- subscription and usage-based telephony, online and Internet access services;

- subscription or transaction-based information services and software sales;
- advertising and marketing services; and
- ancillary functions contributing to business/commercial activities.

The vast majority of these transactions to date have been taking place in countries with advanced economies and infrastructure, such as the members of the Organization for Economic Co-operation and Development (OECD). The author's view is that, for developing countries like Namibia, e-commerce presents important new opportunities to achieve a more level playing field vis-à-vis larger, more developed economies; it would diminish existing advantages of cost, communication, and information that developed countries have over developing countries; and can create huge new markets for indigenous products (like mushrooms) as well as services. While some companies and individuals in Namibia are beginning to take advantage of the potential of e-commerce, critical challenges still remain to be overcome before its potential can be fully realized for the benefit of all citizens. Appropriate policy recommendations that would lead to the formulation of a national policy on e-commerce in Namibia, should be made.

2.3 Categories of e-commerce

Four distinct categories of e-commerce can be identified as follows: business-to-business, business-to-consumer, consumer-to-consumer, and consumer-to-business [Rayport and Jaworski (2001)].

2.3.1. Business- to- Business (B2B)

This category of e-commerce refers to the full spectrum of e-commerce that can occur between two organizations. Among other activities, B2B e-commerce includes purchasing and procurement, supplier management, inventory management, sales activities, payment management, and service and support. One example of a practical B2B is the emergence of a venture consisting of a group of three major automakers that are working with Oracle and Commerce One

to provide auto parts sourcing. This venture is forecasted to create a $250 billion market in the US [Rayport and Jaworski (2001)]. Greenstein and Feinman (2000) argue that the biggest growth area in e-commerce over the last few years has been business-to-business transactions. This is true because B2B involves Internet-enabling of existing relationships between two companies. Hence, with the availability of the Internet, companies have been able to increase their trade relationships by using B2B e-commerce.

2.3.2. Business-to-Consumer (B2C)

This refers to exchanges between businesses and consumers. Examples of these are, Amazon.com, and Yahoo.com. Similar transactions that occur in business-to-business e-commerce also take place in the business-to-consumer context. These are retailing transactions with individual customers [Rayport, J.F. and Jaworski, B.J. (2001)].

2.3.3. Consumer-to-Consumer (C2C)

C2C e-commerce is an alternative to B2C. Simply put, it allows consumers to purchase goods from one another. An example of this is an online auction, such as eBay [*http//www.u.arizona.edu/~smason/c2c.htm (March 2004)]*. In C2C e-commerce, first, a prospective customer visits an online auction site and selects a category of interest. Next, a product is selected, and in many instances is bided on. These bids must often be completed within a certain time constraint set by the seller. Finally, once time has expired the item is auctioned off and is sent to the highest bidder.

2.3.4. Consumer-to-Business (C2B)

In this type of e-commerce, customers can gang together to form and present themselves as a buyer group to businesses. Such groups could buy products or services from large business enterprises [Rayport and Jaworski (2001)].

Figure 2.1 below shows the four different categories of e-commerce depending on whether you are buying or selling products to another business or to consumers.

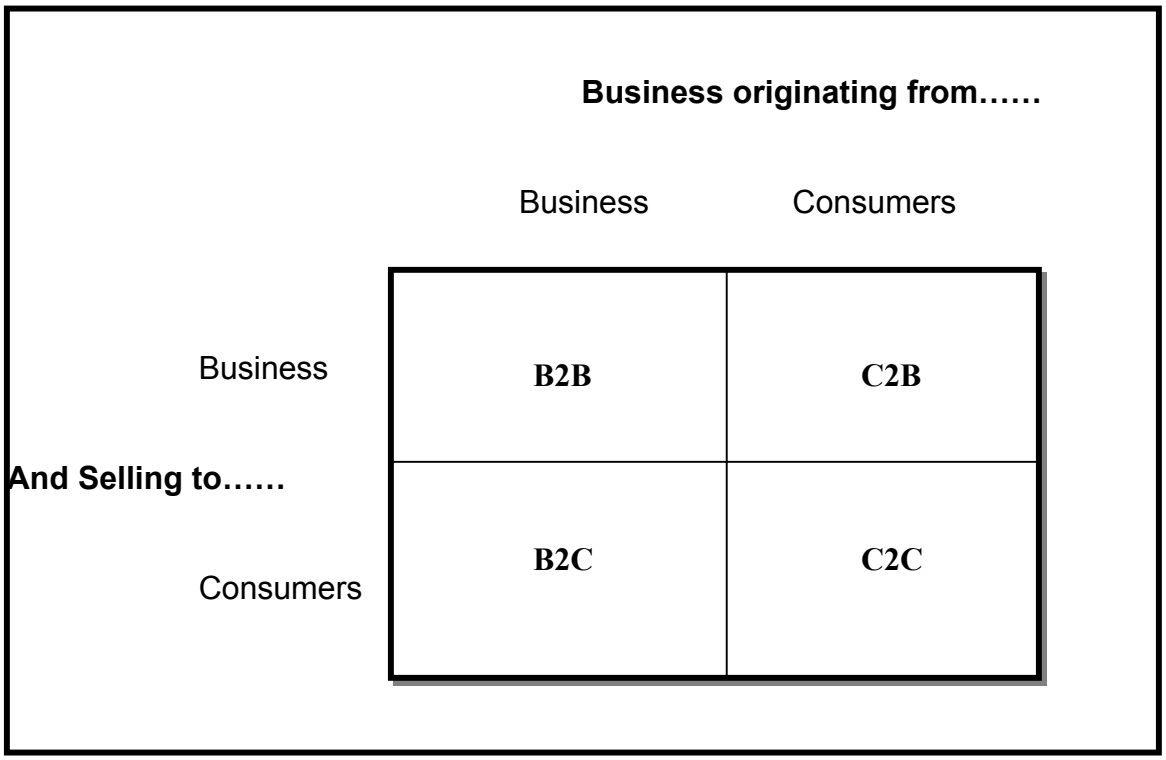

Fig 2.1 Four categories of e-commerce

2.4 Current status of e-commerce

E-commerce has permeated every aspect of trade because of its inherent benefits and the availability of an enabling environment in which it can be carried out. As mentioned in Chapter one, companies in the developed world talk of billions of US dollars of profits with ease. It is, therefore, not a technology that can be ignored or taken for granted. It is increasing *[Fig. 1.1]* and those companies that are ready to embrace it will reap the benefits that it offers.

2.4.1 Infrastructure support

Several factors must be in place for electronic commerce to exist. The most obvious technology needed for electronic commerce is the Internet. Beyond that system of interconnected networks, many other sophisticated software and hardware components-including database software, network switches and hubs, encryption hardware and software, multimedia support, and the World Wide Web-provide the required support structure to maintain an electronic commerce site [Perry and Schneider (2001)]. To compete in the constantly changing realm of the Internet, businesses that conduct electronic commerce must be able to adapt their sites to use new technology as it becomes available, or risk losing potential and existing customers to better sites. More online shoppers and the increasing traffic between businesses, will force companies to find faster and more efficient ways to conduct business electronically. For companies that plan their electronic commerce strategies well, the payoff can be huge-with online business volumes sometimes doubling in less than a year [Rayport and Jaworski (2001)].

2.4.2 Electronic Commerce Software Functions

Regardless of how an electronic commerce site is created, most electronic commerce sites have the following common features and functions:

- Catalog Contains detailed information about each product sold by the company, including the items name, description, price, shipping cost, size, colour, and sometimes even a picture. Most sites include a search feature that lets customers search for an item and determine its availability *[http//www.dlib.org/dlib/february99/thibadeau/02thibadeau.html (1999)]*.

- Shopping Cart Keeps track of the items a customer has selected to purchase and lets the customer view and updates the contents of the cart, add new items to it, or remove items from it. When a customer adds an item to a shopping cart, all of the product's details, including its item code, description, and price, are stored automatically. Some Web commerce sites let customers use a shopping cart to add items for purchase, put the cart in "virtual storage", and then return to site later to confirm and pay for the purchases [Schneider and Perry (2001)].

- Transaction and payment processing Occurs when the shopper proceeds to the virtual checkout. The electronic commerce software calculates volume discounts, sales tax, shipping cost, and the order's total cost, and then processes the customer's payment (credit or debit card, or other form of payment), including any verification process. When a customer enters his/her credit card information, it is sent in plain, unencrypted text form to the server hosting the website *[http//sbinformation.about.com/cs/technology/a/paymt_2.htm (2004)].*

Most sites also provide a return policy page, which includes information about how to return a purchase or instructions for returning damaged or defective items. After

a user submits payment and the system secures authorization for that payment, the system opens a Web page with an order number and order information, and informs the user that it has accepted the order [Whiteley (2000)]. Finally, the system forwards the user's order to the processing network for payment processing and order shipment (called fulfillment). These steps are common to both online and physical stores.

In addition, the e-commerce site should provide the following convenient features for the site developer/entrepreneur, as well as for the shopper

- Tools for creating the store catalog for products
- Tools for populating the store catalog
- Tools for building or modifying the site and its pages
- A mechanism to register and track shoppers-both for other businesses and consumers
- Security measures to secure transactions to prevent fraud and theft

[Carol and Hirschl (1998)].

2.5 E-commerce security

2.5.1 Introduction

Computer security, and specifically computer security for electronic commerce, is a complex and broad issue and the subject of ongoing research. Computer security is the protection of assets from unauthorized access, use, alteration, or destruction. There are two general types of security

1. Physical and
2. Logical.

Physical security includes tangible protection devices, such as alarms, guards, fireproof doors, security fences, safes or vaults, and bombproof buildings [Perry and Schneider (2001)].

Protecting assets using nonphysical mechanisms, such as antivirus software and passwords, is called logical security. An example of antivirus software is VirusScan from Network Associates, which scans your disks in search of viruses. A password is another protective measure that denies access to unauthorized persons. Any act or object that poses a danger to computer assets is called a threat.

Countermeasure is the general name for a procedure, either physical or logical, that recognizes, reduces or eliminates a threat. The counter measures can vary, depending on the importance of the asset at risk [Greenstein and Feinman. (2002)].

Protecting Internet and e-commerce assets from both physical and nonphysical threats is important. Examples of threats to the Internet and its traffic include impostors, eavesdroppers and thieves. An eavesdropper, in this context, is a person or device that is able to listen and copy Internet transmissions.

To implement a security scheme, you must

1. Identify the risk,
2. Determine how to protect the asset, and
3. Calculate how much you can afford to spend to protect it.

