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**IMPACT OF  
INFORMATION COMMUNICATION TECHNOLOGY  
INFRASTRUCTURE ON  
E-BANKING AT BARCLAYS BANK KENYA**

**BY**

**CATHERINE W NDERI**

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**Supervisor: Alec Bozas**

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## **Confidentiality Clause**

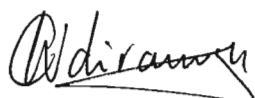
**23<sup>rd</sup> of January 2006**

**To whom it may concern**

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Due to the strategic importance of this research and to abide by the wishes of the organizations that supplied information, it would be appreciated if the contents remain confidential and not be circulated for a period of five years.

Sincerely

A handwritten signature in black ink, appearing to read 'Catherine W. Nderi', with a stylized flourish at the end.

**Catherine. W. Nderi**

## Student's Declaration

I the undersigned, declare that this is my original work and has not been submitted to any other college, institution or university other than the University of KwaZulu-Natal for academic credit.

**Signed:** \_\_\_\_\_  \_\_\_\_\_ **Date:** 13<sup>th</sup> April 2006

Catherine Wanjiru Nderi

Student No: 201 299 470

This project has been presented for examination with my approval as the appointed supervisor.

**Signed:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_

This project has been presented for examination with my approval as the appointed supervisor.

**Signed:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_

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I would like to express my sincere gratitude and appreciation to my supervisor, Alec Bozas whose enthusiasm and dedication made it possible for me to complete this study. Many thanks also go to my family and friends who supported me through the entire process.

## **Dedication**

*To my departed parents Peter and Monica Ndirangu*

## **Abstract**

The purpose of this study is to examine the extent to which the existing ICT infrastructure in Kenya affects the provision of e-banking services at Barclays Bank of Kenya. The study also compares e-banking applications in Kenyan banks with best practice examples from other countries. Other areas studied are the existing ICT and e-banking security systems as well as the policy and regulatory framework that governs e-banking systems in Kenya.

The dilemma still facing the banking and ICT sectors in Kenya is whether the existing ICT infrastructure is adequate and efficient enough to satisfy the demand for voice and data communications required in the provision of e-banking services. The problems that require attention are lack of appropriate equipment to serve a modern financial system and provide the full range of e-banking services, inadequate telephone landlines due to vandalism and failure of Telkom Kenya to expand its network. Other problems include lack of reliable Internet connection, high access costs for landlines and Internet, inadequate capital investment for the provision of sufficient ICT services, dumping of contraband traffic on Telkom's network, cyber crime due to lack of proper e-banking security systems and lack of a suitable policy and regulatory framework for Information Communication Technologies.

A qualitative research methodology and a typical case study research design are adopted in the study. Barclays Bank of Kenya is examined as a case study. The activities of the banking and ICT key industry players, Central Bank of Kenya, Telkom Kenya, Communications Commission of Kenya and Today's Online, are also examined. In addition four other commercial banks namely, Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa are contacted and their senior management interviewed concerning this study. Data is collected from interviews, archives, newspapers, published reports and the Internet.

The study findings reveal that Barclays Bank Kenya offers different forms of e-banking services namely, Internet banking, online banking, telephone banking and mobile banking. However, the poor state of the ICT infrastructure hinders the growth of e-banking services in Barclays and other Kenyan banks. The existing security measures for landlines and e-banking systems in Kenya are also incapable of preventing most forms of risks and threats and need to be improved. Kenya also lacks a sound policy and regulatory framework to efficiently curb these ICT and e-banking risks.

The study concludes by recommending that the Kenyan government should encourage the private sector and development partners to invest in ICT infrastructure and that a comprehensive review of existing laws relating to ICT and e-banking systems be done and amendments formulated.

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## **Chapter One: Introduction**

### **1.1. Background to the Study**

#### **1.1.1. Electronic Banking**

Internationally banking organisations have been delivering electronic services to consumers and businesses remotely for years and Kenyan banks have followed suit. However, the increased worldwide acceptance of the Internet as a delivery channel for banking products and services provides new business opportunities for banks as well as service benefits for their clients, (Basel Committee on Banking Supervision, 2003a).

Competition among existing banking organisations and new market entrants, has also allowed for a much wider array of electronic banking (e-banking) products and services for retail and corporate banking clients. These services include accessing account balances and financial information; electronic funds transfer, obtaining loans, ATM services, debit and credit cards. Other relatively new products and services include electronic bill payment services, personalised financial portals, account aggregation and business-to-business market places and exchanges. The different services can be categorised into Internet banking, online banking, telephone banking and mobile banking, depending on the electronic mode used. They are all referred to as electronic banking services, (Basel Committee on Banking Supervision, 2003a).

A major transformation is taking place in the world's entire financial system and Kenya has joined the list of countries that have realised the importance of managing an important aspect of national economic life –the financial system. Kenya is rich in the number and type of financial institutions, with the Central Bank at its apex; it has a well-developed financial market with 46 commercial banks providing payments services and credit facilities to the public and businesses. Currently, all the 46 commercial banks in Kenya are providing most forms of e-banking services Cash is the most common form of payment medium used. However, it has the major disadvantage of being insecure, bulky and costly to produce. The Central Bank of Kenya is encouraging the population to move

to non-cash payment instruments such as payment cards and e-banking, (Central Bank of Kenya, 2004a).

The Central Bank of Kenya was established in 1966 through the Central Bank of Kenya Act of 1966. This Act set out the objectives and functions and gave the Central Bank limited autonomy. The Central Bank has independence in exercising the powers conferred on it by the Central Bank of Kenya Act, 1996. However, both the Government and the Central Bank make mutual consultations on important policy issues, ([www.centralbank.go.ke](http://www.centralbank.go.ke)).

### **1.1.2. Information Communication Technology**

Given the pace of change over the last 20 years, technology has come to play an important role in the development of sustainable competitive advantage. Sustainable competitive advantage is an advantage or edge over competitors that cannot be easily imitated. Such advantages generate more value than competitors have. Even in financial institutions, mature industries, not-for-profit organisations and small business, it is technology that has on occasions added the extra element to differentiate the organisation. For these reasons, technology strategy deserves careful investigation, (Lynch, 2000).

According to Kalakota (2000), e-banking applications depend on five different ICT infrastructures to provide the necessary Information Communication Technology namely; Common Business Services Infrastructure, Messaging and Information Distribution, Network Infrastructure, Multimedia Content and Interfacing Infrastructure. The implementation of these infrastructures is dependent on four major structures namely; people, policy and regulatory framework, technical standards and protocols, and other organisations. For e-banking services to take place efficiently, a reliable ICT infrastructure, maximum security and legal framework is essential.

In Kenya, liberalisation of the communications sector began in 1999 with the split of the defunct Kenya Posts and Telecommunications Corporation into three entities. Communications Commission of Kenya (CCK) is the industry regulator, while Telkom Kenya and Postal Corporation of Kenya provide telecommunication and postal services respectively. Telkom Kenya is a government entity and is the only fixed national

operator. However, arrangements are underway to licence a second national operator. One regional telecommunications operator has been licensed to provide services in North Eastern region, (Njoroge, 2004).

The growth of the ICT sector in Kenya has been significantly influenced by both global and national trends since the advent of the sectors liberalization in 1999. Of much significance was the growth of cellular mobile connectivity, which continued to outperform that of fixed telephony services. By 2004, the size of the mobile network was seven times the size of the fixed line network, (Communications Commission of Kenya, 2004).

In spite of this growth, Kenya's ICT sector is in a state of crisis. The poor state of affairs has been exacerbated by inadequate telephone landlines due to vandalism and failure of Telkom Kenya to expand its network, lack of reliable Internet connection, high access costs for landlines and Internet, inadequate capital investment, dumping of contraband traffic, cyber crime, and lack of a suitable policy and regulatory framework, (Telecommunication Service Providers Association, 2004).

### **1.1.3. Security of ICT and E-banking Systems**

According to the Principles for Effective Banking Supervision spelt out by the Basel Committee and adopted by the Central Bank of Kenya (CBK), continuing technology developments and innovations are having a significant impact on the way banks interact with their clients, suppliers and counter parties, and how they undertake their operations, (Central Bank of Kenya, 2004a). Banks face the challenge of adapting, innovating and responding to the opportunities posed by computer systems, telecommunication networks and other technology-related solutions to drive their businesses in an increasingly competitive domestic and global market. At the same time these technological innovations pose security risks to the banks and their clients, (Basel Committee on Banking Supervision, 2003b).

The Internet in particular offers major opportunities for banks to reach new markets and expand the range of products and services they provide to clients, (Messer, 2004). However, the provision of financial services over the Internet may also increase e-

banking risks. In Kenya, risks associated with e-banking and ICT systems are classified into five categories. These categories are security, technology, operational, legal and reputation risks, (Central Bank of Kenya, 2004a). These risk categories have been discussed further in chapter four. Another security risk currently facing Kenyan banks and firms is cyber crime due to lack of proper e-banking systems, (Kitau, 2005).

Vandalism of landlines is also a major problem in Kenya. Thieves have been ripping out Telkom's copper cables from overhead and underground lines and it is costing Telkom a fortune. Vandalism has impacted negatively on service delivery and businesses and individuals also suffer from frequent lack of communication. Strict security and policy measures need to be put in place to ensure that this situation does not get out of hand, (Richardson, 2005).

The advancement in technology and telecommunications has increasingly required that Central Bank of Kenya supervisors satisfy themselves that financial institutions have in place a comprehensive risk management process. Due to this, one of the key objectives of the Central Bank of Kenya is to fully adopt the Principles for Effective Banking Supervision that have been set by the Basel Committee. This process should enable bank officials to identify measure, monitor and control all material risks and where appropriate, hold capital against these risks, (Central Bank of Kenya, 2004b).

#### **1.1.4. Policy and Regulatory Framework**

Policy and regulatory framework related to e-banking, encompasses such issues as legal and privacy issues, taxes, universal access and information pricing. According to the Basel Committee on Banking Supervision (2003b), banks need to follow certain legal and reputation risk management principles. These principles ensure that the clients are provided with the required level of comfort regarding information disclosures, protection of client databases and business availability.

In Kenya, there is no law that explicitly and exclusively deals with financial systems. However, in its current form, the Central Bank of Kenya (CBK) Act, as amended in 1996, gives the Bank powers to oversee and regulate the financial systems. The Central Bank of Kenya is also in consultation with other stakeholders participating in the introduction of

an Electronic Transactions Law to cover e-banking, e-commerce, and e-signatures among other products, (Central Bank of Kenya, 2004a).

Kenya also lacks an ICT policy framework. However, the Government has realised the importance of ICT and is currently coming up with an ICT National Policy that will ensure that the ICT sector integrates most spheres of the countries socio-economic life. Kenya's policy and regulatory functions were de-linked from mainstream operation communications market when full liberalisation began in 1999. As a result, the Communications Commission of Kenya (CCK), an independent regulatory authority, and the National Communications Secretariat (NCS), a policy advisory arm, were created, (Communications Commission of Kenya, 2004).

## **1.2. Statement of the Problem**

E-banking technology in Kenya is facing problems due to the shortcomings in the ICT sector. The dilemma still facing the banking and ICT sectors in Kenya is whether the existing ICT infrastructure is adequate and efficient enough to satisfy the demand for voice and data communications required in the provision of e-banking services.

In order for Kenya to provide the e-banking services found in the rest of the world, numerous related problems require attention. The problems include the following according to the Telecommunication Service Providers Association, (2004):

- Lack of appropriate equipment to serve a modern financial system and provide the full range of e-banking services
- Inadequate telephone landlines due to vandalism and failure of Telkom Kenya to expand its network
- Lack of reliable Internet connection
- High access costs for landlines and Internet
- Inadequate capital investment for the provision of sufficient ICT services

- Dumping of contraband traffic on Telkom's network
- Cyber crime, due to lack of proper e-banking security systems
- Lack of a suitable policy and regulatory framework for Information Communication Technologies

Further details to the above problems are presented in chapter 4.

### **1.3. Purpose of the Study**

The purpose of this study is to explore the extent to which the existing ICT infrastructure in Kenya affects the provision of e-banking services. The study will also compare e-banking applications in Kenya with best practice examples from other countries.

By exploring these issues the researcher hopes to identify the e-banking and ICT infrastructure problems faced by Kenyan banks and to provide recommendations to overcome these problems. These problems have been outlined in the statement of the problem and the recommendations will be addressed in chapter five.

### **1.4. Research Questions**

The research questions that the study addressed were:

- 1.4.1. To what extent do Kenyan banks offer e-banking services?
- 1.4.2. How does the existing ICT infrastructure system affect the provision of e-banking services in Kenya?
- 1.4.3. Are the existing security systems for ICT and e-banking capable of preventing theft and fraud?
- 1.4.4. To what extent does the existing Policy and Regulatory framework in Kenya govern e-banking services?



### **1.5. Justification for the Study**

This study aims to explain the present scenario of the banking system in Kenya and at the same time demonstrate the scope and benefits of e-banking compared to the existing system. In so doing, the study will therefore be of importance to the banking industry especially bank managers involved in crafting e-banking strategies for their banks.

The revolutionary developments in ICT and the regulatory framework that guides these developments have also been addressed in this study. The study will therefore also be important to government policy makers, since an understanding of these issues will enable them to come up with appropriate policies that encourage ICT and e-banking growth in Kenya.