Many sources use the terms *privacy* and *secrecy* interchangeably, but a closer evaluation reveals that these terms are different. Privacy is the protection of individual rights to nondisclosure. Secrecy, however, provides protection from inadvertent information disclosure without regard to existing legislation [Perry and Schneider (2001)].

2.5.2 Cookies

A cookie is a small data file that some Web sites write to your hard drive when you view the Web site. Sites that create cookies do it transparently by recording information about Web browsing choices that you make, or by storing your username and password for a particular Web site that you visited [Greenstein and Feinman (2002)].

Your computer may store thousands of cookies - one for each Web site that wishes to record them - without your knowledge. Frequently, cookies make access to selected areas of a Web site more efficient. Many Web sites recover critical user identification information from cookies that they have stored previously on your computer. Storing a cookie on your computer eliminates requiring you to log into a Web site with a user name and password each time you access the Web site that originally wrote the cookie to your computer. Because cookies contain specific information about you, they are similar to photo identification. Browsers support cookies, and they provide various protection mechanisms to partially block or completely disallow cookie storage. Cookies are a privacy threat because they usually contain accurate information-such as your name, address, and credit card number - unless you falsify this information when providing it to the Web site. Falsified information that is stored in a cookie poses no privacy threat because it is inaccurate [Perry and Schneider (2001)].

2.6 The Research

2.6.1 E-commerce and the ZERI project

There is on-going research work on the Zero Emissions Research Initiatives (ZERI) project. ZERI is a concept developed at the United Nations University, Tokyo, Japan in 1994 [*Mshigeni, et al, (1998)*], and promoted in Africa following a co-operation agreement between the United Nations University and the University of

Namibia in 1996 [*Pauli, Mshigeni, and O'Regan, (1997)].* Since then, ZERI has considerably expanded in Africa, and conceived many new research ideas.

The concept behind ZERI is to look at the economic use of the earths' biodiversity, and at natural resources, which are generally regarded as useless, or as waste and even in some circumstances as obnoxious, such as water hyacinth, and generate products of value. ZERI proposes to develop a Web site as a source of information that can be assessed via the Internet. ZERI has decided to use electronic networking to link all involved in the ZERI project, which include researchers, farmers, entrepreneurs, extension workers and short course training. One of the areas that ZERI can significantly benefit is to link farmers and entrepreneurs (producers) on one hand with buyers (customers) on the hand. Thus ZERI was chosen as an ideal environment to demonstrate how e-commerce can be used in Namibia and in Africa in general to the benefit of the entire commercial community.

The Web site provides information on current and coming events regarding the ZERI publications and resources.

A hyperlink was created on the ZERI Web site so that visitors to ZERI can access MEMB in order to participate in buying and selling process.

2.6.2 Decentralized Information Management and Food Security in Namibia

In a report presented by G.E. Kiangi (2003), it is recommended that a trading Web is created to allow farmers access better markets for their produce. On this Web site, farmers can post advertisements. Buyers can also post enquiries, including prices they are offering. This will allow farmers to reach better markets. Kiangi further recommends that efforts should be made to ensure that potential buyers are familiar with the site and that conscious efforts need to be made to popularize the site to farmers and buyers.

The trading Web will be used to link producers and consumers directly, thereby cutting the middlemen, who in many instances do not add value in the supply chain. The creation of MEMB, therefore, falls in line with the above recommendation. It should further be re-emphasized that although the MEMB website currently caters for buying and selling of mushrooms only, the site can be used to buy and sell any other commodity with very minor modifications.

2.7 Extending e-commerce benefits to Africa

Phenomenon successes of e-commerce have been reported and witnessed in advanced countries. These successes can be experienced in Africa if businesses in Africa are willing to embrace and make use of this technology. The benefits that e-commerce offers, can therefore, be extended to Africa.

The use of e-commerce in Namibia is supported by the fact that in July 2000, the group of G8 countries passed the Okinawa Charter on the Global Information Society, a resolution to set up the Digital Opportunities Task Force (DOT Force). One of the priority areas was to encourage participation in global e-commerce networks, (Sida, Dec 2002). The use of Trading software by Namibian small businesses is therefore in direct compliance with the Okinawa Charter. The Sida publication further reports that the Common Market for Eastern and Southern Africa (COMESA) council of Ministers, of which Namibia is a member, has adopted a programme for the stimulation of electronic commerce in the region.

Chapter 3 Research Findings

3.1 Preliminary Analysis

Preliminary analysis of the methods of trading used by businesses in Namibia done for this research showed insignificant use of e-commerce. This was happening when there was proliferation of computers, with immense capabilities, in every sphere of human life [Kiangi (1998)].

Namibia is a developing country with a growing economy. Businesses are therefore mushrooming and expanding at all times. However, the Namibian population, and particularly the business community, have low computer literacy levels, and are not able to embrace and take advantage of e-commerce. What was observed though is the general tendency of businesses to buy computers and various software packages including those that support the use of the Internet. Internet cafes are also mushrooming making it possible for more people to have access to the Internet and the World Wide Web.

In addition, numerous courses in computer literacy were being advertised in all the newspapers and other media outlets. Institutions of higher learning were also offering courses in IT and computer science which include electronic commerce.

Despite all these, it was apparent that e-commerce was still far from being a common way of conducting business in the Namibian context. This was attributed to various factors including the level of Internet usage of computers, whether or not the companies have Web sites, how the companies were using the Web sites, compatibility of current documents to business operations, delivery of the documents and duration of delivery, whether or not the companies were using the Internet for advertising, and the willingness of the small scale companies to use e-commerce.

The Bank of Namibia conducted a study on the status of e-commerce in Namibia in July 2003 *[Bank of Namibia (2003)].* Although the main focus of the study was the Banking Industry, it also covered a number of areas, which are relevant to other sectors.

The survey established that a number of local companies, having realized the potential and opportunities offered by the Internet, are now using it in one way or another. It further establishes that companies have started to offer online products and services such as shopping, communication with clients, branches, headquarter, obtaining after sales reports, marketing research, bookings and reservation confirmations.

Research by the Bank of Namibia established that Internet usage in Namibia is still very low compared to developed countries. None of the companies surveyed had an online share turnover of above 50%.

In light of this situation, the following basic question related to the impact and expanded future use of e-commerce in Namibia had to be addressed:

What were the factors or conditions that inhibited the growth of e-commerce in the Namibian business environment? The specific questions underlying this were:

1. To what level did Namibian companies use the Internet and Web hosting technologies in conducting their businesses?
2. What types of business documents were being used and how were they delivered?
3. What methods of advertising were used and how did they relate to the Internet?
4. What were the views of small-scale businesses with regard to using e-commerce?

On the other hand, expanded future use may require the availability of a software package adapted to the specific business environment in Namibia. In light of this requirement, the following was the basic question related to the expanded future use of e-commerce in Namibia:

> Could a trading software that is used by both small-scale companies and large-scale companies to conduct their businesses be created and address these conditions adequately?

The answer to this question was yes, because existing computer Science technologies provided adequate tools to develop such software to address the question.

3.2 Answer to hypothesis 1 (H1)

The hypothesis to be considered here was Hypothesis 1 (H1) which stated that "there is little use of e-commerce and related Internet technologies within the Small and Medium Enterprise (SME) sector in Namibia". Casual observations however, indicated that e-commerce, as a fairly new method of conducting business had not yet permeated small business enterprises in Namibia. This was also confirmed by the study by the Bank of Namibia [*Bank of Namibia* (2003)].

3.2.1 Data analysis

Data collected via the questionnaire was analyzed using a Decision Logic Table [Appendix II]. Analysis of the reactions obtained via the questionnaire indicated the following

3.2.1.1 Computer usage

Most companies, who were using the Internet, were using it mainly for e-mail, despite the fact that a few of them had Web sites which displayed static pictures of their products. Companies still had to learn how to apply e-commerce.

25 of the 36 companies (70%) interviewed showed that they use computers for one function or another in transacting their businesses. 1 company (2.5%) did not use computers at all.

3.2.2 Types of business documents

Traditional brick-and–mortal trading documents in paper form, delivered by hand or post and whose delivery time depended on the mode of delivery, were in use. 19 out of the 36 companies (53%) visited responded that they use invoices, order forms, quotation forms and delivery notes. However, 36% of them said that they only use invoices, 44% use order forms only, 8% use quotation forms only and 6 % use delivery notes only.

3.2.3 Methods of advertising

36 out of the 36 companies visited (100%) advertise through the print media, television, radio and open space billboards, despite the fact that Internet advertising was beginning to mushroom. A very small percentage (2.5%) use the Internet for advertising.

3.2.1.4 Views of small-scale businesses toward use of e-commerce

All (100%) of the companies visited showed willingness to embrace the use of e-commerce. 2.5% of the companies knew of the existence of e-commerce let alone its use in transacting business.

3.3 Use of the Trading Software [Appendix III –MEMB User manual]

The original idea was to test the software with mushroom growers in the ZERI project. However, after the software was developed, the ZERI project experienced

delays in acquisition of funds to assist the mushroom growers. A decision was then made to use students, to represent mushroom growers in order not to delay this research.

A group of forty students was selected. The software was loaded on a server, which was accessible by the forty users over an intranet. The users were instructed on how to use the software, and they were monitored as they used the software for a period of time. During this time observations were carried out to determine changes in trading habits, the response of the users, and any other obstacles relating to real implementation of the software. The software was observed to be performing according to the software specifications.

Chapter 4 MEMB E-commerce model Design and Implementation

4.1 Introduction

Mushroom farming is a new business in Namibia. As such, it provides us with an opportunity to create an e-commerce model that can assist mushroom farmers to market their product. The model is named MEMB.

4.2 About MEMB

MEMB is an acronym for Mushroom Electronic Micro Business. Mushroom growing in Namibia is an on-going activity that is being undertaken under the supervision of ZERI. **ZERI** is an acronym for Zero Emissions Research Initiatives project. It is a concept that was developed at the United Nations University, in Tokyo Japan in 1994,(Mshigeni, et al, 19981), and promoted in Africa following a co-operation agreement between the United nations University and the University of Namibia in 1996 [Pauli, Mshigeni, and O'Regan (1997)]. Since then **ZERI** has considerably expanded in Africa, and conceived many new research ideas.

The concept behind **ZERI** is to look at the economic use of the earths' biodiversity, and at natural resources, which are generally regarded as useless, or as waste and even in some circumstances as obnoxious, such as water hyacinth, and generate products of value. **ZERI** has developed a Web site as a source of information that can be assessed via the Internet. The Web site provides information on current and coming events regarding the **ZERI** publications and resources [Kiangi and Mshigeni (2002)].

MEMB therefore acts as a support tool for this initiative.

4.3 Analysis and Design of MEMB

The Systems Analysis and Design approach was used in the creation of MEMB. Systems analysis and Design approach involves six steps as follows:

(i) Problem Definition –identification of the problems or needs.

(ii) Generation of alternatives – the present system is studied in depth. New requirements are specified.

(iii) Choice of the best alternative – a new or alternative system is chosen.

(iv) System Design – a new or alternative system is designed.

(v) System Implementation – the new system is installed and people are trained to use it

(vi) Testing – the new system is tested for its applicability and performance.

Using the Systems and Design approach, the MEMB software was created as follows:

4.3.1 Problem Definition

The problem at hand was to develop a software system that would combine programming, Internet web technology, Active server Pages (ASP) scripting, and database management systems to produce a software application that would be used for e-commerce transactions for small-scale businesses in Namibia.

4.3.2 Generation of alternatives

The need for new application software had already been identified from the analysis of the questionnaire. The Checklist [O'Leary and O'Leary (2002)] method of data analysis was used to analyze the data collected via the questionnaire. A checklist is a list of questions, and it is helpful in guiding the researcher through

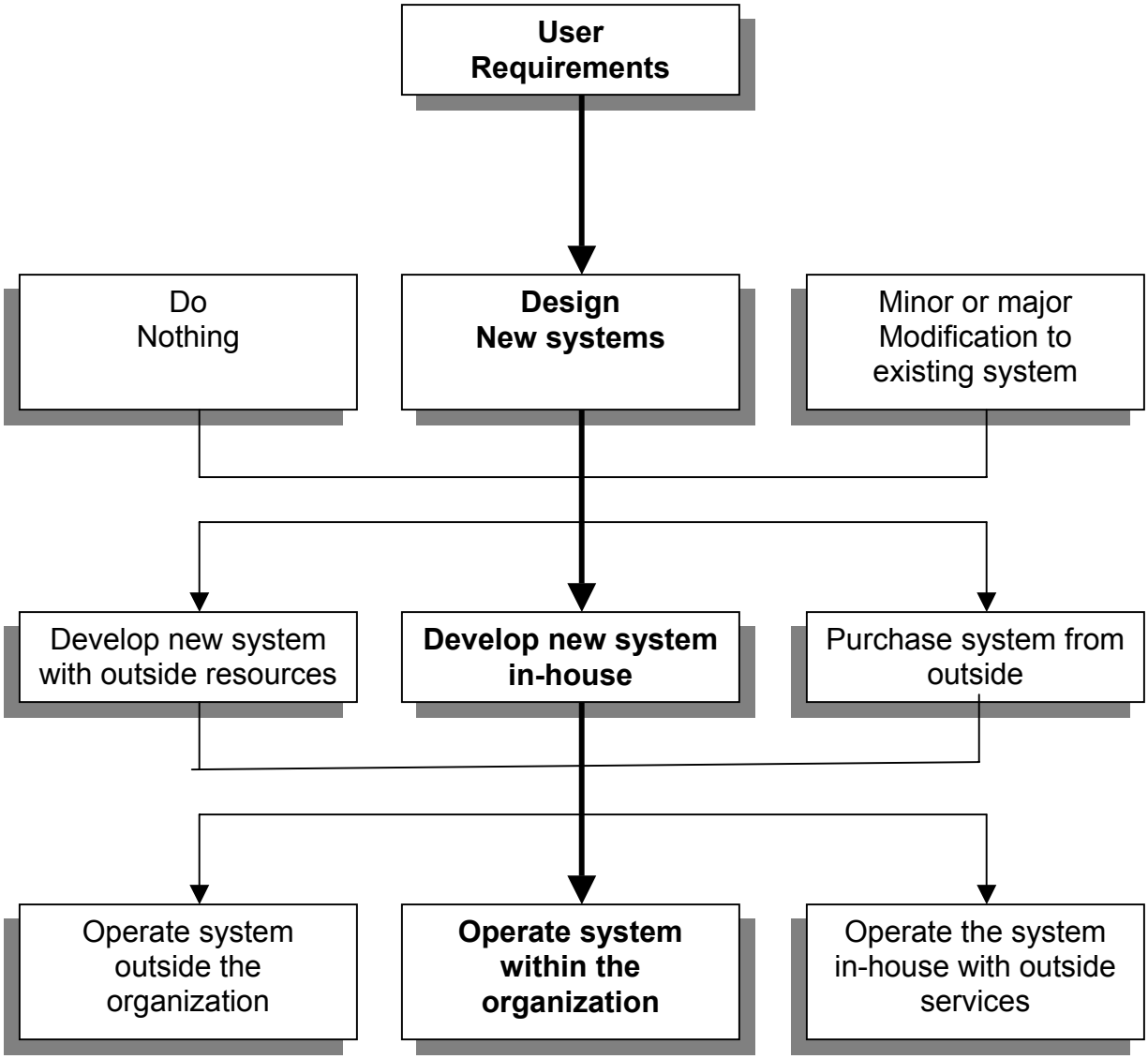

Fig 4.1 Major Design Options available to the analyst

Note The path taken for this project is shown in **bold.**

key issues for the present system. It is important to note here that there was no existing computerized system of trading; therefore creating a new system was the only viable alternative.

An evaluation of the system for its feasibility was carried out. The feasibility evaluation included the following three elements

a) Economic feasibility The costs of the new system would be justified by the benefits the system would provide.
b) Technical feasibility The system would work reliably, because there was available reliable hardware, software and user training facilities.
c) Operational feasibility The small-scale business people would use the system and that they would not resist its implementation.

4.3.3 Choice of the best alternative

As noted in (ii) of section 4.3, there were no alternative choices. However, the new system would be able to satisfy the following requirements

a) The system would be integrated with existing systems like ZERI
b) The system would be flexible enough so that it can be modified in the future to be used for any type of small scale business transactions
c) The system would be equipped with enough security mechanisms to avoid its unauthorized use
d) The benefits of the system would be worth its cost.

4.3.4 System Design

Membership of MEMB

For now, the membership of MEMB is by registration. It is hoped that if this work is developed further, the membership will be obtained by subscribing to the site, hence make the site a full-fledged commercial website.

The design of MEMB was centered on Buyers and Sellers. The Buying and Selling process is shown in the Fig 4.2.

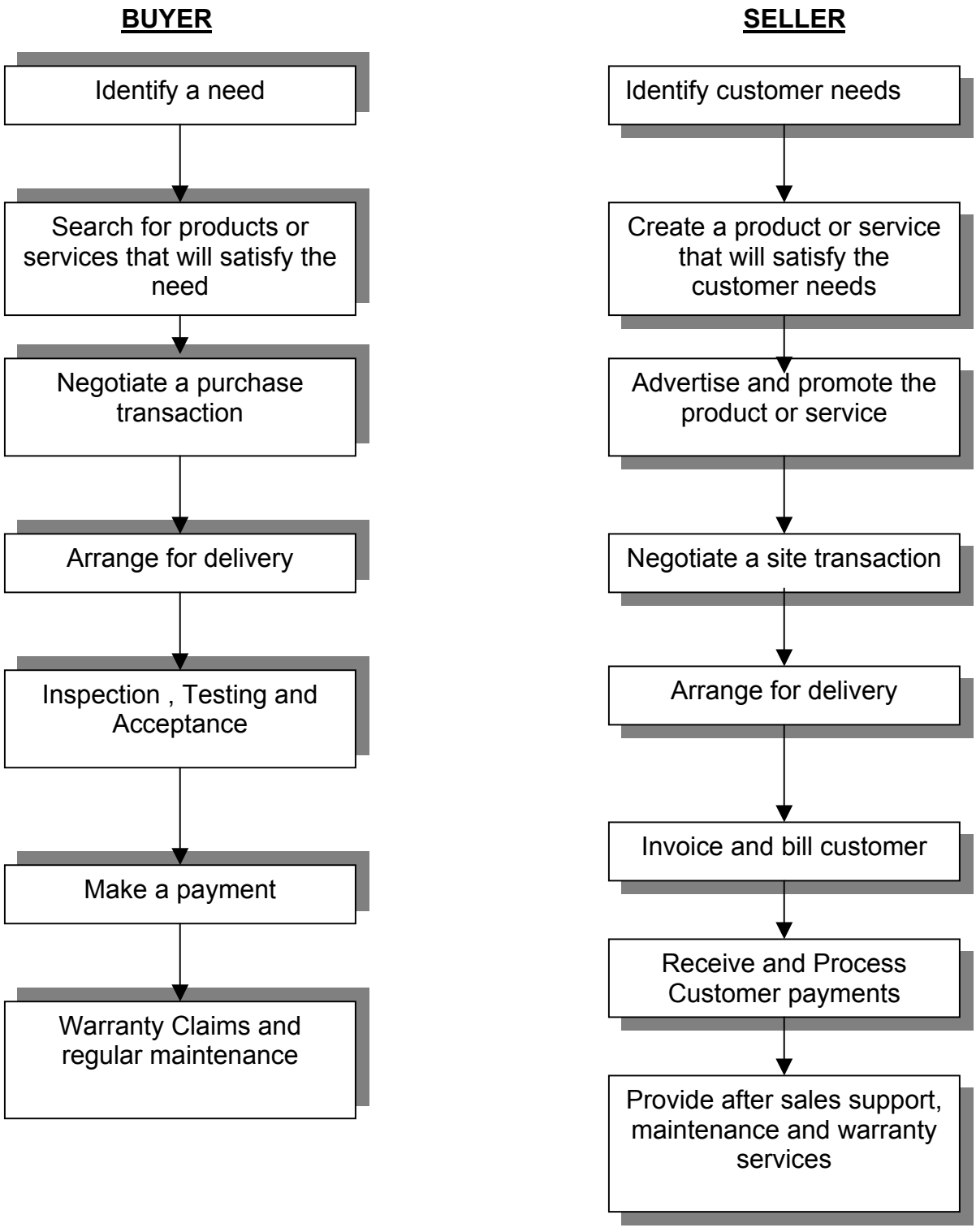

Fig 4.2 Buyer and Seller Roles in Commerce [Perry, J.T. and Schneider, G.P. (2001).]

In the design of MEMB, a similar structure shown in Fig 4.2 was used. The processes are depicted in the following Fig 4.3 – 4.4.