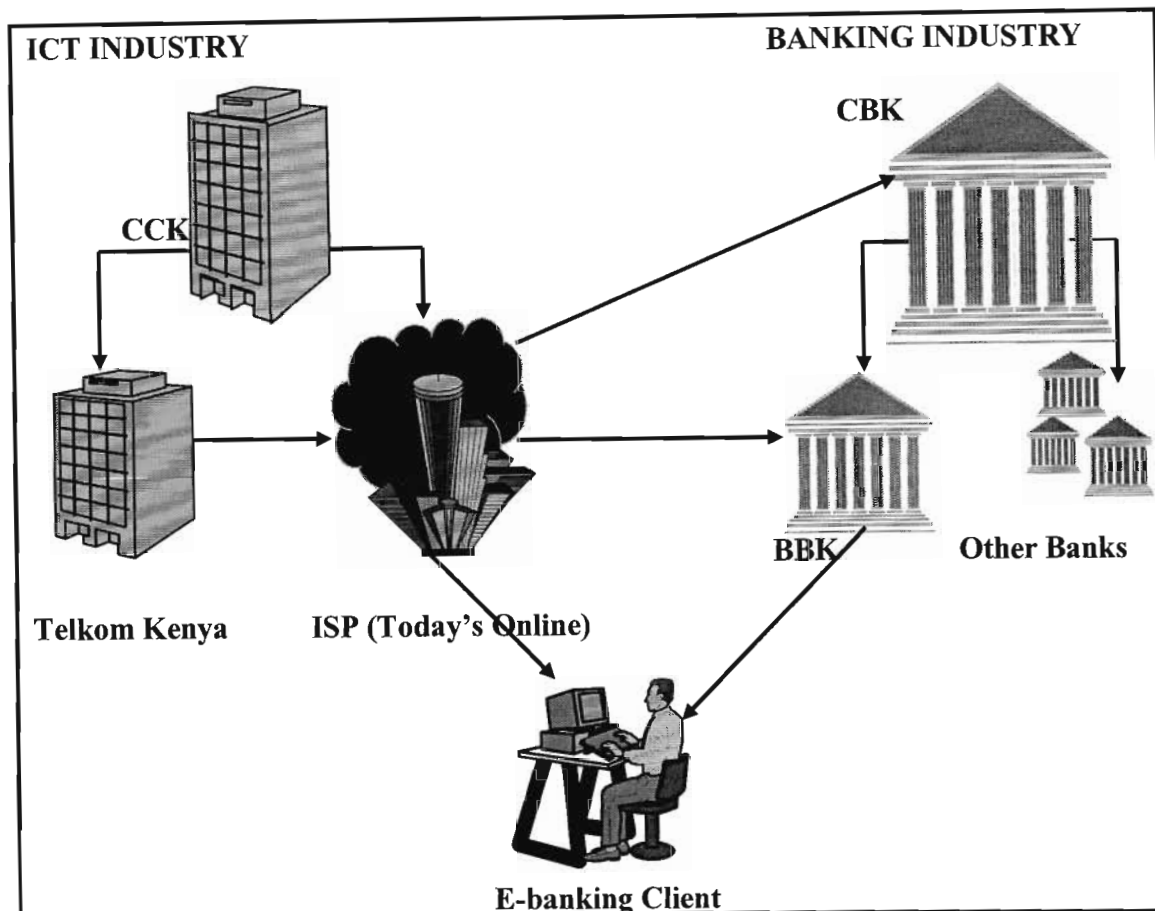
### **1.6. Scope of the Study**

A qualitative research methodology will be adopted in this study. The population of interest is all Kenyan banks that provide e-banking services as well as the providers of ICT infrastructure that facilitates e-banking. For this research, one bank, Barclays Bank of Kenya (BBK) is selected as a case study. Barclays Bank of Kenya is one of the leading commercial banks in Kenya and it has the largest Automated Teller Machine (ATM) network. In order to get a clearer understanding of the ICT and banking industries in Kenya, the activities of four other key players in these industries, will also be critically examined. A further analysis will be carried out on four top commercial banks in Kenya.

The key players in the ICT industry are Communications Commission of Kenya (CCK), which is the regulator of communications services in Kenya, Telkom Kenya the main provider of ICT infrastructure, and Today's Online, a leading Internet Service Provider. Kenya has a total of 46 banks and the key players in the banking industry are Central Bank of Kenya (CBK), which regulates and supervises the banking system, Barclays Bank of Kenya and four other top commercial banks, namely Standard Chartered Bank, Citibank, Kenya Commercial Bank and Commercial Bank of Africa.

Figure 1.1 shows an overview of the ICT and banking industries and the key players in the provision of e-banking services. As shown in the diagram, all these players work

together to provide e-banking services to their clients. Further details on the operations of these organisations have been discussed in chapters three and four.



**Figure 1.1: E-banking Industry Players**

### 1.7. Limitations of the Study

Only one bank has been targeted in this study due to the following limitations:

- Not all banks would share information on their weaknesses with the researcher
- Having been a former employee with a good working relationship with the senior management at the bank, the researcher was able to get access to inside information at Barclays Bank
- The researcher could not study the entire Kenyan banking industry due to the sensitive nature of the industry, which has a strict code concerning confidentiality of key banking information, systems and processes. This information remains private to

a few senior authorised officials and is not viewed or used by those unauthorised to do so. This resulted in the study being limited to a handful of senior authoritative sources

- The researcher planned the study within the available financial resources. The cost of studying the entire Kenyan banking industry would therefore have surpassed the set budget by a wide margin

## **1.8. Chapter Summary**

A qualitative research methodology will be used in this study in order to explore the existing state of the ICT infrastructure in Kenya and to investigate its implications on e-banking services. Aspects covered in this study will include:

- E-banking services offered by Kenyan banks
- A case study of Barclays Bank of Kenya
- The existing ICT infrastructure system in Kenya
- The existing security systems for e-banking and ICT in Kenya
- The existing policy and regulatory framework for e-banking and ICT in Kenya

The topics addressed in this chapter were; the background of the problem, the statement of the problem, purpose of the study, research questions to be addressed, importance of the study, scope of the study and definition of terms. The next chapter will be the literature review, which will shed light on the study objective and is based on work and studies done by other scholars and researchers in this discipline and in related fields.

Subsequent chapters of this study will discuss the methodology and data collection methods used to conduct the study; results and findings obtained from the data collected, discussions of the findings, conclusions and recommendations for improvement and for further research.

## **Chapter Two: Literature Review**

The literature review is based on work and studies done by other scholars and researchers in this discipline and in related fields. The literature will be addressed in sub-headings as per the research questions, problem statement and related issues. In addition the literature review will shed light on the study objective.

### **2.1. Electronic Commerce**

The term e-commerce has no widely accepted definition. The literature review has identified many e-commerce definitions including:

E-commerce can be defined as "... the buying and selling of information, products and services via computer networks today and in the future, using any one of the myriad networks that make up the Internet", (Lawrence *et al.*, 2002).

E-commerce can also be defined as "...technology-mediated exchanges between parties (individuals, organizations, or both) as well as the electronically based intra or inter-organizational activities that facilitate such exchanges." Interfaces such as Automated Teller Machines (ATMs), Electronic Data Interchange (EDI) and electronic banking also fall in the general category of e-commerce, (Rayport and Jaworski, 2001).

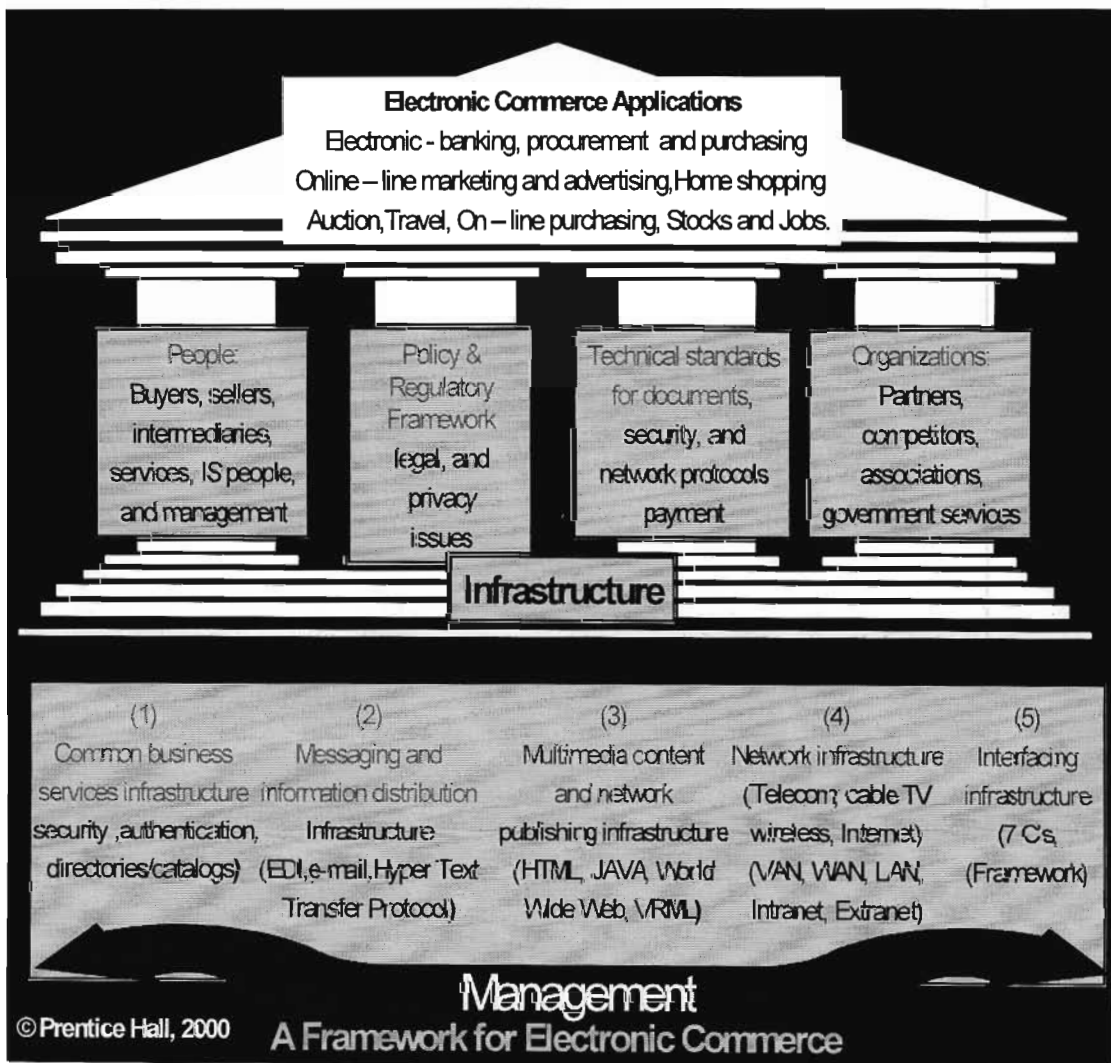
### **2.2. Framework for E-commerce**

Figure1 shows that e-commerce applications such as electronic- banking, procurement and purchasing, on-line marketing and advertising, home - shopping, auctions, travel, on-line publishing, stocks and jobs, are supported by the following ICT infrastructures; (Kalakota, 2000).

- Network infrastructure
- Common business services infrastructure
- Messaging and information distribution infrastructure

- Multimedia content and network
- Interfacing infrastructure

The implementation of these infrastructures is dependent on four major structures (shown as supporting pillars), people, public policy, technical standards and protocols and other organisations. This study will discuss the impact of the above ICT infrastructures on e-banking services, (Kalakota, 2000).



**Figure 2.1: A Framework for Electronic Commerce.** Source: Kalakota, R. (2000) *Introduction to Electronic Commerce*. Prentice Hall

### **2.3. Electronic Banking**

Electronic banking, also known as e-banking, is considered to be a key segment of e-commerce to the extent that banks are involved in the conduct of business transactions via electronic media. The literature review has identified two e-banking definitions.

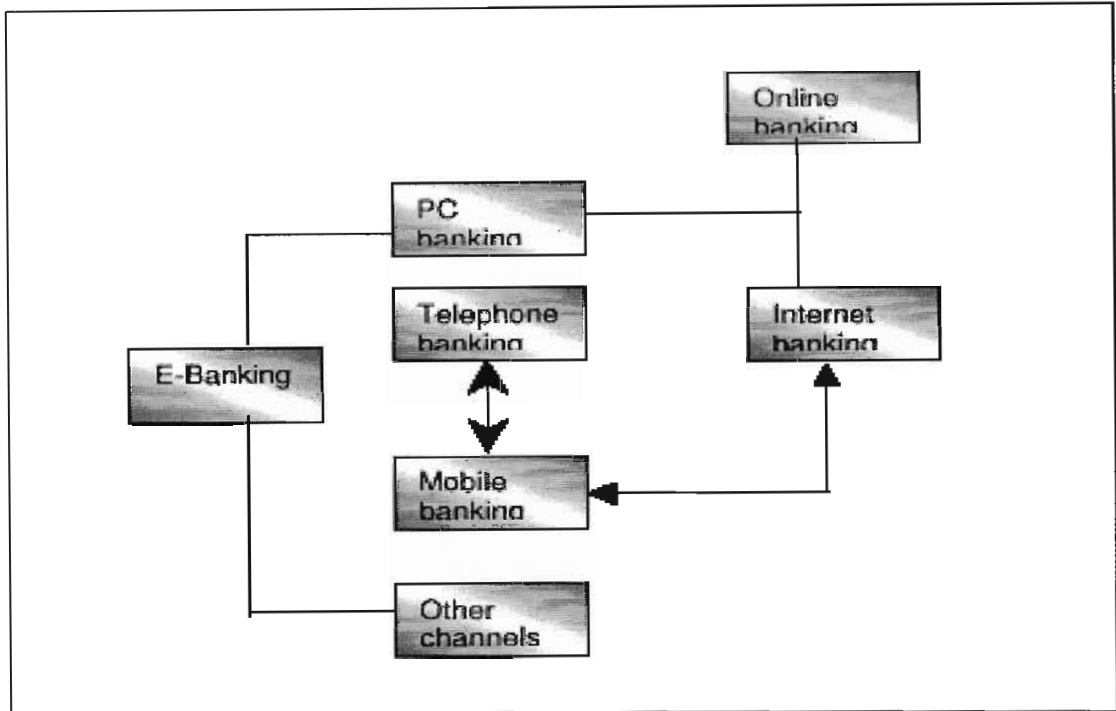
“E-banking encompasses all the different ways of transacting banking business electronically whereby, clients can access their banks without having to be physically present at a bank branch,” (Deutsche Bundesbank, 2000).

“E-banking is generally an extension of traditional banking, using the Internet as an electronic delivery channel for banking products and services,” (Basel Committee on Banking Supervision, 2003a).

### **2.4. Different Forms of E-banking**

E-banking describes the way transactions are conducted. As shown in figure 2.2, it is understood as a catch-all term, which covers the different ways of transacting banking business. The different forms of e-banking that have been discussed in this study include: (Deutsche Bundesbank, 2000).

- PC banking, which is categorised into online banking and Internet banking
- Telephone banking
- Mobile banking
- Electronic payments



**Figure 2.2: Different Forms of E-banking.** Source: Deutsche Bundesbank (2000)  
**Electronic banking from a prudential supervisory perspective.** Deutsche Bundesbank.

E-banking enables delivery of comprehensive retail and corporate services across delivery channels. According to the Monetary Authority of Singapore (2003), services supported by the different forms of e-banking include:

- Account Management functions like balance and mini-statements enquiry from various products such as savings accounts, checking accounts and loan accounts
- Funds Transfers between own accounts or to other third-party accounts
- Trade finance functions like enquiry, lodging of Letters of Credit and Bank Guarantees
- Accessing business related information
- Support for assigning rights to corporate users depending on their profile

- Electronic Bill Presentment and Payment – the bank presents bills to its retail clients, who can then pay them online
- Electronic Invoice Presentment and Payment – the bank presents its corporate clients' invoices to third parties for payment

Business-to-Business (B2B) payments – by offering a safe trading platform for its clients, banks are able to participate in B2B e-payments cycles. Clients in turn are able to track the status of multiple deals and enable the payments and receipts through various mechanisms such as Direct Debit and Credit, (Monetary Authority of Singapore, 2003).

#### **2.4.1. PC Banking**

The increasing awareness of the importance of computer literacy has resulted in the increased use of personal computers worldwide. Furthermore, the incredible plummet of the cost of microprocessors has accelerated the use of computers, (Deutsche Bundesbank, 2000).