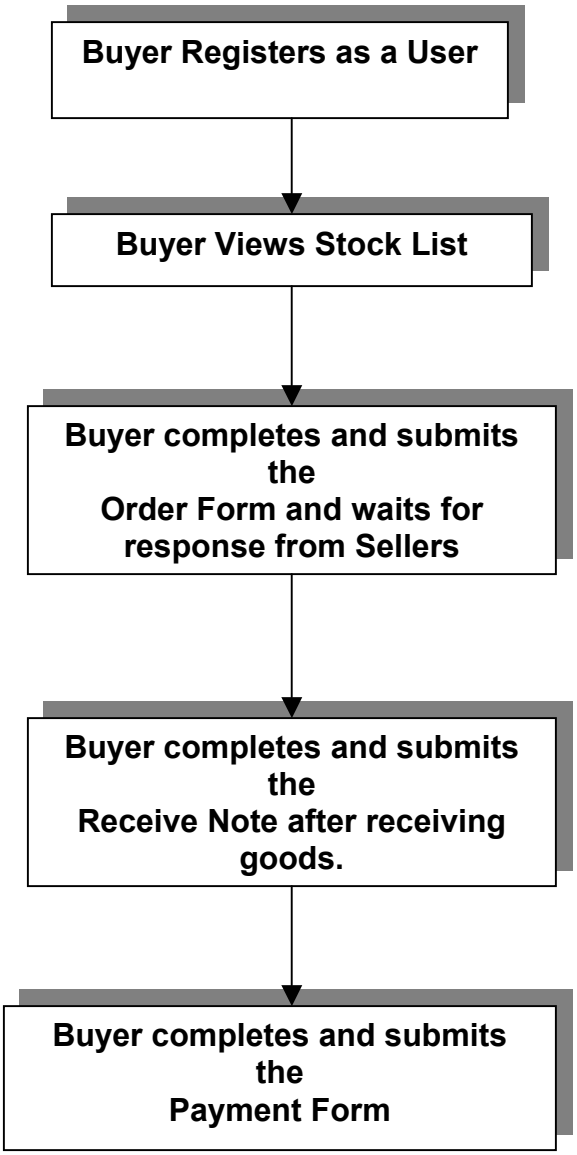

Fig 4.3 The Buying process

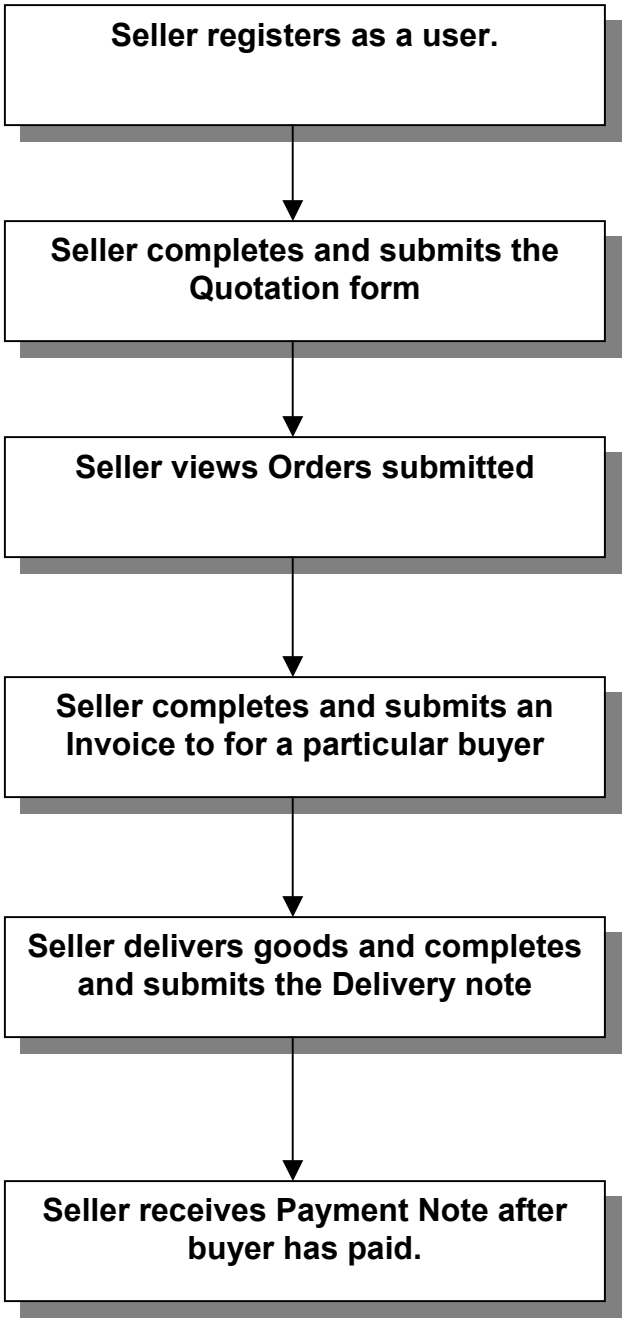

Fig 4.4 The Selling process

Both Buyers and Sellers can

1. View customers details
2. View Enquiries submitted
3. Register with MEMB

The site is designed to utilize a content administrator whose functions include

1. Updating the Web site as necessary
2. Control of the Registration of Users
3. Provision of Feedback as requested on the Feedback form by users

4.3.5 MEMB Architecture

MEMB was implemented within a windows environment. In particular, Windows 2000 Operating System was used. Windows 2000 was found to be most suitable because it did not pose any problems during the construction and testing phases of the project.

System data is stored in an MS-Access database. MS-Access was chosen because of its availability, being a part of the Microsoft office tools. The amount of data to be processed at the level of this research was found not to be big enough to warrant use of a bigger database management system like Oracle. Further work on this may require the use of a more powerful database management system like Oracle.

Interaction between the Web site and the database was implemented via Active Server Pages (ASP). ASP was used to make the Web site more interactive. The system used here was a three-tier system whereby the server program connects to the data source and processes the required data. The data is then returned to the client application. In such an instance, the client does not connect directly to the

data source. For example, you can create an application that connects to the Internet Information Server (IIS). Then the IIS connects to the data source and processes the required information. The information is then returned as standard HTML to be displayed on the browser. Figure 4.5 illustrates this process.

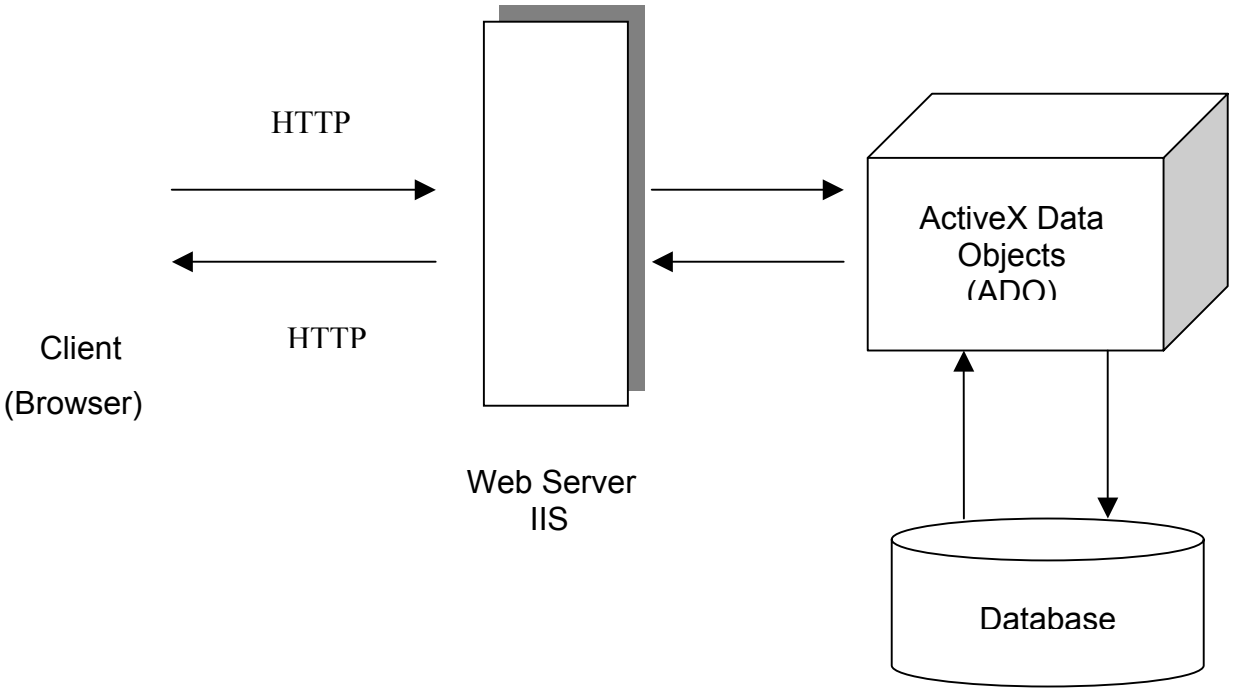

Fig 4.5 Accessing a database

The architecture and requirements for developing a Web-enabled application also differ from the traditional client/server applications. A Web-enabled application cannot function in isolation. It requires several network and application components to deliver the desired results to the user. A client machine is connected to a Proxy Server within an organization. The proxy Server contains firewalls required to filter information that is being sent to other resources, and a database.

Figure 4.5 illustrates the Web architecture that was used to develop and deploy the MEMB application.

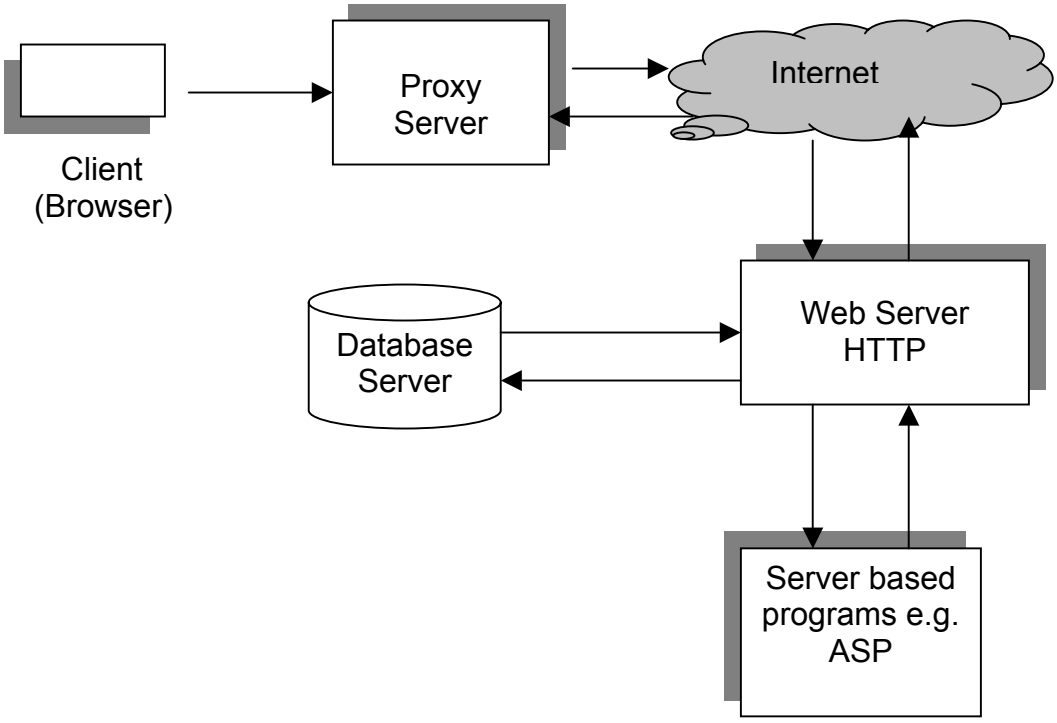

Fig 4.6 The typical infrastructure for a Web-enabled application

At the prototype level, Internet Information Server (IIS) was used to store all business and data access components. IIS is Microsoft's brand of Web server software, utilizing Hypertext Transfer Protocol (http) to deliver World Wide Web documents. IIS incorporates various functions for security, allows for CGI programs, and also provides for File Transfer Protocol (FTP) servers. *[http//www.alphastarcomputer.com/fp_2000_glossary.htm#I].*

The user-interface was implemented using a browser, which presents a Graphical User Interface (GUI) and facilitates communication between the user and the Web Server.

4.3.5.1 Design for all users of the system

All visitors to the MEMB Web site arrive at the Welcoming Screen. The screen is designed so that it offers a friendly welcome by requesting the visitors' first name.

This screen is a local page hyper linked to the MEMB welcome page. It does not store the first name that is entered.

The welcome screen is designed to echo a visitor's name or no name if no name is entered. This is to exemplify the friendly nature of the Web site. The screen goes on to give a brief synopsis of the purpose of the Web site and an encouraging message for the visitor to proceed on after the submit button is clicked.

4.3.5.2 Registration with the system

All users of the system are required to register as members of MEMB. Registration is currently free and any visitor who wishes to participate in any transactions on the site must register.

At the registration level, the required inputs are a username and password. These are taken and stored in a database. No two users can share the same username. If a user attempts to register
An already existing username, the system detects this and redirects the user back to the user registration form with instructions to use another username.

4.3.5.3 Logging into the system

After the user successfully registers, the system allows him to log into the system using the supplied username and password at registration. The log in details are submitted to the database via an ASP script for attention. If matching username and password are supplied, then the system allows the user to view all contents of the Web site.

This interface is very simple and very user-friendly.

4.3.5.4 The Seller

The primary intention of the seller would be to post his products on the Web site. Therefore after registration and successful logging into the system, the seller clicks on the “selling” button which is permanently visible at the top frame of every page. The seller then completes a Quotation Form which details the products on offer then submits this to a database which holds all items being sold. The submission to the database then triggers a request for the user to complete a form, which gathers more information than simply the username and password. This information is also kept in the database table, which stores details of all customers. Thus you only become a customer if you actually buy or sell a product on the site.

Sellers therefore keep checking the Orders Submitted to view any orders that may have been placed and respond accordingly by effecting physical delivery of the goods.

4.3.5.5 The Buyer

The buyer, like the seller, must register, log in and provide other details as described in subsection 4.3.5.4. However, the buyer must additionally complete the Order Form and submit to the database. After delivery has been effected, the buyer completes the Receive Note Form to confirm that he has received the goods,

then he pays fro them. (Payment has not been addressed, but can be effected either before of after delivery of the goods.)

4.3.5.6 User Design Interface

The following factors were designed and implemented

- The Web site was designed to allow people with the least knowledge of computers to be able to use it. However the basic idea about the operation of windows and the use of the mouse will be necessary
- It was designed to allow visitors to navigate the links very easily
- All frequently used links were designed to be permanently visible to the user no matter which page is being viewed
- The Web site's name and contact information were clearly placed on the home page.
- The Business jargon and terms that may not be familiar to visitors were strictly avoided
- Consistency with the use of design features and colors on all web pages within the site was strictly adhered to
- All navigation controls and links were clearly labeled.

4.3.5.7 Site Administration and maintenance design

The site Administrator has access to all aspects of the site including all the database contents. The database Administrator can disable or even delete a particular user account from the system if the user's conduct is not in the best interests of the site's objectives. The site Administrator may change the design, appearance, content, etc., of the site without reference to another party.

4.3.6 System Implementation

A new system can be implemented using one of the types of conversions shown in Table 4.1.

Table 4.1 Types of System Implementation

Number	Type	Description	Discussion
1	Direct	Abandon the old	Very risky; not recommended
2	Parallel	Run old and new side by side	Very low risk; however, very expensive; not generally recommended
3	Pilot	Convert part of organization first	Less expensive but riskier than parallel conversion; recommended for situations with many people performing similar operations
4	Phased	Implement gradually	Less risky but more expensive than parallel conversion; recommended for situations with many people performing different operations

For implementation of MEMB, number 3 – Pilot- was preferred because farmers affiliated with ZERI will try out the new system. Once the system is working smoothly in ZERI, it can then be used in any other small-scale business enterprise.

4.3.7 System Testing

Testing Philosophy

After the system was developed, it was fed with sample data. The processed information was then evaluated to see whether results were correct. This is the mode of testing that was adapted for MEMB.

In this approach, relatively large number of users was used. Keeping in mind that the Web site will be used by people who may be using a computer for the first time;

the site was given to 40 University first year computer literacy students. Some of these students were totally new to computers but managed to follow the instructions that were given to them. The system was loaded onto the Researcher's server located in his office and accessed via an Intranet. The students were requested to run the application while taking note of their observations. The entire class of 40 students opened the application concurrently. Feedback from these users was unanimous that the site was quite straightforward to use. The fact that the most frequently used buttons for the site were permanently visible to the users was a very attractive feature to the students.

The users were able to register with the system, log in, complete forms, submit them to the database and also observe database responses. The system did not show any signs of deterioration.

The prototype was therefore subjected to a large number of transactions and it demonstrated its ability to handle high volumes of transactions.

4.3.7.1 MEMB Interactive components

The following data components interact with each other on the site Buyer, Seller, casual visitor, the Web administrator, site objects, a database and the server.

The site is designed with a view that it could be converted to a commercial site at a later date. Therefore, access to it at the moment is restricted to registered members only so that the condition can be easily changed to paid-up members only if need be. This is intended to make it easier later on to change it to a subscription site, so that only paid up members may view the site contents.

Non-members of MEMB must first register as members by providing a unique username and password. If a user enters a username that already exists in the users database, he is prompted that the particular username has already been used, then he is requested to select another one. A user can, therefore, only

successfully register if he chooses a username that does not exist in the users database already. This information is kept in a database on the web server and a message is returned from the server to inform the new user that he is now registered and can log into the system. Login requires the user to use the exact username and password supplied during registration. Otherwise an error message is generated.

A user can be a Buyer or Seller. A buyer may view the contents of the stock list, which shows a list of what sellers have posted to sell. He then completes and submits an order form and the process continues as shown in Fig 4.3 and Fig 4.4.

4.3.7.2 Site Administration

As for the Administration of the site, the Administrator has access to all components of the site. He can update the site, delete pages, create new ones, have access to customer passwords and generally have full control of all functionalities of the Web site. A user cannot perform Administrator functions.

4.4 Problems and Evaluation

4.4.1 Problems Encountered

No major problems were observed during this final phase of testing. However, during earlier testing sessions, the system could not allow more than one user to write into the database. The problem was that all users had not been given sufficient rights to access the database. The problem has since been solved.

MEMB Website can be accessed via the Internet. A link to the MEMB Web site has been placed on the ZERI Web site (*http//www.zeri.unam.na*). The name of the link is Trade Web.

4.4.2 Evaluation

System evaluation refers to the way a system is performing in terms of its failure or success in achieving its initially stated objectives. It would be deemed to have failed if it does not meet the objectives or succeeded if its objectives are satisfied.

4.4.2.1 Achievements

The following objectives were realized

- A model to help a small-scale businessman was developed and tested.
- Buyers are able to use MEMB and buy mushrooms online.
- Sellers are able to post their products on the site
- MEMB is able to restrict its access to registered members only.
- Multiple users can access MEMB simultaneously.
- MEMB demonstrates the combined use of system Analysis and Design, network technology, database management systems, Active Server Pages technology and Web site Development Techniques.

4.4.2.2 Failures

In the course of developing MEMB, the following failures were encountered

- MEMB did not tackle the problem of payment over the Internet.
- The database access could have been made more interactive.

Chapter 5 Conclusion

In chapter 1 of this document, the objectives of this research were set out. The main thrust of the research work was to show that the Computer Science System Analysis and Design methodology can be applied to develop a software system that combines programming, internet Web Technology, Active Server pages (ASP) scripting and database systems.

5.1 The Objectives, the Hypotheses and results

The original objectives of this research were in two categories as follows

5.1.1 Overall Objective

To examine factors and conditions, which inhibit the growth of e-commerce in Namibia, and develop a suitable business model for trading that will be adapted to the Internet using electronic commerce technologies, as an example on how to boost e-commerce in Namibia.

5.1.2 Specific Objectives

The specific objectives related to this research are

a) To determine how much Namibian companies use the Internet and web hosting technologies in conducting their businesses.
b) To study the methods of advertising in use.
c) To show that the Computer Science System Analysis and Design methodology can be applied to develop a software system that combines programming, Internet web technology, Active Server

Pages (ASP) scripting, and database systems, that can be utilized for e-commerce transactions in Namibia.

d) To use the software developed to show that small-scale Namibian companies could increase their efficiencies by utilizing e-commerce.

5.1.2.1 Factors which inhibit the growth of e-commerce in Namibia

To examine factors and conditions which inhibit the growth of e-commerce in Namibia, the following hypothesis was set

> That there is little use of e-commerce and related Internet Technologies within the Small and Medium Enterprise (SME) sector in Namibia. To test this hypothesis, it was converted to a Null and Alternative hypothesis.

The Null hypothesis stated that SME sector in Namibia use e-commerce to an appreciable extend. Analysis of data gathered during this research shows that only 14% of companies (Appendix II/2) interviewed use e-commerce and related Internet technologies. The Null hypothesis was therefore rejected.

The Alternative hypothesis stated that SME sector in Namibia does not use e-commerce to an appreciable extent. This was confirmed by the results of the survey, because from the results obtained, 86% of companies in Namibia do not use e-commerce. The Alternate hypothesis was therefore adopted.

Analysis of the data gathered also indicated that only 2.5% of the companies interviewed use the Internet for advertising, indicating that most of the companies in Namibia do not use the Internet for advertising.