The term 'PC banking' is the term used for banking business transacted from a client's Personal Computer (PC). Clients can now use their personal computers at home or at work to access their accounts for transactions by subscribing to and dialing into the banks' Intranet proprietary software system using a password. For instance, the exchange of data involved in the transmission of orders for credit transactions to the bank is effected via phone lines, either analog, by modem, or using an ISDN adapter, connected to the PC. There are two types of PC banking both of which will be explained below, (Deutsche Bundesbank, 2000).

#### **2.4.2. Online Banking**

In this type of PC banking, bank transactions are conducted within closed networks. The client needs special software provided by his bank. Often, for simplicity, the term "online banking" is used to mean Internet banking as well, (Deutsche Bundesbank, 2000).



### **2.4.3. Internet Banking**

“Internet banking can be defined as providing clients with the ability to access their accounts, transfer funds between accounts and perform other banking transactions via the Internet,” (Egland *et al.*, 1998).

Unlike Online banking, where transactions are conducted within closed networks, Internet banking permits the client to conduct transactions from any terminal with access to the Internet. Internet banking is reaching critical mass among corporate and institutional clients in cash management, fixed-income trading, foreign exchange trading and trade services such as payments and letters of credit. By using the Internet as compared to available “proprietary” PC banking, banks have the potential to reach a large number of clients at a low incremental cost. The openness of the Internet also allows banks to avoid the problems associated with the distribution of software and updates that are found with proprietary PC banking, (Deutsche Bundesbank, 2000).

Devices other than PCs can be used for Internet banking; examples include palmtops or hand-held personal computers, kiosks, and Web television. However, for Internet banking to take place efficiently, a reliable ICT infrastructure, maximum security and legal framework is essential. The comprehensive security infrastructure includes layers of security from the network to the browser, including sophisticated encryption that protects clients’ from intrusion when they access the bank over the public network, (Egland *et al.*, 1998).

### **2.4.4. Telephone Banking**

Telephone-based banking does not require the user to obtain any special technology other than the telephone. The interface between the client and the bank usually involves some kind of automated voice-response system that may be activated either by the client’s own voice or by the client keying in various numbers on a touch-tone phone, (Deutsche Bundesbank, 2000).

To access an account a client is required to dial a particular telephone number and there are several options of services. Options include, checking account balances, funds transfer

between current, savings and credit card accounts, bill payments, stock exchange transaction, receive statement via fax and loan payment information, (Deutsche Bundesbank, 2000).

#### **2.4.5. Mobile Banking**

Increasingly, digital business is being carried out using mobile phones and personal digital assistants (PDAs) such as Palm Pilots. This business has been christened m-commerce or w-commerce, for mobile e-commerce and wireless e-commerce. Similarly, mobile-banking refers to the use of a hand-held device to access ones bank account and pay bills, (Lawrence *et al.*, 2002).

Mobile banking is a vivid example of how the lines between the various e-banking applications are becoming increasingly blurred. The general tendency, encouraged by mobile banking, is for the Internet and telecommunication sectors to converge, giving banks a further wireless access channel for conducting banking business, (Deutsche Bundesbank, 2000).

Thanks to new transmission technologies such as WAP (wireless application protocol), portable terminals such as mobile phones, personal digital assistants (PDAs) or small hand-held PCs are providing bank clients with access to the Internet and thus paving the way to Internet banking. Smart phones, using Bluetooth technology, offer fax and phone capabilities all in one, to make mobile banking available to an increasingly mobile work force. A mobile financial system enables one to make payments by sending a text message over the phone, this is known as "SMS'ing (Short Message Service) the funds to a recipient's account. By keying in another person's mobile number, the amount, and a PIN, consumers can instantly transfer funds to that person, even if halfway around the world, (Daily Mail and Guardian, 2001).

Thuraya Satellite Telecommunications Company, based in the United Arab Emirates (UAE) offers the Wireless Application Protocol (WAP) feature in its mobile satellite phone. WAP is an open global standard for communication between a mobile handset and the Internet or other computer application. WAP-based technology enables the design of

advanced, interactive and real-time mobile services such as mobile banking services, ([www.thuraya.com](http://www.thuraya.com)).

However, despite the above advancements, the use of mobile banking is still in a nascent state. The slower transmission speed of the WAP standard and the limited amount of information available are just two of the factors inhibiting the use of mobile terminals, (Daily Mail and Guardian, 2001).

## **2.5. Electronic Payment Systems**

An electronic payment system (EPS) is an information system designed to record, transfer, store and process data about goods and services purchased. It describes how value (usually money) is exchanged for goods, services or information, (Lawrence *et al.*, 2002). The different types of Electronic payment systems include:

### **2.5.1. Automated Teller Machines**

Automated teller machines (ATMs) are automatic machines for dispensing certain banking services to clients. The services most commonly delivered include: cash withdrawals, details of most recent balance of account, mini-statement showing the most recent transactions to have passed through the account, statement ordering facility, deposit facility, payments to third parties. The payments will typically be to such organisations as utility companies and large retailers where the cardholder has a cheque account, (Central Bank of Kenya, 2003).

A bank's ATM resources will usually consist of a number of ATMs linked to a host computer, which instantaneously authorizes transactions and relays details of the completed transaction to the client's account. ATM's use authentication cards that contain coded information. Clients swipe the card through a card reader slot and usually type a password for security reasons. ATM's are relatively expensive to buy and install thus most banks have opted to reduce these costs by sharing ATM networks, (Central Bank of Kenya, 2003).

### **2.5.2. Electronic Funds Transfer (EFT) and (EFTPOS)**

“EFT is any transfer of funds initiated through an electronic terminal, telephone, modem, computer or magnetic tape so as to order, instruct or authorise a financial institution to debit or credit an account,” (Lawrence *et al.*, 2002).

Electronic Funds Transfer at Point of Sale (EFTPOS) involves goods and services being paid for at the point of sale (e.g. supermarket) through electronic debit of the client’s account. EFTPOS operates on either credit or debit cards, immediately debiting the value of the exchange against an existing bank account. On credit cards, EFTPOS systems check the validity of the card status and then credit the value of exchange against the credit card account for future payment by the cardholder. EFT and EFTPOS utilise computer and telecommunication components both to supply and to transfer money or financial assets, (Lawrence *et al.*, 2002).

### **2.5.3. Electronic Data Interchange (EDI)**

EDI is the automated exchange of structured business documents, such as purchase orders and invoices, between an organisation and its clients, suppliers or other trading partners. Using EDI, a business document may be transmitted by a communications application across the trading network and automatically processed by a receiving application residing with the trading partner. Subsequently, the trading partner communications application can generate and send back to the original party a reply EDI document (such as an invoice), which can be automatically interpreted at the receiver’s end. This entire process is paperless, highly efficient and requires little or no human handling, (Lawrence *et al.*, 2002).

Financial EDI is an EDI used for financial transactions. Electronic Funds Transfers (EFTs) can be implemented using a Financial EDI system. Safe Financial EDI needs to adopt a security scheme used for the Secure Socket Layer (SSL) protocol. An extranet encrypts the packets exchanged between senders and receivers using the public key cryptography, (Kalakota, 2000).

The most obvious benefit of EDI is that consistent standards mean data do not need to be re-keyed by the receiving business, (Strauss and Frost, 2001). By structuring the transfer process and standardising the format of these electronic documents, EDI enables purchasers and suppliers to communicate and transact more efficiently even if they are on different business and computer systems. The network infrastructure for EDI must contain; a communications channel that delivers the EDI documents across the trading network, and conformance to EDI standards, (Lawrence *et al.*, 2002).

#### **2.5.4. Credit Cards**

A credit card transaction is an instruction by a client for funds to be transferred into a business account and charged against the client's account. The client gives the instruction to the seller directly, by handing over the card or by telephoning, emailing or faxing details such as card number, name on the card, expiry date and type of card, (e.g. Visa or MasterCard). Normally once a month clients are expected to make a payment to their bank either to settle all recent transactions or to pay a minimum amount, (Lawrence *et al.*, 2002).

Credit card numbers can be sent over the Internet encrypted or unencrypted. Encryption is the process of enabling information, data or knowledge to be coded in such a way that it cannot be read without a decoding system or key. The encryption system therefore making the process of transacting over the electronic system far more secure. All Internet browsers provide some level of data security. Unencrypted dealings with credit cards are analogous to giving your credit card number over the phone. Clients can check if their browser supports session encryption by looking for a small closed lock in Internet Explorer or a small unbroken key in the Netscape browser family, (Lawrence *et al.*, 2002).

#### **2.5.5. Electronic Cheques (eCheck)**

Electronic cheques operate as though you were being issued a set of numbers from the bank and each number represents a cheque. This is a virtual chequebook without the physical cheques. You use each set of numbers only once in the same manner as one would use a chequebook. With eCheck, the drawer of the cheque types the cheque on the

computer, signs it electronically, and emails it over the Internet. The payee receives it, verifies the drawer's signature, endorses it, writes a deposit slip and signs it. The endorsed check is then sent by email to the payee's bank for deposit. Bank personnel verify signatures, credit the deposit, and then clear and settle the endorsed eCheck by sending it on to the payer's bank, where signatures are once again verified and the amount of the eCheck is debited from the payer's account, (Lawrence *et al.*, 2002).

#### **2.5.6. E-Wallets**

Electronic wallets have been designed to make it easier to shop on line. Bank clients who sign up for e-wallet, only need to enter their billing and shipping information once and thereafter, when they shop on line the information will be automatically accessible. The e-wallet software will then instantly fill out online order forms with a click of a mouse. To make gift giving easier, the wallet can also store the shipping addresses of friends and family, (Lawrence *et al.*, 2002).

#### **2.5.7. Digital Cash**

Digital cash has the advantage of being weightless, since it is really just a series of zeros and ones that can be transported at high speed across the Internet. It is represented by a small string of encrypted digits, or electronic tokens that can be used as a substitute for money to purchase various goods and services in an electronic environment, usually the Internet. Digital cash replaces money in the transaction but depends on an institution, such as a bank, to provide the monetary value for the digital transaction. For example Yahoo offers PayDirect at its web site at [www.paydirect.yahoo.com](http://www.paydirect.yahoo.com). This system allows consumers to send money to anyone in the United states with an email address; pay for an auction item they have won; create custom links on their web page to expedite direct payment by creditors and send a group bill to collect money for a party, (Lawrence *et al.*, 2002).

Digital cash has the disadvantage of being expensive to use as each payment transaction must be reported to the bank and recorded. Legally, Digital cash is not supposed to issue more than an electronic gift certificate even though it may be accepted by a wide number of member stores, (Kalakota, 2000).



### **2.5.8. Prepaid Cards**

Prepaid cards that are used for online payments are typically distributed as simple scratch-off, embossed plastic or magnetic stripe cards. The cards are available in different denominations and can be purchased from a retailer with any payment mechanism but most typically using anonymous cash. When distributed to retailers the cards are inactive; they must be activated prior to use as a payment instrument. Prepaid cards offer an attractive alternative to credit cards, especially for young people who are not eligible for a credit card. Visa offers prepaid cards, called Visa Buxx, through some of its member banks, (Lawrence *et al.*, 2002).

### **2.5.9. Smart Cards (Stored Value Cards)**

Smart cards are a form of EPS (Electronic Payment System) that use a plastic card with a microchip that stores information usually about value. The microchip acts like a microcomputer with a typical input/output device, a microprocessor, and RAM (Random Access Memory). Smart cards rely on another medium or reader to supply the power source to make them work. Smart cards can be recharged at designated locations, such as bank office or a kiosk and in future recharging may be done from ones PC. Examples of smart cards include Mondex and VisaCash, (Kalakota, 2000).

Value stored on the card acts as a substitute for cash. Smart cards, or stored value cards (SVCs) can store more information and perform more functions than the magnetic stripe cards that are more commonly in use internationally. They are used to store information about people's health, personal information, as identity cards, and security cards, and as electronic signatures for digital mobile phones. Smart cards may eventually replace the common magnetic stripe cards now used in EFTPOS and banking transactions using ATMs. They have the potential to allow institutions other than banks to issue value and thus may erode the traditional role of banks in the financial systems used in society. However, the Australian and other banks are in the forefront of the development and issue of SVCs so as to maintain their traditional role, (Lawrence *et al.*, 2002).

## **2.6. ICT Infrastructure for E-Banking**

As shown earlier in figure 2.1, e-banking which is an application of e-commerce, is supported by five major ICT infrastructures according to Kalakota, (2000), they are:

- Network infrastructure
- Common business services infrastructure
- Messaging information distribution infrastructure
- Multimedia content and network
- Interfacing infrastructure

The implementation of these ICT infrastructures is dependent on four major supporting structures, people, public policy, technical standards and other organisations. This section will discuss how the above ICT infrastructures and their supporting structures relate to and affect e-banking services, (Kalakota, 2000).

### **2.6.1. Network Infrastructure**

Network infrastructure can be defined as... “The basic, underlying group of electronic devices and connecting circuitry designed as a system to share information. It includes all of the various communication systems and networks now in use, such as telephones, cable television, broadcast radio and television, computer, satellite, and wireless telephone,” (Rayport and Jaworski, 2001).