This research therefore showed that SME sector in Namibia does not use e-commerce to an appreciable extent. The specific objectives to determine how

much Namibian companies use the Internet and web hosting technologies in conducting their businesses and a study of the methods of advertising in use were therefore achieved.

5.1.2.2 Development of a software system

In order to show that Computer Science System Analysis and Design methodology can be applied to develop a software system that combines programming, Internet web technology, Active Server Pages (ASP) scripting, and database systems, that can be utilized for e-commerce transactions in Namibia, the following Hypothesis was set

> That it is possible, using Computer Science Systems Analysis and Design Methodology, to develop computer software as an e-commerce tool for SME sector in Namibia.

A Web site (MEMB) was developed using Computer Science Systems Analysis Methodology to enable traders to buy and sell their products as detailed in chapter 5 of this thesis. This fulfilled the specific objective that Computer Science System Analysis and Design methodology can be applied to develop a software system that combines programming, Internet web technology, Active Server Pages (ASP) scripting, and database systems, that can be utilized for e-commerce transactions in Namibia.

5.1.2.3 Use of the software developed for the SME in Namibia

To show that the software developed can increase the efficiency of SME in Namibia, the following hypothesis was set:

That e-commerce can improve efficiency of the business of small-scale entrepreneurs in Namibia.

To test this Hypothesis, a Null Hypothesis and an Alternative Hypothesis was formulated as follows:

- Null Hypothesis

The Null hypothesis states that use of e-commerce (Software developed in this research) cannot improve the efficiency of SME businesses in Namibia. This research showed that if SMEs use the software developed in this research, their efficiency will improve. The Null hypothesis was therefore rejected.

- Alternative Hypothesis

This states that use of e-commerce can improve efficiency of SME businesses in Namibia. Based on the feedback obtained from students who used the MEMB software, businesses can greatly improve their efficiency if they used e-commerce because they would benefit from all the advantages provided by e-commerce and benefits provided by the trading software. The Alternative hypothesis was therefore adopted.

The objective that the software developed can increase the efficiency of SME companies in Namibia was therefore satisfied.

Although the MEMB Model specifies mushroom transactions, it should be emphasized that the prototype can be modified with relative ease to transact any other business. The Web site is therefore flexible and adaptable to any changing circumstance.

5.2 Limitations and Constraints

The following limitations and constraints were experienced in spite of the successes scored:

- Gathering of data from traders was a major handicap. Some merchants were unwilling to provide information citing that they were busy. There were also some companies, which I cannot enumerate here, that totally declined to either answer questions or complete questionnaires.
- The research work took longer than anticipated because the researcher and supervisor suffered extreme time constraints. It happened that when either of the two was free, the other was busy. Thus it was not easy to organize meetings and therefore progress was very slow, and deadlines were hard to meet.

5.3 Suggestions and Future Work

The following are suggestions by the author for future work on this research:

- The topic of payments has evidently been left out in this research. Payment in e-commerce is a complex issue and requires further research. Therefore, this Web site can be re-engineered and the payment functionality added to it. This is an area that would be suggested for further work

- The database schema could also be revisited so that the database tables are connected to enable more automated searches to the database.

- As the volume of users increases, it may be necessary to use a bigger database management system like Oracle.

- MEMB however, has provided a resounding platform from which other research work can be launched to implement an application with even more functionalities than hitherto undertaken.

- Work need to be done on computerizing fully the entire supply chain for each product and assess the benefits.

- Issues of bandwidths, particularly to customers who may have poor dial-up lines of very low bandwidth need to be examined.

- The possibility of using mobile telephones linked to the Internet can significantly add value to the Web site usage. This possibility needs to be examined.

- Work need to be done to allow queries by e-mail only, and allow the system to respond automatically, again by e-mail.

- Policy makers should see the need to formulate a National Policy on e-commerce that would guide the development of e-commerce in Namibia. Similar policies exist in South Africa (*htt//document.pwv.gov.za)* and the United States of America *(http//www.doc.gov/ecommerce/privacy.htm).*

REFERENCES

1. Anderson, Sweeney,and Williams (1994), Introduction to Statistics West Publishing Company, USA. ISBN 0-314-02813-7

2. Elizabeth Eisner Reding (2001), Building an eBusiness, McGraw-Hill, USA. ISBN 0-07-2427365

3. Carol M. Cram, C.M. and Hirschl, M.C. (1998). Creating Websites Projects, Course Technology, USA. ISBN 0-7600-5802-4.

4. Capron H.L., (2000). Computers Tools for an Information Age, Prentice Hall, USA. ISBN 0-201-612111-9

5. Design Team, H.O. Mumbai, (2000). Sever Side Scripting with ASP, APTe-commerceH Computer E

6. Greenstein, M. and Feinman, T. (2000). Electronic Commerce Security, Risk Management and Cont

7. Jankowicz, A.D.(2000). Business Research Projects, Thomson Learning, UK. ISBN 1-86152-549-4.

8. Kendall, K.E. and Kendall, J.E. (1999). Systems Analysis and Design (Fourth Edition), Prentice Hall,

9. Kiangi, G.E. (1998). Introduction to Electronic Data Interchange and Electronic Commerce, SAR Pub

10. Morneau, H. and Batistick, J. (2001). Active Server Pages, Thomson Learning, Canada. ISBN 0-619

11. O'Leary, T.J. and O'Leary, L.I. (2002). Computing Essentials, 2001-2002 Edition, Mc Graw-Hill, USA. ISBN 0-07-116610-6.

12. Perry, J.T. and Schneider, G.P. (2001). e-commerce New Perspective, Thomson Learning, USA. ISBN 0-619-01929-8.

13. Post, G.V. (1999). Database Management Systems, Mc Graw-Hill, USA. ISBN0-07-289893-3.

14. Rayport, J.F. and Jaworski, B.J. (2001). e-commerce, Mc Graw Hill, Singapore. ISBN 0-07-118945-9

15. Riley, M., Wood, R.C., Clark, M.A., Wilkie, E. and Szivas, E.(2000). Researching and Writing Dissert

16. Rob, P. and Coronel, C. (2002). Database Systems Design, Implementation and Management, Cour

17. Sarah E. Hutchinson and Stacey C. Sawyer (1998). Computers, Communications And Information, McGraw-Hill, USA. ISBN 0-07-115759-X

18. Schneider, Gary P. and Perry, James T. (2001). Electronic Commerce, Course Technology, Canad

19. Shelly, G.B., Cashman, T.J. and Vermaat, M.E. (2003). Discovering Computers,

Course Technology, USA. ISBN0-7895-6514-5.

20. Vaughn, W. (1998). Visual Basic and SQL Server – Sixth Edition, Microsoft Press, USA. ISBN 1-57231-848-1.

21. Welman, J.C. and Kruger, S.J. (1999). Research Methodology for Business and administrative Scien

22. Whiteley. (2000). E-commerce Strategy, Technologies and Applications, McGraw Hill, Cambridge Un

23. Whitten, J.L., Bentley, L.D. and Dittman, K.C. (2000). (Systems Analysis and Design Methods – Fif

24. Williams, B.K. and Sawyer, S.C. (2001). Using Information Technology, Mc Graw-Hill, USA. ISBN 0

Published Papers and Journals

1. A country ICT Survey for Namibia, Swedish International Development Cooperation Agency (Sida), December 2002.

2. African Academy of Sciences, Discovery and Innovation, Volume 14 Number 1 / 2, June 2002 ISSN 1015-079X

3. G.E. Kiangi and K.E. Mshigeni, Information and Communication Technology (ICT) in Africa Opportunities and Challenges, 2002.

4. G.E. Kiangi and K.E. Mshigeni, Information and Communication Technology (ICT) and Economic Development; A framework for Change in Developing countries.

5. G.E. Kiangi, Decentralized Information Management and Participatory Communication for Food Security IT Needs and requirements for the Pilot Region, August 2003.

6. Namibia Policy Programme on Small Business Development - Ministry of Trade and Industry (1997).

The following references identify key resources, documents, and policy information on the World Wide Web, concerning each of the main issues and sub-issues involved with the development of a National Electronic Commerce Policy

1. http//docweb.pwv.gov.za/Ecomm-Debate/myweb/docs/discuss-appen.html
   National policy discussions concerning the development of Electronic Commerce in South Africa.

2. http//www.doc.gov/ecommerce/privacy.htm
   More recent policy paper (June 1998) by the United States Department of Commerce on privacy issues generally involved with e-commerce. Describes international consensus on principles for privacy protection, and options for implementing those principles (legislative vs. self-regulation). Identifies the U.S. policy approach as a combination of these methods. Also includes useful international examples and survey of basic questions to be raised in establishing a national policy.

3. http//www.oecd.org/subject/e_commerce/ebooks/ecomm1_4.pdf
   An OECD summary document (in .pdf format) concerning consumer protection issues relating to electronic commerce.

4. http//www.ispo.cec.be/ecommerce/dataprotect.html
   Links to the most recent Directives of the European Commission on data protection policy.

5. The e-commerce Analyst - http//www.econminfocenter.com
   Link to e-commerce Analyst journal

6. What is Electronic Commerce? - http//ecommerce.vaderbilt.edu

7. The Economic and Social Impacts of EC - http//www.pcweek.com

8. *http//www.u.arizona.edu/~smason/c2c.htm -* A web site, which describes the different types of e-commerce.

9. *http//www.dlib.org/dlib/february99/thibadeau/02thibadeau.html* - A web site dedicated to e-commerce catalog construction.

10. http//www.alphastarcomputer.com/fp_2000_glossary.htm#i - A glossary of definitions.

11. *http//docweb.pwv.gov.za/Ecomm-Debate/myweb/docs/discuss01.html (November 2002)* - a discussion paper prepared on behalf of the Department of Communications (DoC) of the Republic of South Africa to serve as a starting point for national policy discussions concerning the development of Electronic Commerce in South Africa.

12. *http//www.findarticles.com/cf_dls/m0HWW/46_3/77033858/p2/article.jhtml?term=* Avon Web site.

13. *http//www.fool.com/research/2000/foolsden000808.htm* General Electric Web site.

APPENDIX I

QUESTIONNAIRE

Introduction

In order to improve the way businesses are transacted in Namibia, New ways of trading must be employed. Electronic trading is rapidly replacing the traditional trading practices worldwide. A survey is therefore necessary to determine what types of trading methods are in force currently in Namibia, from which recommendations shall be made to help improve trading between businesses.

To help us in this exercise, please answer the following questions as comprehensively as possible

(1) Company/Enterprise name

_____

(2) Physical address

_____

(3) Nature of Business

_____

(4) Do you use computers in your company? Yes/No. _____

If Yes, for what purpose(s)? Please enumerate

a.)

b.)

c.)

d.)