Network infrastructure refers to both the hardware and software used in communication. In computer networks, any two or more computers are connected for exchange and sharing of data and system resources. These networks can be characterised by topology (bus, star or ring), spatial distances (LAN or WAN), network protocol (TCP/IP or SNA), type of signals (voice, data or both), type of connection (dial-up, dedicated, or virtual



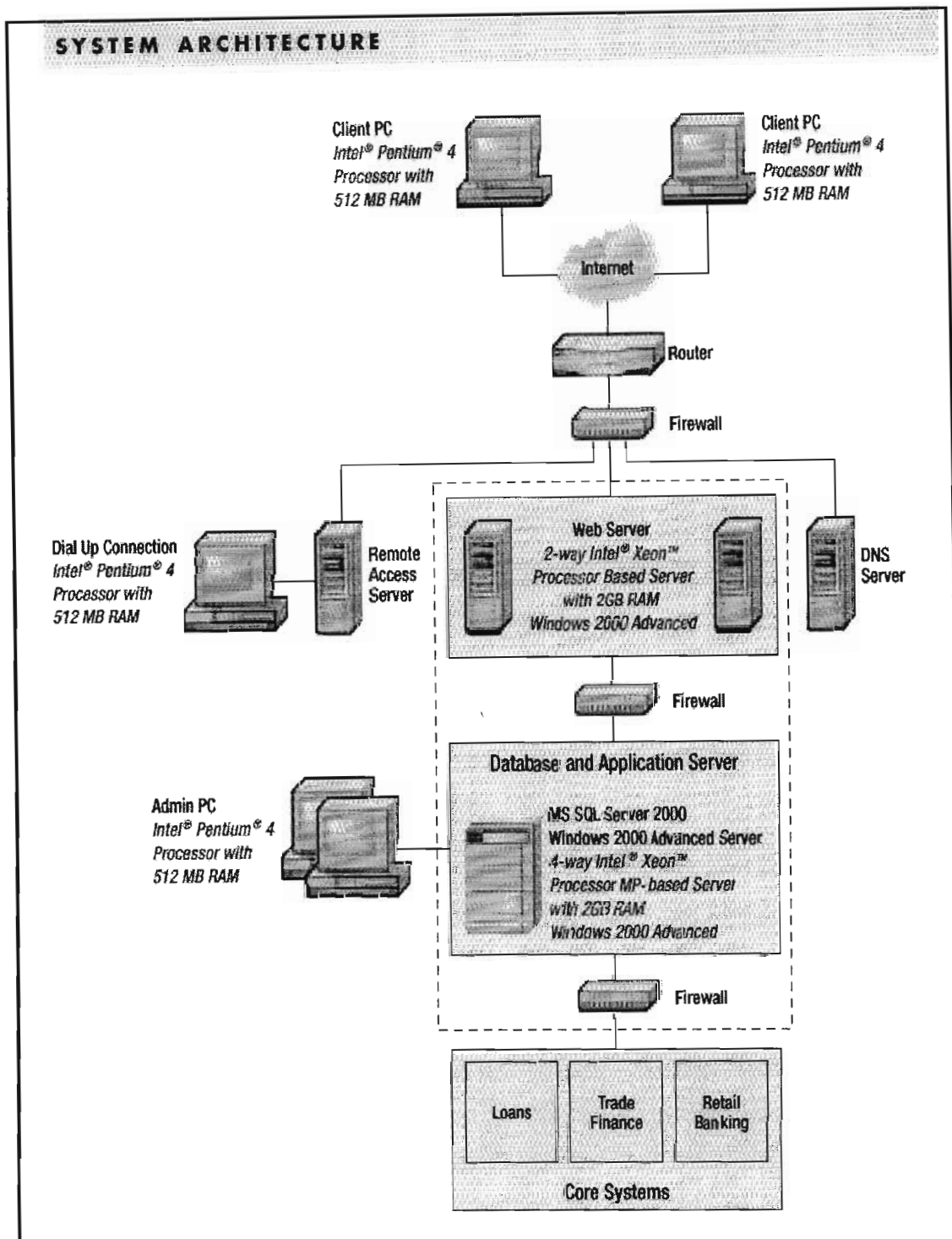
connection), and type of physical link (fibre-optic, coax cable, or twisted-pair), (Rayport and Jaworski, 2001).

According to Kalakota (2000), the different components that make up a network infrastructure include:

- Information Super Highway
- Local Area Networks (LANs) & Wide Area Networks (WANs)
- Internet
- Intranet & Extranet
- Wireless
- VSAT & Satellite based

E-banking relies on a networked environment. Figure 3 shows an example of a typical e-banking network infrastructure. The general network infrastructure (systems architecture) for e-banking must place an extremely high priority on reliability and fault-tolerant operation. In figure 3, the network infrastructure is one based on multi-processor Intel Xeon family-based servers running Microsoft Windows 2000 Advanced Server, a robust and well-proven industry standard, (Infosys, 2002).

Security is assured by encryption and strict session management, while the application server, deployment server and Web server are protected by three firewalls. The servers support online banking services over the Internet, Intranet and Extranet networks. Scalability is achieved by increasing the number of database and application servers to match required capacity, (Infosys, 2002).



**Figure 2.3: E-banking Network Infrastructure** Source: Infosys (2002) **Consumer e-banking and on-line corporate banking solutions**, United States of America.

### **2.6.1.1.Information Super Highway**

The Information Superhighway has many different types of transport systems and does not function as a monolithic entity. Instead, the architecture is a mixture of many forms of high-speed network transport, which include land-based telephone, air-based wireless, modem-based PC, or satellite-based. For instance, mail sent from a portable PC in one country to a computer in another country, might travel across several different types of transport networks interconnected with each other before it reaches its destination, (Kalakota, 2000).

Network infrastructure companies and service providers that enable the transport of digital information include network service providers (e.g., telephone companies, or telcos; cable-TV companies, known as multiple system operators (MSOs); and direct-broadcast satellite (DBS) firms; Internet Service Providers or ISPs (Earthlink, ATT WorldNet, GTE); electronic subcomponent suppliers (Intel, Motorola); hardware providers (Dell, Compaq, IBM); and software companies (Microsoft, Oracle). E-business application architecture includes software and service providers that facilitate the online buying and selling process: application service providers or ASPs (Marimba, Novell); and middleware or enterprise solution providers for e-commerce (SAP, PeopleSoft, Ariba), (Kalakota, 2000).

### **2.6.1.2.LANs & WANs**

Local Area Network (LAN) is a computer network that connects PCs (personal computers), usually over private communications lines within an office of a building. Such a LAN would consist of a box called a hub or a switch plus wiring. The hub or switch transfers messages from one PC to another. Each computer must have a network interface card (NIC) that manages communication with the network. The machines that provide services to these PCs are called servers. The largest LANs serve an entire site, such as a university campus, an industrial park, or a military base, (Panko, 2001).

The cheapest LAN transmission medium is ordinary copper wire. For a complete electrical circuit, a pair of wires twisted around each other is needed. Although twisting reduces interference problems, typical data transmission wiring usually does not have any

other shielding against electrical interference. It is therefore called unshielded twisted pair (UTP). UTP wiring uses voltage levels to indicate ones and zeros. In contrast, optical fibre uses light. In each clock cycle, the transmitter turns light on for a one and off for a zero. Optical fibre can be installed on land or under the sea, (Olawo, 2003).

Wide area networks (WAN) connect many PCs over long-distance common carrier telephone lines. Many organisations have multiple sites and require a WAN to link the LANs in their various sites together. Routers are the devices that connect the LANs inside various organizations with the WANs of various network providers. This interconnection enables easy communication between separate networks across geographical distances and provides access to distributed computing resources. The Internet is a WAN that connects thousands of disparate networks worldwide and provides a resource for global communication between government, educational, and industrial computer networks, (Panko, 2001).

### **2.6.1.3. Internet**

The Internet can be defined as ... “an international network of computer networks. It permits public access to information on a huge number of subjects, and allows users to send and receive messages and obtain products and services. It relies on agreed rules and protocols about how information is exchanged,” (Lawrence *et al.*, 2002).

At the network layer, the Internet can be viewed as a collection of sub networks that are connected to each other. There is no real structure, but several major backbones (WANs) exist. These are constructed from high-bandwidth lines and fast routers. The glue that holds the Internet together is the network layer protocol, IP (Internet Protocol). Attached to the IP-backbones are LANs and Internet Service Providers (ISP), (Lawrence *et al.*, 2002).

The Internet is undoubtedly one of the fastest-changing phenomena in the ICT arena. In its wake the Internet is quickly redefining the rules in the ICT sector by consolidating many services that were previously provided separately. In addition, the Internet removes geographic boundaries with respect to the trade in goods and services. However, delivery

of Internet services to the wider population requires access infrastructure and internet-enabled devices, (Kimani, 2003).

ISPs provide Internet access functionally for consumers and companies. Different transmission protocols and media can eventually be used to support the IP protocol. Typically what distinguishes the Internet is its use of TCP/IP (Transmission Control Protocol/Internet Protocol). The most important Internet access technologies for consumers are either dial-in via the telephone network (via an analog modem or ISDN) or via a cable modem on the CATV network, (Lawrence *et al.*, 2002).

There is no doubt that the Internet is a driving force of historical and revolutionary proportions. With every passing day, it becomes clearer that the Internet economy presents opportunities and threats that demand strategic response and that require managers to craft bold new strategies. The rush of new and existing enterprises to exploit the opportunities presented by the Internet economy is giving rise to innovative business models and radically different approaches to competitive strategy and market positioning. It is also causing companies whose present businesses are threatened in one way or another by e-commerce business approaches to adapt their business models and strategies to the new environment, (Thompson and Strickland, 2001).

Jeevan (2000) suggests that the Internet enables banks to offer low-cost, high value-added financial services. The challenge for banks is to provide multiple access points to meet client needs, while increasingly converting users to the Internet, (Batt, 2001).

The Internet is the largest computer network in operation in the world, having been developed in the 1960s and popularised in the 1990s. This popularisation occurred when the business and information exchange possibilities of the Internet were realised and specific drivers and search engines were developed to facilitate information exchange. This exchange has been enhanced with graphics and video transmission, and interactive communication, (Lawrence *et al.*, 2002).

Cumulatively the technologies that make up the Internet have resulted in four key features that are enabling some revolutionary changes in the ways firms do business. First, it is truly a global, open information and communication platform for storing, displaying, and

communicating information. Second, no single organisation, company, or government agency “owns” the thousands of interconnected yet independently owned and managed networks that make up the Internet. Third, the Internet is a flexible and powerful platform for communicating and interactively sharing information in all of its many forms, (e.g., data, text, voice, video, and graphics). Finally, the cost, time, and expertise required to connect to this vast network of information is very low- a fraction of what it would cost and time and expertise that would be required to develop and maintain a proprietary, global network, (Applegate, 1999).

One of the applications that are being supported through the Internet is Internet banking, especially in the context of the World Wide Web (WWW). Extending IP networks throughout the bank makes it easy to give clients access to all available resources such as access to their accounts, transfer funds between accounts and performing other banking transactions via the Internet, (Applegate, 1999).

In April 2005, Thuraya Satellite Communications Company launched a high-speed satellite Internet service branded as ThurayaDSL. ThurayaDSL is aimed to improve the Company’s service offerings to clients in need of reliable high-speed data services in areas lacking adequate terrestrial infrastructure. The new service will be available across the whole regional coverage of Thuraya spanning more than 120 countries in Europe, North and Central Africa, large parts of South Africa, the Middle East, Central Asia and South Asia, ([www.thuraya.com](http://www.thuraya.com)).

ThurayaDSL offers a similar experience to that in the terrestrial Internet service at the office or home, providing a broad range of applications such as Email, Internet, web browsing, File Transfer Protocol, Virtual Private Networks and other data facilities. Thuraya phones enable users to send an email from their satellite phones to any email address without an Internet connection or subscription, ([www.thuraya.com](http://www.thuraya.com)). ThurayaDSL would therefore be appropriate technology to support Internet banking services in areas lacking adequate terrestrial infrastructure.

#### **2.6.1.4. Intranet**

Intranets are privately developed computer networks that operate within organisations. They rely on the standards and protocols of the Internet to operate, and invariably are protected by various forms of security to guard the internal operations of the user organisation. Intranets operate as separate networks within the operations of the Internet. Educational institutions use intranets to set up virtual classrooms where students can interact with each other and their lecturers, (Lawrence *et al.*, 2002).

#### **2.6.1.5. Extranets**

An extranet is a collaborative network that uses Internet technology to link businesses with their suppliers, clients or other business that share common goals, (Lawrence *et al.*, 2002). Extranets are usually linked to business intranets where information is either accessible through a password system or through links that are established collaboratively. They can also be private worldwide networks that operate on protocols that are either the same as the Internet or specifically developed for those networks. A secure link can be created across the Internet, which can be used by the corporation as a Virtual Private Network (VPN). A VPN utilises a public network, such as the Internet, to transmit private data. Extranet VPNs offer cost and security benefits for an organisation or bank, (Lawrence *et al.*, 2002).

These various networks, the Internet, intranets and extranets perform different functions in e-banking. Other users of these networks include newsgroups, where new ideas or information are shared between companies or groups of companies. Training programs also can be shared and operated through extranets. Groupware, such as Lotus Notes and Microsoft Exchange, refer to programs that help people work together collectively while located remotely from each other, (Lawrence *et al.*, 2002).

#### **2.6.1.6. Satellite Communications**

A satellite is a space-based receiving and transmitting radio. It sends electromagnetic waves, carrying information over distances without the use of wires. Since its function is to transmit information from one point on Earth to one or more other points, it actually

functions as a “radio frequency repeater.” A satellite receives radio-frequency signals, up linked from a satellite dish on the Earth, known as an Earth Station or Antenna. It then amplifies the signals, changes the frequency and retransmits them on a downlink frequency to one or more Earth Stations. Satellites are thus often described as a mirror or a “bent pipe” in the sky, (Intelsat, 2002).

The benefits of satellite communications have steadily expanded its usage. Today, satellites’ diverse purpose encompasses wide area network communication, cellular backhaul, Internet trunking, television broadcasting and rural telephony. Satellites are also frontiers of such advanced applications as e-commerce, e-banking, telemedicine, distance learning, Voice over Internet Protocol (VoIP) and video on demand (VOD), (Intelsat, 2002).

Thuraya, a satellite telecommunications company based in the United Arab Emirates, provides cost-effective satellite-based communication solutions in urban centres, as well as remote areas and villages and seas beyond terrestrial telecom networks. It offers mobile and fixed telephony, rural telephony solutions in remote areas, maritime communications, fleet management and vehicle tracking, and satellite Internet services across a vast footprint of more than 120 countries, ([www.thuraya.com](http://www.thuraya.com)).

#### **2.6.1.7.The Satellite’s Orbital Location**

Most communication satellites in use today are geostationary. For their trunk lines, telephone companies sometimes use geosynchronous earth orbit (GEO) satellites. Orbiting at about 36,000km (23,300 miles), GEOs orbit every 24 hours, making them turn with the earth and therefore making them appear stationary in the sky. Only four satellites are required to achieve global coverage, (Intelsat, 2002).

Telephone companies use dish antennas, which are highly directional. This allows them to pick up weak signals from distant GEOs. The narrow beams created by dish antennas allow point-to-point transmission between switching offices, making them ideal for trunk line use. If a large dish is used on the satellite it creates a narrow footprint while a small dish creates a very large footprint. It may encompass an entire country or at least a large geographic region. This is how direct broadcast television works. The satellite uses a



small dish to broadcast the signal to many receivers in a region. Usually, receivers have small antennas, leading to the name very small aperture terminal (VSAT) system. VSATs can be used for Internet access and Internet banking, (Intelsat, 2002).

Global Mobile Personal Communications via Satellite (GMPCS) is the industry in which all Mobile Satellite Systems (MSS) operate. In the satellite industry, GMPCS is the satellite equivalent of GSM (Global System for Mobile), the widely adopted mobile telephone standard, (Intelsat, 2002).

#### **2.6.1.8. Wireless Communications**

In the last few years, many wireless connectivity standards and technologies have emerged, enabling users to connect a wide range of computing and telecommunications devices easily and simply, without the need to buy, carry, or connect cables. These technologies deliver opportunities for rapid ad-hoc connections, and the possibility of automatic, unconscious connections between devices. This creates the possibility of using mobile data in a variety of applications, such as mobile-commerce and mobile-banking, (Technofile, 2001).

Wireless LANs (WLANs) have started emerging as much more powerful and flexible alternatives to their wired counterparts. An 802.11 wireless LAN allows us to take notebook computers, personal digital assistants, and other mobile computers with us when we work anywhere in a building. Mobile computer users also want to link their laptops to the Internet. Wireless Internet access systems use radio transceiver The most notable wireless technologies and standards are WAP (Wireless Application Protocol), Bluetooth, IrDA, SWAP, HomeRF and IEEE 802.11, all of which compete in certain fronts and are complementary in other areas, (Technofile, 2001).

The HomeRF Working Group developed Shared Wireless Access Protocol (SWAP), an industry specification that permits PCs, peripherals, cordless telephones and other devices to communicate voice and data without the use of cables. It can operate as an ad-hoc network or as an infrastructure network under the control of a connection point. Walls and floors do not cause any problem in its functionality and some security is also provided through the use of unique network Ids. It is robust, reliable, and minimises the

impact of radio interference. This technology can be used to provide Internet connection at airports, (Technofile, 2001).

Another wireless communication technology is the wireless local loop. The local loop refers to the communications segment in between the client (business or residential) premises and the first level local telecommunications exchange or switching office, (Kibathi, 1999). In wireless local loop communication, subscribers are connected to the nearest switching office with wireless transmission lines, however connection between the switching offices is via wired cables know as trunk lines, (Olawo, 2003). Wireless local loop services allow point-to-point or multipoint connections to either a service provider or a branch office using wireless technology on the 3.5 or 5.8 Ghz frequency range, (www.uunet.co.ke).

Microwave transmission system is yet another wireless technology. It is one of the most important uses of radio in carrier trunk transmission. Microwave systems permit the transmission of information over reasonably long distances without the expense of laying ground wires. They use dish antennas for point-to-point transmission and operate in gigahertz range, in which highly directional transmission is possible with dish antennas only a few meters in diameter, (Panko, 2001).

However, microwave systems can travel only a limited distance before problems occur. Signals may grow too weak because of attenuation or the receiver might be so far away that the target falls below the horizon, losing the required line-of-sight connection (the ability of the two dish antennas to see one another). There may also be mountains and other obstacles between the dishes. In general, line-of-sight microwave transmission is good for only 30 to 50 kilometres (20 to 30 miles). To solve this problem, microwave systems use repeaters. These repeaters capture and regenerate the signal, often cleaning it up to remove propagation effects before passing the message on to the next repeater or to the ultimate receiving antenna, (Panko, 2001).

### **2.6.2. Common Business Service Infrastructure**

According to Kalakota (2000), this infrastructure includes the different methods for facilitating online payments. It consists of two main elements:

- Security of ICT and e-banking systems
- Directory services and search engines

### **2.6.2.1. Security of E-banking Systems**

The advances in Internet security and the advent of relevant protocols such as SET (Secure Electronic Transaction) has put banks in perspective as financial intermediaries and facilitators of complete commercial transactions via electronic networks and especially via the Internet. Consumers are increasingly looking for services they can access from one single entry point, (Stamoulis, 2000).

Internet security is about reducing risk of intrusion into private data, curbing data loss or theft, and disruption of business. To gain an understanding of the level of risk inherent in a network, it is necessary to come to terms with common terminologies that are often ignored: ([www.uunet.co.ke](http://www.uunet.co.ke)).

- Vulnerability-this is an error weakness in the design, implementation, or operation of a system
- Threat-this is the danger posed to a system by an adversary that can exploit an existing vulnerability to cause immense damage
- Risk-this is the product of a systems vulnerability and threats posed to it

If the vulnerabilities are high but the threats of attack are low, the overall risk level is low. Similarly if the vulnerabilities are low but the threats are high, the risk is also acceptable. Reducing either vulnerabilities or threats to zero would eliminate all the risk, but this is not practical. Security attacks can be either executable based or network based. Executable-based attacks include viruses, Trojan horses and worms because they work at the executable level, meaning they are based on software programs and as such, run as executables, ([www.uunet.co.ke](http://www.uunet.co.ke)).

The Internet is a global network that is intrinsically insecure. Threats arising from denial of service attacks, spoofing, sniffing, hacking, mutating virus, worms and other forms of malicious or fraudulent acts pose heightened security risk levels which banks would have rarely encountered before. It is imperative that banks implement strong security measures and risk management principles that can adequately address and control these types of risks and security threats. Banks should provide the assurance that transactions performed over the Internet are adequately protected and authenticated. This would require a security policy to be established to enable the following objectives to be met; data confidentiality; system and data integrity; authentication and non-repudiation, client protection, system availability, segregation of duties, access privileges and audit trails, (Monetary Authority of Singapore, 2003).

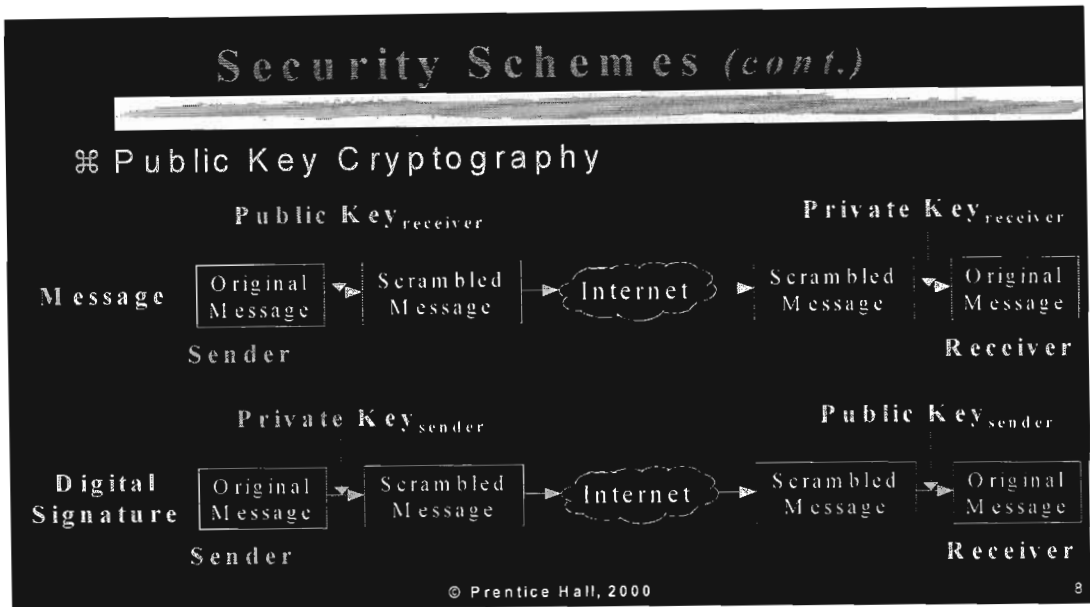
- Data Confidentiality

Banks should take appropriate measures to preserve the confidentiality of key e-banking information. Data Confidentiality is the assurance that key information remains private to the bank and is not viewed or used by those unauthorised to do so. Measures taken to preserve confidentiality should be commensurate with the sensitivity of the information being transmitted or stored in databases, (Basel Committee on Banking Supervision, 2003b).

The bank's online system should employ a level of encryption appropriate to the type and extent of risk present in its networks, systems and operations. In addition, banks should only select encryption algorithms which are well-established international standards and which have been subjected to rigorous scrutiny by an international community of cryptographers or approved by authoritative professional bodies, reputable security vendors or government agencies, (Monetary Authority of Singapore, 2003). Encryption is the process of enabling information, data or knowledge to be coded in such a way that it cannot be read without a decoding system or key, (Lawrence, *et al.*, 2002).

As shown in figure 2.4, if a sender encrypts a message with his/her private key, any receiver with the sender's public key can read it. However, if a digital signature is attached by a sender to a message encrypted in the receiver's public key, then the receiver

is the only one that can read the message and at the same time he/she is assured that the message was indeed sent by the sender, (Kalakota, 2000).



**Figure 2.4: Public Key Cryptography.** Source: Kalakota, R. (2000) **Introduction to Electronic Commerce.** Prentice Hall.

- System and Data Integrity

System and data integrity refers to the accuracy, reliability and completeness of information processed, stored or transmitted between the bank and its clients. A high level of system and data integrity should be achieved consistent with the type and complexity of online services provided. With Internet connection to internal networks, financial systems and devices, largely determined and controlled by banks, can now be potentially accessed by anyone from anywhere at anytime, (Monetary Authority of Singapore, 2003).

Moreover, transaction errors and operating flaws resulting from processing or transmission may remain latent and undetected for indeterminate periods as Internet systems generally employ more automated processes than other less complex systems. Banks should therefore install monitoring or surveillance systems that would alert them to any unusual or dubious online transactions taking place. To provide physical access security, banks may use firewall infrastructure. Firewalls are key components of secure

networks, which are needed to separate the internal network segments from the Internet. Internal and external networks operating at varying sensitivity and protection levels should be physically and logically isolated from one another by appropriate firewall configurations and architecture, (Monetary Authority of Singapore, 2003).

- Authentication and Non-repudiation

In Internet banking, encryption technologies play an important role in ensuring confidentiality, authenticity and integrity. Clients are required to provide their user IDs and a password so that their identity and authenticity could be verified before access to their accounts is permitted. The process of authentication is to validate the claimed identity of the client by verifying what the client knows (usually a password or personal identification number) and what the client has (such as a security token, smart card or digital certificate), Banks should ensure that encrypted and authenticated sessions remain intact throughout the duration of the communications. In the vent of a security lapse, the session must be terminated and the affected transactions resolved or reversed out, (Monetary Authority of Singapore, 2003).

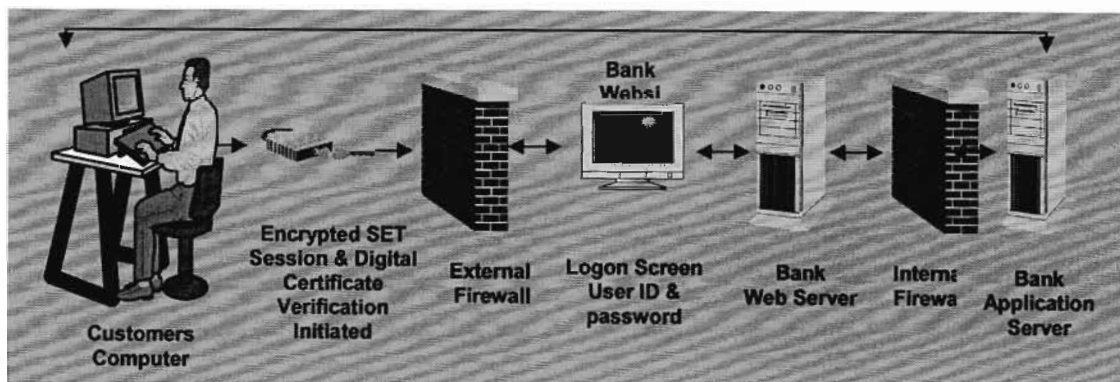
Non-repudiation involves creating proof of the origin or delivery of electronic information to protect the sender against denial by the recipient that the data has been received. Non-repudiation is a means to protect the recipient against denial by the sender that the data has been sent. A technique that may be used by banks to help establish non-repudiation and ensure confidentiality and integrity of e-banking transactions is digital certificates using public key infrastructure, (Basel Committee on Banking Supervision, 2003b).

- Client protection

Client protection is also of paramount importance in e-banking. Banks should advise clients on how to select or create robust passwords or personal identification numbers that cannot be easily guessed or predicted, (Monetary Authority of Singapore, 2003). In South Africa for example, First National Bank offers a DigiTag to their clients for security. The DigiTag is a credit card sized device that generates security access codes for the client to

enter when he/she logs in to the bank's e-banking system, and thus offers an additional level of security to clients, (www.ebucks.com).

Clients also need to authenticate the bank's website or online system which interacts with them through security mechanisms such as Secure Electronic Transaction (SET) or Secure Sockets Layer (SSL) server-authentication. One of the most heavily promoted payment standards for secure e-banking transactions is Secure Electronic Transaction (SET). SET offers a non-repudiation feature. It uses public key infrastructure and digital certificates to mutually verify that the merchant and the client are who they claim to be, and to ensure that the buyer won't later deny the purchase. SET offers this feature to ensure that unscrupulous merchants won't use the client credit card numbers fraudulently. Secure Sockets Layer (SSL) is a protocol for encrypting Web transactions that is easier for merchants to implement. However, unlike SET, SSL only authenticates the merchant's identity, (Kalakota, 2000).



**Figure 2.5: Illustration of an E-banking Security System.** Source: Kalakota, R. (2000) **Introduction to Electronic Commerce.** Prentice Hall.

- System Availability

A high level of systems availability is required for maintaining public confidence in an online network environment. All of the previous security and control components are of little value if an online service is not available when it is needed. In broad terms, users of e-banking services expect to be able to access the online systems 24 hours every day of the year, tantamount to near zero system downtime, (Monetary Authority of Singapore, 2003).

Considerations associated with maintaining high system availability are adequate capacity, reliable performance, fast response time, scalability and swift recovery capability. Banks, their service providers and vendors who provide e-banking services need to ensure they have ample resources and capacity in terms of hardware, software and other operating capabilities to deliver consistently reliable service, (Monetary Authority of Singapore, 2003).

- Segregation of Duties and Access Privileges

Banks should ensure that appropriate measures are in place to promote adequate segregation of duties within e-banking systems, databases and applications. Segregation of duties is a basic internal control measure designed to reduce the risk of fraud in operational processes and systems and ensure that transactions and company assets are properly authorised, recorded and safeguarded. If duties are adequately separated, fraud can only be committed through collusion, (Basel Committee on Banking Supervision, 2003b).

Banks should also ensure that proper authorisation controls and access privileges are in place for e-banking systems, databases and applications. In order to maintain segregation of duties, banks need to strictly control authorisation and access privileges. Failure to provide adequate authorisation control could allow individuals to alter their authority, circumvent segregation and gain access to e-banking systems, databases or applications to which they are not privileged, (Basel Committee on Banking Supervision, 2003b).

- Audit Trails

Banks should ensure that clear audit trails exist for all e-banking transactions. Delivery of financial services over the Internet can make it more difficult for banks to apply and enforce internal controls and maintain clear audit trails if these measures are not adapted to an e-banking environment. Banks are not only challenged to ensure that effective internal controls can be provided in highly automated environments, but also that the controls can be independently audited, particularly for all critical e-banking events and applications, (Basel Committee on Banking Supervision, 2003b).



### **2.6.2.2.Security of ICT Systems**

ICT systems such as telecommunication cables are highly prone to vandalism and damage. Don Paynter (2005) a former president of the Zululand Chamber of Business pointed out that the South African Government and Telkom have come up with the following solutions to curb security problems related to telecommunication cables.

- Installing alarm systems on the telephone lines and initiating armed patrols as costs of downtime; client complaints and lost revenue were astronomical. Theft of lines amounted to acts of economic sabotage as many large corporate firms were unable to conduct business for periods of up to a day until links were restored
- Closer Telkom association with local communities, and creating awareness, so as to reduce cable theft
- South African Telkom advertised for “whistleblowers” people who would be willing to come forward anonymously to divulge information pertaining to thefts against Telkom and handsome rewards were offered
- Replacing copper landlines with microwave radio links in some cases; in others fibre optic cable is used. Though much more expensive than copper, a small fibre optic cable can carry far more traffic than copper cable
- Developing stricter legislation concerning the sale and purchase of second hand materials and goods

### **2.6.2.3.Directory Services and Search Engines**

Additional components of the Common Business Services Infrastructure include services used to index the contents of the Internet; e.g. directory services and search engines. Bank managers should pay attention to these services for two reasons: first, they provide useful and extensive information about the Internet, and second, they can provide visibility since becoming listed with them gives potential clients a route of access, (Kalakota, 2000).