(5) Do you use Electronic Commerce? Yes / No. _____

If Yes, Please briefly explain with which partners.

_____

_____

_____

_____

_____What type of business documents do you use?

- _____

  _____
- _____

  _____
- _____

  _____
- _____

  _____

Kindly provide us with some samples.

(6) How are the documents delivered to their destinations?

_____

_____

_____

How long do they take? _____

Do you experience delays? Yes / No. _____

(7) What problems are you experiencing between your company and customers in terms of ordering and delivery of goods?

_____

_____

_____

_____

_____

_____

(8) How do you advertise your goods and /or services? State the kind of advertising methods you use and indicate whether they are effective or not?

_____
_____
_____
_____
_____

(9) What method of payment do you use? e.g. cash, check etc. Please specify.

_____
_____
_____
_____
_____

(10)What is the general company attitude towards the use of Electronic trading?

_____
_____
_____
_____
_____
_____
_____

(11)Feel free to give any other comments regarding how you think trading could be improved between your company and its customers.

_____
_____
_____
_____
_____
_____
_____

_____

_____

_____

Your Position in the company

_____

Telephone contact _____

Appendix II/2

Summary of e-commerce questionnaire

The following summaries were obtained from the data collected in appendix II/1. A summary response is shown against each question

1. Does the company use e-commerce?
   Yes - 5/36 = 14%
   No - 31/36 = 86%

2. What type(s) of business documents are used?
   a) Invoices - 13/36 = 53%
   b) Order forms - 16/36 = 44%
   c) Quotation forms - 3/36 = 8 %
   d) Delivery notes - 2/36 = 6%
   e) All - 19/36 = 53%

3. How are invoices delivered?
   a) By hand - 36/36 = 100%
   b) By Post - 36/36 = 100%
   c) Electronically - 30/36 = 83%
   d) Fax - 30/36 = 83%
   e) All methods - 9/36 = 25%

4. How long do deliveries take on average?
   a) Less than 1 week - 36/36 = 100%
   b) Over 1 week - 0/36 = 0%

5. Are there any problems with deliveries?
   a) Yes - 36/36 = 100%
   b) No - 0/36 = 0%

6. How is advertising done?
   a) Media - 6/36 = 100%
   b) Bulletin Boards - 35/36 = 99%
   c) Internet - 1/36 = 2.5%
   d) All types - 1/36 = 2.5%

7. How effective is the advertising?
   a) 100% effective - 0/36 = 0%
   b) Between 50% and 80% - 36/36 = 100%
   c) 10% effective - 0/36 = 0%
   d) 0% effective - 0/36 = 0%

8. What is the level of computer usage in your company?
   a) 100% usage - 25/36 = 70%
   b) 50% usage - 9/36 = 25%
   c) 10% usage - 1/36 = 2.5%
   d) 0% usage - 1/36 = 2.5%

9. What method(s) of payment do you use?
   a) Credit card - 20/36 = 56%
   b) Cash - 36/36 = 100%
   c) Check - 20/36 = 56%
   d) Electronic - 15/36 = 42%
   e) All methods - 16/36 = 44%

10. What is the attitude of workers towards the introduction and use of computers?
    a) Good - 36/36 = 100%
    b) Bad - 0/36 = 0%

11. What action should be taken to improve trade?
    a) Introduce computers - 36/36 = 100%
    b) Use e-commerce - 36/36 = 100%

12. Would you like to use e-commerce technology?
    a) Yes - 36/36 = 100%
    b) No - 0/36 = 0%

Appendix II/3 List of SMEs obtained from the Ministry of Trade and Industry

No.	Company Name
01	Book Den
02	Alpha Tronics cc
03	CITI Shoetique
04	Libero - Fashion for men
05	Time boutique and MusicQueen of Namibia
06	Jack and Jill Toys
07	Bloomsbury's Gift Shop
08	Emgees Book Café
09	Le Trip - Camping and cycling
10	Supertronics
11	Cordies
12	Colours Boutique
13	Le Gear
14	JNP Hair Salon
15	Citi Gold Jewelers
16	Crystal Cabinet
17	Bio Dynamics
18	Bima Electrical
19	Boom Trading
20	Bosch Srvice Agent
21	Coffees And Crafts
22	Cloddy Dressmakers
23	Crafty Art Crafts
24	Erundu Welding
25	Etemo Take-away
26	Friendly Grocer Bakery
27	GM Auto Electric
28	GM Refrigeration
29	Galaxy Glassware
30	Geva Renovations
31	GL Construction cc
32	Gypsey Caravans
33	H&L Printers
34	Guys and Girls Retail Clothing
35	Hair Design cc
36	Hakuna Matata Backpackers & Tours
37	HP Plumbing - Plumbers
38	Hansie's Barber Shop

39	Harpago (Pty) Ltd -Exporter
40	Hotel Pension Moni
41	I & H Motor Repairs
42	House of Wines Ltd
43	Inter Toys
44	Informal Trading- Hawkers
45	Iver Production (Craft)
46	JR Motors Service Station
47	Johanna Take Away
48	Joy World
49	Kabamba Curios
50	Karibu Fashions
51	Kavandje Fruits
52	Luisen Apotheke
53	Maagano Hair Salon
54	Makalani Crafts Market
55	Makita Power Tools
56	Maria Hairsalon
57	Maria Self Help
58	Market Motors
59	Medica Pharmacy
60	Mellinium Refrigerators
61	Mini Shop
62	Mini Upholstery
63	Modren Picture Framing
64	Monica Enterprises
65	Motorcycle Center
66	Muehr Otto and Co.
67	Mwaninga General Shop
68	Prime Real Estate
69	Porsche Namibia
70	Oriental and Persian Carpets
71	Multi-tyre Ltd
72	Namam Millers
73	Ombili Bakery
74	Schneidr Electric
75	Scara Beauty Salon
76	Sky Scene Retailers
77	Simao Tailors
78	Simply Shoes
79	Spices for Africa
80	Spes Bona Motors

81	Steam and Valve Specialists Namibia
82	Ssang Yong Namibia
83	Sprengel Bricks Ltd
84	Tjika Dairy cc
85	Top Shop
86	Topaz Agency
87	Titus Mechanics
88	Tony's Repairs
89	Tobies Clothing cc
90	Torga Optical Windhoek
91	Tormaline Safaris
92	Uwe's Autoelectric
93	Valley Omar Car Sales
94	Up-Up Hawkers
95	Vet to Pet
96	Vera's Properties
97	Vanessa Hair Salon
98	Windhoek Optics
99	Windhoe Bolts and Nuts
100	Windshield Repairs AJ

APPENDIX III

MEMB USER MANUAL

1.0 The Interface

MEMB is launched through the browser by typing its Uniform Resource Locator (URL) address in the browser's address line. This will start MEMB and the first page to load is the MEMB Welcome Screen. A greeting message, which echoes the visitor's first name, encourages the visitor to proceed. The next screen displays a brief write-up about what the site is all about. This screen then invites the visitor to either register (for new users) or login (for registered users).

After registration and or successful login, the MEMB homepage opens. The Home page is divided into three frames-the Header Frame, the Mainframe and the Footer Frame. The Header and Footer Frames contain the main navigation buttons. These buttons are

- Home
- Zeri
- Enquiries
- Selling
- Buying
- Links
- Receivenote
- Invoice
- Paynote
- Acknowledgement

The Center Frame displays a brief statement about the mission of MEMB, contact person address, telephone numbers, e-mail, and links to

(a) Feedback Page

(b) Registered Customers

(c) About us

Fig A3.1 MEMB Home Page

1.1 User log on interface

A user can either create a new account, or log on to his account, if he is a registered user. The screen that is displayed to the user is shown in Figure A3.2 .

Fig A3.2 User log on interface

The interface further allows the user to register if he has not done so. If the user name does not exist in the system users database, the response shown in Figure A3.3 is returned.

Fig A3.3 Wrong Username or Password or Unregistered response

1.2 User account details

When a user commences to buy or sell products on this site, the site administration requires more than just a username and a password. Because Buyers and Sellers must contact each other, more details are essential. A buyer/seller must therefore complete the form shown in Figure A3.4 in order to proceed with the transaction.

Fig A3.4 MEMB Customers' details

1.3 The Selling Interface

A user with products he wishes to sell posts his product details by clicking on the **selling** button, which activates the Quotation Form shown in Fig A3.5. A successfully completed form after submission returns the response shown in Fig A3.6.

Fig A3.5 Quotation Form

Fig A3.6 Quotation Response (.asp)

From the screen of Fig A3.6, a seller is able to view the stock list and is requested to complete the **Customer Details** form so that other customers can reach him.

1.4 Buyers' Interface

A buyer invokes the buying process by clicking on the **Buying** button. This opens a screen, which presents him with 2 options

i) To view the Stock List (Fig A3.7)

ii) To complete the order form and submit it to the database (Fig A3.8).

Fig A3.7The Stock List

Fig A3.8 The Order Form

On submission of the Order Form a message is returned to confirm the order [FigA3.9] and the user can view [Fig A3.10] the orders so far placed by clicking on the provided hyperlink.

Fig A3.9 Order Form response

Fig A3.10 Orders Placed so far

This screen also provides a chance for the user to BUY or SELL by clicking on the relevant button.

1.5 The Delivery Interface

All items that have been delivered can be viewed by selecting the “Links” option on the Footer frame of the Website Home page and clicking on the “Delivery Note content” link, which displays details of all deliveries that have been effected so far. The list is shown in Fig A3.11 A delivery Note is completed and submitted by a seller after he has physically delivered items to a particular buyer. The form is shown in Fig A3.12.

Fig A3.11 Delivery Note

Fig A3.12 Delivered items

1.6 The Links Interface

The Links interface provides links to screens that show the current position regarding buying and selling activities on the site. These include information about

- The enquiries made so far
- A list of all quotations
- All orders placed on the site
- Deliveries that have been effected
- All items that have been delivered and received
- In voices sent out by the Sellers
- All the payments that have been effected
- A list of all registered customers of MEMB

Each one of the links above provides a table to show the details of each of the transactions listed. For example, clicking on the link for “Customers Details” opens the table shown in Table A3.1.