On the Web, a directory is a subject guide, typically organised by major topics and subtopics. In computer networks, a directory is a collection of users, user passwords and, usually, information about what network resources they can access, (Lawrence, *et al.*, 2002).

Internet search engines are databases of web links, often comprising millions of web pages, which can be searched via the Web using keywords to find sites providing the information, services or products of interest to the searcher, (Lawrence, *et al.*, 2002).

### **2.6.3. Messaging and Information Distribution Infrastructure**

The information content transferred over the network consists of text, numbers, pictures, audio and video. However the network does not differentiate among content, as everything is digital that is, combinations of ones and zeros. Once content has been created and stored on a server, vehicles, or messaging and information distribution methods, carry that content across the network. The messaging vehicle is called middleware software and it sits between the Web servers and the end-user applications, (Kalakota, 2000).

Messaging software effectuates the movement of information through the channels of the Internet. For the purpose of e-commerce and e-banking, existing messaging mechanisms must be extended to incorporate reliable, unalterable message delivery that is not subject to repudiation, to be able to acknowledge and give proof of delivery when required. The challenge in the development of messaging software is to make it work across a variety of communications devices (PCs, workstations and wireless communicators) interfaces (characters, graphics and virtual reality), and networks (satellites, cable, twisted pair, fibre optics and wireless). Messaging software takes such forms as email, instant messaging, file transfers and groupware, (Kalakota, 2000).

#### **2.6.3.1.E-mail**

The most popular Internet application is email, which is the transmission of messages and files over a computer network. It is used to transfer company data orders, invoices, word-processed documents, spreadsheets and CAD files between business partners, saving

much time and the expense of sending paper communications. Many e-mail services (e.g. Eudora, Outlook Express) require the user to have an account with an ISP. Incoming and outgoing e-mail is routed through the ISP's mail server, and all e-mail a user receives is stored on his or her own computer, (Lawrence *et al.*, 2002).

The core TCP/IP mail standard for the transmission of messages between mail hosts is the Simple Mail Transfer Protocol (SMTP). Typically, a client sends a message to his or her own mail host. That mail host delivers the message to the receiver's mail host or to an intermediary mail host for delivery to the receiver's mail host. Transmission between mail hosts is always governed by SMTP, (Lawrence *et al.*, 2002).

### **2.6.3.2. Instant Messaging (IM)**

This is an Internet Protocol (IP)-based application that provides convenient communication between people using a variety of different device types including computer-to-computer and mobile devices, such as digital cellular phones. IM can support voice or video communications such as Short Message Service (SMS). SMS is a globally accepted wireless IM service that enables the transmission of alphanumeric messages between mobile subscribers and external systems such as electronic mail, paging, and voice-mail systems, (Visualtron Software Corporation, 2002).

The banking industry uses SMS as a data transport mechanism. Clients who subscribe to this service are able to check their balances, transfer funds between accounts, pay for their bills and credit cards. The SMS service makes use of an SMSC (Short Message Service Centre), which acts as a store-and-forward system for short messages. The wireless network provides the mechanisms required to find the destination station(s) and transports short messages between the SMSCs and wireless stations, (Visualtron Software Corporation, 2002).

### **2.6.3.3. File Transferring**

This consists simply of transferring a copy of a file from one computer to another on the Internet. The most common procedure, File Transfer Protocol (FTP), allows entire files, even large ones, to be transferred within an office or across the globe more quickly and

securely than with e-mail, (Lawrence, *et al.*, 2002). FTP is one of the earliest application standards on the Internet, (Panko, 2001).

#### **2.6.3.4.Groupware**

This is software that enables a group to work together on a project, even from remote locations, by allowing them simultaneous access to the same file. Calendars, written documents, e-mail messages, and databases can be shared through such software products as Lotus Notes and Microsoft Exchange. CU-SeeMe and Microsoft NetMeeting actually make electronic “face-to-face” meetings possible, (Lawrence *et al.*, 2002).

#### **2.6.4. Multimedia Content & Network Publishing Infrastructure**

This infrastructure comprises the fourth building block in the generic framework for e-commerce and e-banking. The Information Superhighway is the transportation foundation that enables the transmission of content. The electronic system through which content is transmitted is analogous to the non-electronic world in which different types of products (content) are stored in distribution centres (network publishing servers) before they are loaded onto various vehicles for transport. Multimedia content and network publishing infrastructure includes: (Kalakota, 2000).

- World Wide Web
- Hypertext Markup Language (HTML)
- Extensible Markup Language (XML)
- Java

##### **2.6.4.1.World Wide Web**

Currently, the most prevalent architecture that enables network publishing is the World Wide Web. The Web is a graphical hypertext environment that operates within the Internet. It supports multimedia presentations, including audio, video, text and graphics. It

is accessed through browsers. The Web can support business-to-business e-commerce in the exchange of data (EDI), the billing and sending of accounts, the payment of accounts, electronic funds transfer and other e-banking functions, (Lawrence, *et al.*, 2002).

The World Wide Web is a subset of the Internet that is accessible through the use of HTTP (Hypertext Transfer Protocol) to link documents at various URLs (Uniform Resource Locator) that are composed in HTML (Hypertext Markup Language) or XML (Extensible Markup Language), (Rayport and Jaworski, 2001).

The Web's architecture is based on three parts namely:

- HTTP-The protocol (a set of rules, procedures and standards) that underpins the Web is (HTTP) and the protocol for doing business on the Web is Secure Hypertext Transfer Protocol, which provides a basis for secure communications, authentication, digital signatures and encryption. HTTP does not process the packages of data it transmits, but rather it is a mechanism that allows users to search for information or data. Further, it allows databases to interact and information to be manipulated, (Lawrence *et al.*, 2002).

HTTP is a client/server protocol. This means that it is based on request-response cycles, in which the browser sends a request message and the web-server program on the web-server sends back a response message, (Panko, 2001).

- A Common Gateway Interface (CGI) is used by a web server to run a separate program that contains dynamic information, format it into HTML and send it on to the web server, (Lawrence *et al.*, 2002). CGI is a standardized way for a web-server program to pass input data to other programs. CGI is often used to pass data to an intermediary program rather than the ultimate database application, (Panko, 2001).
- HTML (Hypertext Markup Language) is a programming language used to specify how a web browser (e.g. Netscape Navigator or Internet Explorer) will display a text file retrieved from a server. It allows the developer of a web page to define hyperlinks between documents and any others that the author might think are important to link together and it also describes the contents of web pages on the Internet. HTML is

outstanding for describing to a computer (or browser) the appearance of displayed information. For example it specifies whether a line of text should be bolded, a larger font or a different colour, (Lawrence *et al.*, 2002).

#### **2.6.4.2. Extensible Markup Language (XML)**

XML was created by the World Wide Web Consortium (W3C) to compensate for the restrictions of HTML. Where HTML describes the layout of information, XML describes what kind of information is being displayed. It describes a standard for creating documents that can store almost any kind of data. XML also uses the HTTP protocol as the transport mechanism, making transmission across the Internet inexpensive and convenient, (Lawrence *et al.*, 2002).

#### **2.6.4.3. Java**

Java is a programming language used as a software development tool for the Internet. It was originally developed by Sun Microsystems for use in embedded systems to control appliances and machinery. The developers recognised that because it is both powerful and multi-platform in nature, Java is also well suited as a language for developing applications to extend the functionality of web browsers, (Lawrence *et al.*, 2002).

Java has thus been adopted for web use as a 'network –centric computing platform' that lets developers create applications that can run on virtually any combination of computer hardware and operating system, (Lawrence *et al.*, 2002).

#### **2.6.5. Interfacing Infrastructure**

The Interface is the virtual and visual representation of a firm or banks chosen value proposition. It can be a desktop PC, sub notebook, personal digital assistant, cell phone, WAP device, or other appliance. In order to capture the design considerations of the Interface infrastructure; the 7Cs framework can be used, (Rayport and Jaworski, 2001). The seven design elements that form the basis for an effective Interface infrastructure are:

- Context
- Content
- Community
- Customisation
- Communication
- Connection
- Commerce

#### **2.6.5.1.Context**

Context is defined as the look-and –feel of a screen-to-face client interface. The look and feel of a website, PDA, or cell phone can be categorised by both aesthetic and functional criteria. A functionally oriented site focuses largely on the core offering- whether that is a product, services, or information. Banks offering e-banking applications should primarily have design features that are simple, clean, and straightforward. The site should allow for quick access to information that is relevant to the client, (Rayport and Jaworski, 2001).

#### **2.6.5.2.Content**

Content is defined as all digital subject matter on the site. This includes the form of the digital subject matter – text, video, audio, and graphics – as well as the domains of the digital subject matter, including product, service, and information offerings. While context largely focuses on the “how” of site design, content focuses on “what” is presented. In terms of media, an e-banking site should use a combination of text and graphics to convey its content, (Rayport and Jaworski, 2001).

### **2.6.5.3.Community**

Community is defined as the interaction that occurs between site users. It does not refer to site-to-user interactions. User-to-user communication can occur between two users (e.g., e-mails, joint game-playing) or between one user and many (e.g., chat, rooms.), (Rayport and Jaworski, 2001).

### **2.6.5.4.Customisation**

Customisation is defined as the site's ability to tailor itself or to be tailored by each user. When the customisation is initiated and managed by the bank, we term it tailoring. When customisation is initiated and managed by the user, we term it personalization, (Rayport and Jaworski, 2001).

### **2.6.5.5.Communication**

Communication refers to the dialogue that unfolds between the site and users. This communication can take three forms: site-to-user communication (e.g. email notification), user-to-site (e.g., client service request), or two-way communication (e.g. instant messaging), (Rayport and Jaworski, 2001).

## **2.7. Policy and Regulatory Framework**

This chapter has discussed the five main ICT infrastructures that support e- banking applications. The implementation of these infrastructures is dependent on 4 main structures, namely: policy and regulatory framework, technical standards, people and organisations. For purposes of this study, policy and regulatory framework, which is the main e-banking support structure, will be discussed.

Policy and regulatory framework, related to e-banking, encompasses such issues as legal and privacy issues, taxes, universal access and information pricing. According to the Risk Management Principles for E-banking laid out by the Basel Committee on Banking Supervision, (2003b) and adopted by the Central bank of Kenya, banks need to follow certain legal and reputation risk management principles. These principles ensure that the



clients are provided with the required level of comfort regarding information disclosures, protection of client databases and business availability. The principles include:

### **2.7.1. Adequate Information**

Banks should ensure that adequate information is provided on their websites. This would allow potential clients to make an informed conclusion about the bank's identity and regulatory status of the bank prior to entering into e-banking transactions, (Basel Committee on Banking Supervision, 2003b), Examples of information that a bank could provide on its website include:

- Name of the bank
- Location of its head office and local offices
- Identity of the primary bank supervisory authority responsible for the supervision of the bank's head office
- How clients can contact the bank's client service
- How clients can obtain access to information on applicable national compensation or deposit insurance coverage

### **2.7.2. Privacy**

Banks should take appropriate measures to ensure adherence to client privacy requirements applicable to the jurisdictions to which the bank is providing e-banking products and services. Maintaining a client's information privacy is a key responsibility for a bank. To meet these challenges concerning the preservation of privacy of client information, banks should make reasonable endeavours to ensure that the matters mentioned in the following paragraph are considered and addressed, (Basel Committee on Banking Supervision, 2003b).

The bank's client privacy policies and standards must take account of and comply with all privacy regulations and laws applicable to the jurisdictions to which it is providing e-banking products and services. Clients should be made aware of the bank's privacy policies and relevant privacy issues concerning use of e-banking products and services. Clients may decline ("opt out") from permitting the bank to share with a third party for cross-marketing purposes any information about the client's personal needs, interests, financial position or banking activities. Client data should not be used for purposes beyond which they are specifically allowed, or for purposes beyond which clients have authorised, (Basel Committee on Banking Supervision, 2003b).

### **2.7.3. Effective Capacity and Business Continuity**

Banks should have effective capacity, business continuity and contingency planning processes to help ensure the availability of e-banking systems and services. The challenge to maintain continued availability of e-banking systems and applications can be considerable given the potential for high transaction demand, especially during peak time periods. In addition, high client expectations regarding short transactions processing cycle times and constant availability (24x7) has also increased the importance of sound capacity, business continuity and contingency planning, (Basel Committee on Banking Supervision, 2003b).

To provide clients with the continuity of e-banking services that they expect, banks need to ensure that current e-banking system capacity and future scalability are analysed in light of the overall market dynamics for e-commerce and the projected rate of client acceptance of e-banking products and services. E-banking transaction processing capacity estimates should also be established, stress tested and periodically reviewed, (Basel Committee on Banking Supervision, 2003b).

### **2.7.4. Incident Response Plans**

Banks should develop appropriate incident response plans to manage, contain and minimise problems arising from unexpected events, including internal and external attacks, which may hamper the provision of e-banking systems and services. They should develop appropriate incident response plans, including communication strategies that

ensure business continuity, control all types of risks and limit liability associated with disruptions in their e-banking services, including those originating from outsourced systems and operations, (Basel Committee on Banking Supervision, 2003b).

## **2.8. Conclusion**

The literature review shows that e-banking is considered a key segment of e-commerce and it encompasses all the different ways of transacting banking business electronically. E-banking is supported by five major ICT infrastructures. The next chapter describes the methods and procedures used to carry out the study in order to achieve the study objective and answer the research questions.

## **Chapter Three: Methodology & Data Collection**

### **3.1. Introduction**

This section highlights the methods and procedures used to carry out the study in order to achieve the study objectives and answer the research questions stated in chapter one. This chapter will cover the following areas of research; research design, population and sampling, data collection methods, research procedures, data analysis and presentation.

### **3.2. Research Design**

This study adopted a qualitative research methodology. With this approach data is usually collected in the form of descriptions. Even though some of the methods used, such as interviews, are similar to those used in quantitative research, the difference is that, qualitative researchers only use non-mathematical procedures when interpreting and explaining their research. In management and business this approach is used to study the way organisations, groups and individuals behave and interact, (White, 2000).

A typical case study research design was also used in this study. A case study is an extensive study of a single situation such as an individual, family or organization. All case studies are inductive in that they report on the particular and specific, and then try to relate that to the general picture. Typical case studies are situations where the organisations studied are as typical as possible, (White, 2000).

This was a typical case study in that the ICT industry and one typical bank participating in the industry were studied. The case study was also exploratory in nature since it examined patterns and themes related to e-banking and was an exploration of a problem. The justification for choosing a case study approach is that it is an approach well suited for small-scale research and can be carried out by a single researcher. It also generates empirical data and the researcher is not solely dependent on already published work. Further, case study approach takes place in a natural setting within an organisation, is relatively cheap and does not depend on expensive technology, (White, 2000).

For this research, Barclays Bank of Kenya (BBK) was examined as a case study. The activities of the industry players, Telkom Kenya, Communications Commission of Kenya (CCK), Central Bank of Kenya and Today's Online, were also studied. Telkom Kenya is a government entity with a monopoly in the provision of fixed line telecommunication services. Telkom is also the main provider of ICT infrastructure in Kenya. The Communications Commission of Kenya (CCK) is responsible for developing and coordinating the policies and strategies with respect to development and operation of telecommunications services in Kenya. Central Bank regulates and supervises banking systems and manages monetary policy operations while Today's Online is a leading Internet Service Provider. In addition four other commercial banks namely, Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa were contacted and their senior management spoken to concerning this research.

The justification for selecting Barclays Bank of Kenya as a suitable sample for the case study is that Barclays was a good representation of the industry. Barclays Bank is one of the leading commercial banks in Kenya and it has the largest ATM network with a total of 82 ATMs. The bank is also the market leader in the retail segment in Kenya where it currently holds a market share of 30%. Kenya has a total of 46 commercial banks.

In addition, Barclays Bank staff understood that the researcher would not compromise their security network and that the study was an overview of the state of the existing ICT infrastructure in Kenya and of e-banking systems in general. The study also included an exploration of ways to improve security and roll out of links to enable more consumers to have access to the Internet. The researcher provided this explanation in the introduction letter written to the bank requesting to carry out the study, (Appendix II).

Further, the Central Bank of Kenya controls and stabilises the operations of all the 46 commercial banks in Kenya. This standardises the banking industry making it possible to use one large bank such as Barclays Bank of Kenya as a case study. Kenyan Banks have also moved towards collaboration and use of shared networks and interfaces that talk to one another. This situation creates similarities in the operations of the banks allowing for one large bank to be used as a suitable representative sample.

### **3.3. Population and Sampling**

Cooper and Schindler (2001), define population as the total collection of elements about which the researcher wishes to make some inferences. The population of interest in this study was all Kenyan banks that provide e-banking services as well as the providers of ICT infrastructure that facilitates e-banking. E-banking activities at BBK, which is one of the largest banks in Kenya, were examined. In addition, in order to get a clearer understanding of the ICT and e-banking sectors in Kenya, the activities of four other organisations, Telkom Kenya, Central Bank of Kenya, Communications Commission of Kenya and Today's Online were also critically studied. Other banks examined were Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa.

Non-probability sampling was used in the study. According to White, (2000), non-probability sampling also known as non-random sampling works best if the nature of the research does not require detailed statistical analyses.

During the examination process of e-banking activities, three senior BBK employees were interviewed. These were the Technical Advisor in charge of Information Technology, the Operations Manager and the Business Banking Manager. In addition, the Deputy Head of Department in the Monetary and Policy unit of Central Bank of Kenya was interviewed. While examining the ICT infrastructure system in Kenya, the Network Planning Manager of Telkom Kenya was interviewed as well as the Director, Market Analysis and Tariffs at Communications Commission of Kenya and the Systems Administrator at Today's Online.

These seven people are senior staff and are directly in charge of operations in their respective organisations. No other people in these organisations would have been able to provide the researcher with detailed, accurate and up to date information on the operations of the organisations in relation to the study. Further, some of the information sought by the researcher was confidential and could only be provided by senior staff.

Although the case study focus was on Barclays Bank, the researcher also questioned senior officials from four other top commercial banks so as to gain further insight on e-banking activities in Kenyan banks. These banks were Standard Chartered, Citibank,

Kenya Commercial Bank and Commercial Bank of Africa. A total of eleven people were interviewed in this study as shown in table 3.1. The survey sample size was too small to be statistically valid and although some quantitative results have been presented, the study is largely qualitative.

<b>Organisation</b>	<b>Number of people interviewed</b>
Barclays Bank of Kenya	3
Central Bank of Kenya	1
Communications Commission of Kenya	1
Telkom Kenya	1
Today's Online	1
Standard Chartered Bank of Kenya	1
Kenya Commercial Bank	1
Commercial Bank of Africa	1
Citibank	1
<b>Total Number of people interviewed</b>	<b>11</b>

**Table 3.1: Number of People Interviewed**

The Technical Advisor in charge of Information Technology, Operations Manager and the Business Banking Manager were the only three people who were interviewed at Barclays Bank Kenya because they were the top-level staff at the bank and the custodians of any confidential and up to date information concerning the banks operations. Furthermore, Barclays Bank staffs have signed confidentiality agreements with the bank forbidding them from divulging any confidential information to the public without written permission from the Operations Manager, Business Banking Manager and the Technical Advisor in charge of Information Technology.

The researcher was privileged to be able to secure the input of these three senior staff because had she not known them she would have had to interview 20 or so junior staff who would not have been able to give out the information required. All attempts to interview junior staff were futile because on all occasions the researcher was referred back to the managers in charge of the sections who were represented by the three senior staff interviewed. Each branch of Barclays Bank has only one Technical Advisor in charge of Information Technology, one Operations Manager and one Business Banking Manager.

All Barclays Bank Kenya branches follow the same operational guidelines and therefore the three interviewees were a good representation for the entire bank. Furthermore all the 46 commercial banks follow similar operational guidelines as set out by the Central Bank of Kenya and most of the commercial banks are now sharing IT systems. The three senior officials interviewed at Barclays Bank Kenya, one from Central Bank and the four from the different commercial banks (Appendix I), were therefore a good representation of the Kenyan Banking industry and provided sufficient information for the study.

### **3.4. Data Collection Methods**

The study made use of both desk research and field research. Desk research involved literature review and content analysis. This was carried out through the collection and analysis of primary and secondary data on the discipline and other related fields, using sources from the library, archival records, the Internet and documents provided by Barclays Bank, Central Bank of Kenya, Telkom Kenya, CCK, Today's Online, Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa.

Field research included face-to-face personal interviews with management and technical personnel at these organisations. In total, eleven people were interviewed for this study as shown in the schedule of interviewees, (Appendix I). Seven of them were senior officials from Barclays Bank, Central Bank of Kenya, Telkom Kenya, Communications Commission of Kenya and Today's Online. Three of the interviewees were from Barclays Bank and one each from the other organisations. In addition; one senior officer from each of the four top banks that compete with Barclays in Kenya, namely, Standard Chartered Bank, Citibank, Kenya Commercial Bank and Commercial Bank of Africa, was interviewed.

The researcher intentionally interviewed senior officials from these four banks after completing the study so as to gauge whether they agreed or disagreed with her assessment of the e-banking and ICT service providers. During these interviews the researcher held open-ended discussions with the officials so as not to lead them on and once they had spoken the researcher questioned them on specific issues concerning the e-banking and ICT companies.



Open-ended semi-structured questions (Appendix III) were used to administer the interviews held with all the interviewees. One advantage of these types of questions is that they allow the respondent freedom in answering questions and the chance to provide in-depth responses, (Wimmer and Dominick, 1983).

In semi-structured personal interviews the interview takes the form of a discussion, and the interviewer directs the conversation by identifying a number of topics and allows the interviewee to talk them through in their own time. This type of interview provides a great deal of information and is excellent where the aim is to understand the perspective of the interviewee and the personal meanings they attach to different situations, (White, 2000). When the respondents were very positive or negative about an issue this form of interview enabled the researcher to probe further and get important information especially on the challenges the banking industry was facing due to the poor state of the ICT infrastructure in Kenya.

These semi-structured open-ended questions allowed the researcher to delve into the quality of answers, to clear up any doubts and vague issues. Further, since the questions were face to face and conducted personally by the researcher, they enabled the researcher to be sure that the answers were not misinterpreted by a hired fieldworker. Note taking and tape recording were the principle techniques used in data collection. The recorded interviews were then transcribed and analysed. According to Arthur Berger (2000), one advantage of interviews is that one can record the interview and thus have a record of data that can be analysed in detail.

### **3.5. Research Procedures**

The research procedure was carried out in six steps namely; determining the research questions, case study selection, preparation to collect the data, collection of data in the field, evaluation and analysis of the data, preparation of the report.

#### **3.5.1. Determining the Research Questions**

In the first step, the researcher established the focus of the study by forming questions about the situation or problem to be studied and determined a purpose for the study. The

purpose of this study was to investigate the current state of the ICT infrastructure and the regulatory framework governing it in Kenya, and to discuss its implications on e- banking services. The research questions formed were:

- To what extent do Kenyan banks offer E-banking services?
- How does the ICT infrastructure system in place affect the provision of e-banking services in Kenya?
- To what extent does the Policy and Regulatory framework in Kenya govern e-banking services?
- Are the existing security systems for ICT and e-banking capable of preventing theft and fraud?

### **3.5.2. Case Study Selection**

During the design phase of the case study, the researcher determined what approaches to use in selecting single or multiple real-life cases to examine in depth and which instruments and data gathering approaches to use. Data analysis techniques were also considered in this phase. Typical case study research was used in this study by investigating the banking and communications industry and a typical bank participating in these industries i.e. Barclays Bank of Kenya.

These cases were investigated in depth using a variety of data gathering methods to produce evidence that lead to understanding of the cases and answered the research questions. The data gathered was largely qualitative and the tools used to collect the data were interviews, primary and secondary sources from the library, archival records, the Internet and documents provided by the organisations that were studied. In order to ensure that the interpretations of the data collected were both reliable and, the results obtained from primary and secondary sources were balanced with those obtained from the interviews. Validity was ensured by fully addressing the research questions and objectives the researcher had defined. Reliability entailed being consistent and ensuring that other

researchers could use the research design to obtain similar results if they were to replicate this study using other Kenyan Banks, (White, 2000).

### **3.5.3. Preparation to Collect Data**

Case study research generates a large amount of data from multiple sources. A systematic organisation of data was therefore important to prevent the researcher from becoming overwhelmed by the amount of data and to prevent the researcher from losing sight of the original research purpose and questions, (Yin, 1984). In addition, the researcher actively sought opportunities to revisit and revise the research design in order to address and add to the original set of research questions, (Appendix III).

During preparations to collect data, the researcher identified key people to interview and anticipated key problems such as reluctance by interviewees to share information on their organisations weaknesses. In order to minimise these problems, the researcher prepared letters of introduction and established rules for confidentiality, (Appendix II). The purpose of the letters was to request Barclays Bank, Central Bank, Telkom, Communications Commission of Kenya and Today's Online, to allow the researcher to interview employees of these organisations and carry out the study.

### **3.5.4. Collection of Data in the Field**

The researcher collected and stored multiple sources of evidence comprehensively and systematically, in formats that could be referenced and sorted so that converging lines of inquiry and patterns could be uncovered. As the study was being planned, additional interview questions were added to the draft interview schedule. Field notes were also used to categorize and reference the data so that it was readily available for subsequent reinterpretation.

### **3.5.5. Evaluation and Analysis of Data**

Throughout the evaluation and analysis process, the researcher remained open to new opportunities and insights. The researcher treated the evidence fairly to produce analytic conclusions answering the original research questions. The information analysed during

the evaluation of the various chosen components of the Kenyan ICT and banking system was factual. This made it easier for the researcher to be objective than would be the case in research where emotions and personal interests are concerned.

### **3.5.6. Preparation of the Report**

The researcher paid particular attention to displaying sufficient evidence to gain the readers confidence that all avenues had been explored, clearly communicated the boundaries of the case, and gave special attention to conflicting propositions.

During the report preparation process, the researcher critically examined the dissertation and used representative audience groups to review and comment on the draft document. People who participated in the review of the draft dissertation included a senior lecturer in Research Methodology, who is based at the Nairobi University, the largest University in Kenya. The chairman of the Operations Research Society of East Africa, an organisation involved in research and development, also participated in this review process. Based on the comments made the researcher rewrote and revised relevant portions of the draft dissertation.

### **3.5.7. Data Analysis and Methods**

According to Yin (1994), “Data analysis consists of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of a study.” In this study, the data collected was interpreted and analysed by use of tables and figures; and ordering the information based on the research questions formed.

## **3.6. Chapter Summary**

This chapter focused on the research methodology and data collection techniques used in the study. The areas covered included; research design, population, data collection methods, research procedures and data analysis. The next chapter will discuss the results and findings as per the research questions.

## **Chapter Four: Results and Findings**

This is a presentation of the research results and findings obtained from the qualitative and descriptive study that was carried out. Data was collected from face-to-face personal interviews with management and technology personnel at Barclays Bank of Kenya, Central Bank of Kenya, Telkom Kenya, Communication Commission of Kenya and Today's Online. In addition the findings include data collected from four other top commercial banks, namely, Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa. The findings also include primary and secondary data sourced from the library, archival records, the Internet and documents provided by all the organisations interviewed and by other service providers.

The data has been presented in the form of analytical descriptions, figures and tables. A detailed description of the banking and ICT sectors in Kenya is provided, followed by the problems faced within these sectors. The study findings are presented based on the research questions as follows:

- To what extent do Kenyan banks offer e-banking services?
- How does the existing ICT infrastructure system affect the provision of e-banking services in Kenya?
- Are the existing security systems for ICT and e-banking capable of preventing theft and fraud?
- To what extent does the Policy and Regulatory framework in Kenya govern e-banking services?

### **4.1. Banking Sector in Kenya**

#### **4.1.1. National Payment System**

The National Payments System (NPS) is an important feature of any modern society like Kenya because it is an essential part of the financial infrastructure in the market economy.

The organisation and operation of monetary, banking and financial systems are largely determined by the needs of the market. The Kenyan NPS consists of a set of instruments, banking procedures and interbank funds transfer systems that ensure the circulation of money. The NPS covers the whole process of initiating a payment transaction, processing the transaction through to its settlement finality known as financial system cycle. It comprises of the Central Bank, the Government, Commercial Banks and, Financial institutions, Payments System Providers, Laws, Rules and Regulations governing the financial system, technology and physical infrastructure, (Central Bank of Kenya, 2004a).

#### **4.1.2. Financial Institutions**

Kenya, which has become the East and Central African financial hub for most financial institutions, has a well-diversified financial sector. With the Central Bank regulating and supervising the banking system and managing monetary policy operation, at the apex, the industry is a pyramid of financial activity comprising 46 commercial banks, 13 non-bank financial institutions and 2 mortgage finance companies. There are a large number of financial institutions that are not banks; this category is comprised of 4 Building Societies, 37 insurance companies, 20 micro-finance institutions, 57 hire-purchase companies, and some 2,670 Savings and Credit Co-operatives Societies, (Central Bank of Kenya, 2004a).

The Central Bank of Kenya was established in 1966 through an Act of Parliament-the Central Bank of Kenya Act of 1966. This Act set out the objectives and functions and gave the Central Bank limited autonomy. Since the amendment of the Central Bank of Kenya Act in April 1997, the Central Bank operations have been restructured to conform to ongoing economic reforms, ([www.centralbank.go.ke](http://www.centralbank.go.ke)).