Table A3.1 List of registered MEMB customers

1.7 Receive Note Interface

The Receive Note is completed and submitted by a buyer to confirm that the items specified in the form have been received. It should be noted that on this site, which deals with mushrooms exclusively, a standard product name - mushroom - has been used. The mushrooms are however classified as

- Mushroom1 which cost N$ 12.00 per kg
- Mushroom2 which cost N$ 15.00 per kg
- Mushroom3 which cost N$ 17.00 per kg
- Mushroom4 which cost N$ 20.00 per kg

These choices are provided in combo box, which allows the user to select the mushroom of his choice. The interface is shown in Fig A3.13

Fig A3.13 Receive Note interface

1.8 Invoice Interface

After a buyer has declared interest (by completing and submitting the Order Form) the Seller responds by completing and submitting an invoice. These processes may seem laborious and repetitive, but in the real sense, they are necessary because each form is structured to capture specific information about a specific transaction. If the two parties have to avoid misunderstandings in their deals, then these structured documents are necessary. All the information captured is kept in database and can be used for any subsequent litigation that may arise between a buyer and a seller. This interface is shown in Fig A3.14.

Fig A3.14 The Invoice Interface

1.9 Payment Note Interface

The Payment Note Form provides a record of payment by the buyer. It is completed by the buyer to detail how a payment has been effected. This is shown in Fig A3.15.

Fig A3.15 Pay Note Interface

2.0 Acknowledge Payment Interface

This form is completed and submitted by the buyer. It is the last document to be completed and signals the end of a particular transaction. On submission of this document a response is generated to tell the buyer that the transaction is over and further invites him to select another link for further navigation of the site if necessary.

Figure A3.16 shows the Payment Acknowledgement form and Fig A3.16 shows its response.

Fig A3.16 Acknowledge Payment

Fig Fig A3.17 Acknowledge Payment Response

Appendix IV

Some selected code

Most of the web pages on the MEMB website basically utilize a combination of html forms, ASP scripts and database response forms.

The following pages of code show some of the code as follows

1. An html form
2. An ASP form
3. A database response form
4. Check-user login script
5. Why the adovbs.inc code is used.

1. An example of an html form

```
<html>
<head>
<title>Enquiries form by JJ Magenya</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
</head>

<body bgcolor="#00CCFF" text="#333333" link="#00FFFF" alink="#FFFFFF"
vlink="#99CCCC">
<div align="center">
  <p><img src="Mushy.gif" width="127" height="89"> </p>
  <form name="Enquiries" method="post" action="enquiry_response.asp">
    <p><b>ENQUIRIES </b></p>
    <p><b>Please provide the following information regarding your enquiry</b></p>
    <table width="75%" border="1">
      <tr>
        <td>Username</td>
        <td>
          <div align="center">
            <input type="text" name="Username" size="50">
          </div>
        </td>
      </tr>
      <tr>
        <td>Surname </td>
        <td>
          <div align="center">
            <input type="text" name="Surname" size="50">
          </div>
        </td>
      </tr>
```

```
<tr>
  <td>Firstname</td>
  <td>
    <div align="center">
      <input type="text" name="Firstname" size="50">
    </div>
  </td>
</tr>
<tr>
  <td>Company </td>
  <td>
    <div align="center">
      <input type="text" name="Company" size="50">
    </div>
  </td>
</tr>
<tr>
  <td>Productname</td>
  <td>
    <div align="center">
      <select name="Productname">
        <option selected>Mushroom1 N$ 12.00 per kg</option>
        <option>Mushroom2 N$ 15.00 per kg</option>
        <option>Mushroom3 N$ 17.00 per kg</option>
        <option>Mushroom4 N$ 20.00 per kg</option>
      </select>
    </div>
  </td>
</tr>
<tr>
  <td>Address</td>
```

```
      <td>
        <div align="center">
          <input type="text" name="Address" size="50">
        </div>
      </td>
    </tr>
    <tr>
      <td>Email </td>
      <td>
        <div align="center">
          <input type="text" name="Email" size="50">
        </div>
      </td>
    </tr>
  </table>
  <p>
    <input type="submit" name="Submit2" value="Submit">
    <input type="reset" name="reset2" value="Reset">
  </p>
 </form>

</div>
</body>
</html>
```

2. An example of ASP code for the Enquiries form

```
<html>
<title>Enquiries response - by JJ Magenya</title>
<body bgcolor="#00CCFF">

<!--#include virtual="/adovbs.inc"-->


<%
Dim rs
Set rs = Server.CreateObject ("ADODB.Recordset")
Set cn = server.createobject("ADODB.Connection")
cn.Open "DSN=MEMB1"
        rs.activeconnection = cn
        rs.cursortype = adopenkeyset
        rs.locktype = adlockoptimistic
        rs.source = "Enquiries"
        rs.Open

rs.addnew
rs("Username")= Request.form("Username")
rs("Surname")= Request.form("Surname")
rs("Firstname")= Request.form("Firstname")
rs("Company")= Request.form("Company")
rs("Productname")= Request.form("Productname")
rs("Address")= Request.form("Address")
rs("Email")= Request.form("Email")

rs.update
rs.Close
```

```
Set rs = Nothing

%>
<h2> </h2>
<h2 align="center">Thank you for your enquiry. </h2>
<h2 align="center">Click <a href="Quotation_content.asp">here</a> to view our
  stock list.</h2>
<h2 align="center"> </h2>

</body>
</html>
```

3. An example of the database response showing the contents of the Enquiries table

```
<!--
        Code by  JJ Magenya
        Date     01 October 2003
-->
<html>
<head>
<title>Show the contents of the Enquiries table </title>
</head>
<body bgcolor="#CCCCCC" text="#333333" link="#00FFFF" alink="#FFFFFF"
vlink="#99CCCC">
<%
Set conn = Server.CreateObject("ADODB.Connection")
Provider = "Provider = Microsoft.Jet.OLEDB.4.0;"
DBPath          = "Data Source=" & Server.MapPath("MEMB1.mdb")
conn.Open Provider & DBPath
Set rs = Server.CreateObject("ADODB.Recordset")
rs.Open "ENQUIRIES", conn, Cursor, 2
%>
<div align="center"><img src="Mushy.gif" width="117" height="89"> </div>
<h3 align="center">The following enquiries have been made about our
products</h3>
<div align="center">
  <table width="88%" border="1" cellpadding="1" cellspacing="0">
    <tr bgcolor="#CCCCCC">
      <td nowrap><strong>User Name</strong></td>
      <td><div align="center"><strong>Surname</strong></div></td>
      <td nowrap><div align="center"><strong>First Name</strong></div></td>
      <td><div align="center"><strong>Company</strong></div></td>
      <td nowrap><div align="center"><strong>Product Name</strong></div></td>
```

```
    <td><div align="center"><strong>Address</strong></div></td>
    <td><div align="center"><strong>Email</strong></div></td>
  </tr>
  <%
 If Not rs.EOF Then rs.MoveFirst
       While Not rs.EOF
 %>
  <TR valign="top" bgcolor="#00CC99">
    <TD nowrap><%=rs("username")%></TD>
    <TD nowrap><%=rs("surname")%></TD>
    <TD nowrap><%=rs("firstname")%></TD>
    <TD nowrap><%=rs("company")%></TD>
    <TD nowrap><%=rs("productname")%></TD>
    <TD nowrap><%=rs("address")%></TD>
    <TD nowrap><%=rs("email")%></TD>
  </TR>
  <%
              rs.Movenext
       Wend
 %>
  </table>
</div>
<h3 align="center">Please Click here if you want to <a
href="Order_Form.htm"><font color="#FF0000">BUY</font></a>,
  or <a href="Quotation_Form.htm"><font color="#FF0000">SELL</font></a>
.</h3>
<hr>

</body>
</html>
```

4. The following code checks the authenticity of a user

```
<!--
                ASP code for authenticating users
                Code by         JJ Magenya
                Date    01 October 2003
-->

<%
'Dimension variables
Dim adoCon          'Database Connection Variable
Dim strCon          'Holds the Database driver and the path and name of the
database
Dim rsCheckUser             'Database Recordset Variable
Dim strAccessDB     'Holds the Access Database Name
Dim strSQL          'Database query sring
Dim strUserName     'Holds the user name

'Initalise the strUserName variable
strUserName = Request.Form("txtUserName")

'Check the database to see if user exsits and read in there password
'Initialise the strAccessDB variable with the name of the Access Database
strAccessDB = "users"

'Create a connection odject
Set adoCon = Server.CreateObject("ADODB.Connection")

'Database connection info and driver
strCon = "DRIVER={Microsoft Access Driver (*.mdb)};uid=;pwd=letmein; DBQ=" &
Server.MapPath(strAccessDB)
```

```
'Set an active connection to the Connection object
adoCon.Open strCon

'Create a recordset object
Set rsCheckUser = Server.CreateObject("ADODB.Recordset")

'Initalise the strSQL variable with an SQL statement to query the database
strSQL = "SELECT tblUsers.Password FROM tblUsers WHERE tblUsers.UserID
='" & strUserName & "'"

'Query the database


rsCheckUser.Open strSQL, adoCon

'If the recordset finds a record for the username entered then read in the password
for the user
If NOT rsCheckUser.EOF Then

    'Read in the password for the user from the database
    If (Request.Form("txtUserPass")) = rsCheckUser("Password") Then

        'If the password is correct then set the session variable to True
        Session("blnIsUserGood") = True

        'Close Objects before redirecting
        Set adoCon = Nothing
        Set strCon = Nothing
        Set rsCheckUser = Nothing

        'Redirect to the authorised user page and send the users name
```

```
                Response.Redirect"home.htm?name=" & strUserName
        End If
End If

'Close Objects
Set adoCon = Nothing
Set strCon = Nothing
Set rsCheckUser = Nothing

'If the script is still running then the user must not be authorised
Session("blnIsUserGood") = False

'Redirect to the unautorised user page
Response.Redirect"unauthorised_user_page.htm"
%>
```

6. Why use the adovbs file

Why include the adovbs file?

ADOVBS.inc is a file included with IIS that has all of the Active data Objects (ADO) constants defined. When connecting to databases, use constants with names like adOpenForwardOnly and adLockReadOnly. These are constants that are defined in the ADOVBS.inc file and define various connection and recordset (rs) properties with English-like names.

To include ADOVBS.inc, all you need to do is add one simple line to the top of your ASP pages

<! --#include virtual="/adovbs.inc"-->

and be sure to put ADOVBS.inc in your root web application directory.

Here is an example of the contents of ADOVBS.inc

```
'--------------------------------------------------------------------
' Microsoft ADO
'
' (c) 1996-1998 Microsoft Corporation.  All Rights Reserved.
'
'
'
' ADO constants include file for VBScript
'
'--------------------------------------------------------------------

'---- CursorTypeEnum Values ----
Const adOpenForwardOnly = 0
Const adOpenKeyset = 1
Const adOpenDynamic = 2
Const adOpenStatic = 3

'---- CursorOptionEnum Values ----
Const adHoldRecords = &H00000100
Const adMovePrevious = &H00000200
Const adAddNew = &H01000400
Const adDelete = &H01000800
Const adUpdate = &H01008000
```