Though required to support the general economic policy of the Government, the Central Bank has independence in exercising the powers conferred on it by the Central Bank of Kenya Act, 1996. However, both the Government and the Central Bank make mutual consultations on important policy issues. The Central Bank, for example, is required to advise the Government on monetary and fiscal policy issues and other economic issues that may have important ramifications on the Bank's monetary policy, (Kwendo, 2005).

The Central Bank of Kenya plays a unique role in the economy and performs various functions not normally carried out by commercial banks. Over time the functions of the Bank have evolved with changing economic conditions. As stipulated in the Central Bank of Kenya (Amendment Act), 1996 its main task is that of maintaining price stability and fostering liquidity, solvency and proper functioning of a stable market-based financial system, (Central Bank of Kenya, 2004a).

CBK is therefore responsible for formulating and executing monetary policy, supervising and regulating depository institutes, assisting the Government's financing operations and serving as Government banker, in line with contemporary central banking practice the world over. Other functions include, issuing of notes and coins, provision of banking services of commercial banks such as providing commercial banks with cheque clearing facilities and foreign exchange operations, (Kwendo, 2005).

The Kenyan Government through the Central Bank provides clearing facilities to the commercial banks for both debit and credit instruments, (Kwendo, 2005). In recognition of the pivotal role of an efficient payment system, the Central Bank of Kenya, working in collaboration with the Kenya Bankers Association (KBA) has since the mid 1990s implemented various measures to modernise, reform and enhance safety and efficiency. This is exemplified by the full automation of the Clearing House, which has helped reduce the cheque-clearing period to 3 days countrywide while high value transactions of over Ksh 10million (US\$ 135,000) now take a maximum of 20 days to clear. The NPS is being modernised further through introduction of Real Time Gross System (RTGS). This will enhance effectiveness, security and reliability of the settlement system on a real time basis, (Mulei, 2004).

According to Mr. Mutiga (2003), the Business Banking Manager at Barclays, Kenya's banking sector is still faced with many challenges. Many banks are still reeling under huge bad debt portfolios and a legacy of poor risk management, mismatched books, a hostile economic environment, and bad governance. Debate is currently taking place as to whether this can be addressed on an industry wide basis. A financial sector study took place in 2003 that looked at how the sector can be rationalised. How to regulate emerging players in the financial sector like savings and credit societies and micro finance

institutions is a major area of concern. There is also the debate about the role of the government in the financial sector and in particular, the role of development financial institutions.

The officials interviewed from the four commercial banks all agreed that the government has no business in commercial banking therefore it should divest out of Kenyan commercial banks such as National Bank, Kenya Commercial Bank and Consolidated Bank. However Mr Kwendo, Deputy Head of Open Market Operations at Central Bank of Kenya, (2005) maintains that the role of development financial institutions cannot be dismissed off hand. Development financial institutions remain relevant to providing financial services that commercial banks are reluctant to provide. This includes long term financing and financing to the agricultural sector. They however need proper management by government institutions. Overall, the broader range of products on offer has however been a positive development in Kenya's banking industry.

#### **4.1.3. Means of Payment**

There are big differences in the payment systems of different countries, and in the habits of people using the different means of payment. In Kenya and South Africa, for example, the total amount of bank notes and coins in circulation is less than 15 per cent of total demand, or transferable deposits, compared with most of the countries in Eastern Europe (former Union of Soviet Socialist Republics), where it exceeds 100 per cent of the short-term bank deposits or Greece, where it is equal to 104 per cent. In these latter countries, the introduction of electronic payment systems will most probably have a much bigger effect on the demand for coins and bank notes than in Kenya and South Africa, (Market Intelligence, 2004).

Cash is the most common form of payment in Kenya because it is readily accepted. Non-cash payments are by means of instruments such as cheques. Cheques are the major non-cash payment instruments in Kenya accounting for over 90% of all non-cash payments. The bulk of cheques issued in Kenya bear the MICR (Magnetic Ink Character Recognition) code line. Other non-cash payments are conducted through the different forms of e-banking, (Central Bank of Kenya, 2004a). In developed countries, cheques have ceased to be used as a preferred form of payment. According to Dr. Edward Sambili



(2004), the Deputy Governor of CBK, the same trend is developing in Kenya. The cheque is merely a promise to payment and can either be honoured or dishonoured, (Market Intelligence, 2004).

#### **4.2. E-banking in Kenya**

Currently, all the 46 commercial banks in Kenya are providing most forms of e-banking services. The level of competition has increased significantly and the financial systems currently include the use of ATMs, debit and credit cards, execution of payments through Electronic Funds Transfers, Web-based Internet banking, online banking, mobile and telephone banking practices. These are electronic services where the clients can instantly access their account balance and other banking information as well as transfer funds on an on-line basis using a telephone and a personal computer, (Central Bank of Kenya, 2004a).

The transition to cashless payments can be seen elsewhere on the continent. In South Africa, for example, the value of electronic payments between 1989 and 2003 rose from 2.8 per cent to 61.4 per cent. The South African situation is similar to trends elsewhere in the world, where technology has provided a means to move from cash-based payments to more efficient cashless transfers. Another example is the British government, which saves approximately five million Pounds Sterling per month using visa payment systems for procurement, (Clark, 2005).

According to the Barclays Bank Operations Manager, Ms Mutunkei (2003), over the years, Kenyan banks have shown willingness to leapfrog old banking technologies and eagerly adopt new ones and often this leap is a huge one. For example, there was a time, quite recently when settlement between banks was done by groups of messengers who travelled to a central meeting place, like a park, on their bicycles or motorbikes, with cheques which they settled every day. Kenyan commercial banks, through the Kenya Bankers Association clearing house, addressed the daily settlement problem years ago with the introduction of electronic clearing. However, even this system still needs refining since clearing cheques could take a shorter time than the three days they do currently, (Mutunkei, 2003).

While it is true that banks in Kenya have been in many ways more conservative than their likes of Zimbabwe, this is changing. By and large, the Kenyan banking sector was static for a while but a lot has happened since the year 2002 that has tremendously changed the way banking takes place in the country. There has been a lot of innovation and rollout of technological services in the banking sector. The market has also become more competitive and the banks have started to innovate on the client side, (Mutiga, 2003).

A case study of Barclays Bank has been presented further on in this chapter but first a general overview of e-banking services in Kenya as per the research findings is outlined as follows:

#### **4.2.1. Payment Cards**

Payment cards have taken a significant leap within Kenya's non-cash payment instruments segment. They include different types of cards such as credit, debit and prepaid. The credit card is the most common category although debit cards are becoming more popular, (Central Bank of Kenya, 2004a). By the end of 2005, Kenyan banks expect to issue nearly half a million new credit cards. In 2004, only seven banks were issuing credit cards. In 2005 the number had risen to 16 banks, (Mutiga, 2003).

According to Visa International head of corporate communication, Dr Jeremy Reynolds (2005), a study conducted by Global Insight for Visa, showed a positive effect between increased use of electronic payments and economic growth. The study also indicated that a 10 % increase in the share of electronic payments would raise consumer spending by more than 0.5% a year, (Oyuke, 2005).

The number of visa cards in circulation in Kenya had risen by 34% from 620,087 in June 2004 to 828,937 in June 2005. The country also experienced a 62% increase in retail sales value (card spend at point of sale) from June 2004 to June 2005. This shows people are using their cards much more than before. The total spending on Visa cards increased by 18% in 2004 in tandem with total expenditure on Visa cards which has reached US\$ 560 million per annum, (Oyuke, 2005). However, few credit card terminals have taken advantage of broadband technology, which would accelerate transactions. The majority of transactions are verified using telephone technology, (Messer, 2004).

#### **4.2.2. Electronic Funds Transfer (EFT): Credit**

EFT payment system is used for transferring funds through the Clearing House among banks and on behalf of their clients. Payment/Value is given on a same day basis, (Mutunkei, 2003).

#### **4.2.3. EFT: Direct Debits**

These are pre-authorized payments by the client, who gives permission for his bank to debit his account upon receipt of instructions initiated by a service provider e.g. insurance or mortgage companies, (Mutunkei, 2003).

#### **4.2.4. EFT through SWIFT**

Society for Worldwide Interbank Financial Telecommunications (SWIFT) is a cooperative owned by member banks in 199 countries worldwide. The majority of banks worldwide are members of SWIFT and in Kenya 34 out of 46 commercial banks are members. It is a requirement by CBK that any interbank transfer must be through SWIFT. The banks are connected to SWIFT either directly or through a bureau. SWIFT has a track record of supplying secure, standardized financial messages since 1974, (Central Bank of Kenya, 2004a).

#### **4.2.5. Real Time Gross Settlement System (RTGS)**

The RTGS system in Kenya was implemented in July 2005. The system, also referred to as the Kenya Electronic Payment and Settlement System (KEPSS), was developed by the Central Bank at a cost of Ksh 123 million (US\$ 1.7 million) and it connects all commercial banks electronically. The implementation of the RTGS aimed at addressing deficiencies in the current payment methods that have, for a long time, relied heavily on traditional payment methods including cash and cheques, (Wahome, 2005).

#### **4.2.6. Automated Clearing House (ACH)**

The Central Bank facilitates the ACH operations through the Kenya Bankers' Association (KBA) which owns, operates, and administers the clearing for cheques and EFTs that are used by 38 clearing banks, including CBK and 5 other non-clearing banks. MICR (Magnetic Ink Character Recognition) system was adopted during 1998 as the basis for the automation of clearing effects in the whole country. Automation of the Clearing House has helped reduce the cheque-clearing period to 3 days countrywide while high value transactions of over Ksh 10million (US\$ 135,000) now take a maximum of 20 days to clear, (Central Bank of Kenya, 2004a).

For security purposes all files to and from the Clearing House are signed by a system that generates signature files for the exchanged files. All banks must have the signature software installed to participate in the Clearing House. Each signature file is associated with a data file that enables the authenticity of the data file to be verified, (Central Bank of Kenya, 2004a).

#### **4.2.7. Shared ATM/POS Switch-Kenswitch**

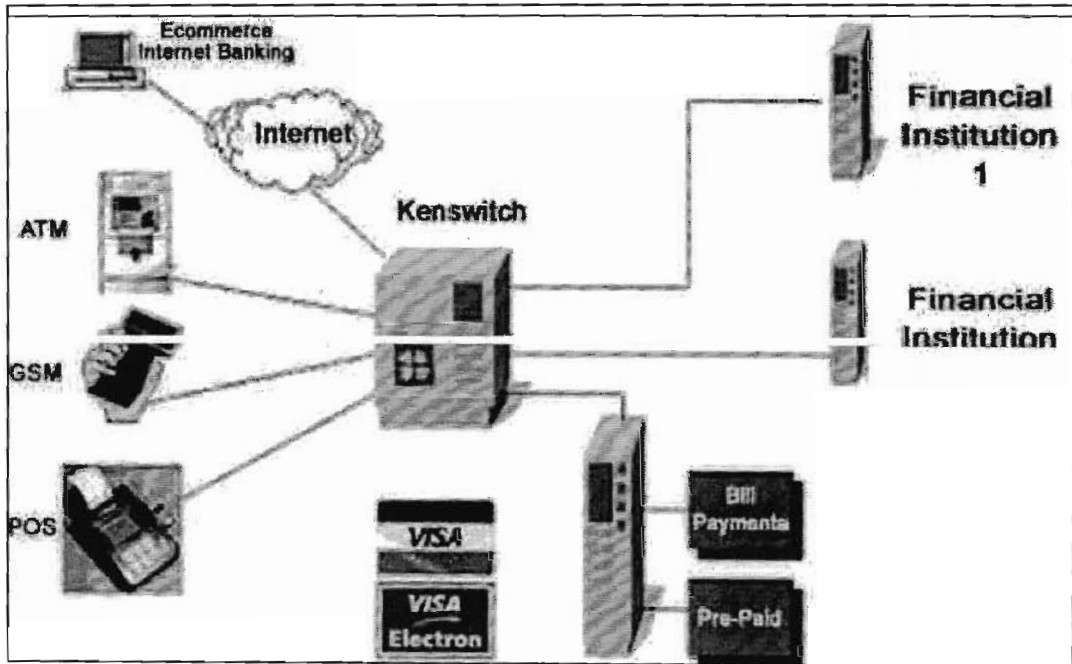
The Shared Automated Teller Machines is a project of eighteen banks whose objective is to establish shared ATMs. The shared ATMs operations are under a trade name Kenswitch (Kenya Switch) the switch went live to the public on December 20, 2002 with 4 banks that have all issued cards to their clients. By the end of 2003, the number of Kenswitch ATMs had increased to 50 and the total number of shared and non-shared ATMs in Kenya, was over 230 compared to 159 ATMs in 2001, (Central Bank of Kenya, 2004a).

As shown in figure 4.1, the switch software is capable of providing various solutions, transactions, switching, payments and remote banking through Internet and WAP, mobile commerce and prepayments and finally call centre acquiring. Future plans include expanding the network to other towns and establishing connectivity with international payment networks such as VISA and Master Card. Industry standard techniques have

been used to ensure security of e-transactions passing through the system, (Central Bank of Kenya, 2003).

**Figure 4.1: Kenswitch Functional Design.** Source: Central Bank of Kenya (2003)

Payments System in Kenya, Kenya. Central Bank of Kenya.



#### 4.2.8. Pesa Point ATM Network

In July 2005, technology firm, Paynet, began work on a new automated teller machine (ATM) service under the name PesaPoint. PesaPoint, a third-party network, will be the largest such system in Kenya. The concept is to offer all financial institutions access to the network so that their cardholders can benefit from a wider footprint of ATMs. The first phase comprises of 120 ATMs. From the merchant perspective, the firm provides 24-hour card authorisations services, which should help with authorisations for merchants when their links are down. The company has also installed all the technology to provide a complete back office for credit and debit cards. These services will be available to all financial institutions, including micro finance firms, savings and credit cooperative societies, building societies and banks. The advantage for a bank is that it does not have to go through the capital expense and time to set up its own processing centre, (Mugambi, 2005).

Paynet hopes to attract financial institutions for two reasons. First, it suits those that start with low volumes as their corresponding processing and capital costs are not prohibitive. Secondly, it reduces the overheads and management time required to run a processing centre. The company uses the CTL Prime, Online and Fraudguard systems that it says are the most advanced in the market. The rising cases of credit card fraud are a matter of concern to the company. However, Paynet says its Fraudguard system from CTL plays a major role in early detection of fraud before transactions are authorised. The company is working closely with Visa and is extremely vigilant within its processes to minimise the impact of credit card fraud, (Mugambi, 2005).

With the exception of Citibank, all the officials of the other commercial banks interviewed were eager to implement the PesaPoint system once it was fully operational. They felt that the system would be beneficial to their respective banks in terms of profits earned from increased transactions and fees charged through the use of the system. Citibank on the other hand has no ATM network because it maintains a client base that is largely corporate and has minimal needs for ATM services. An ATM network would therefore not add value to Citibank's operations.

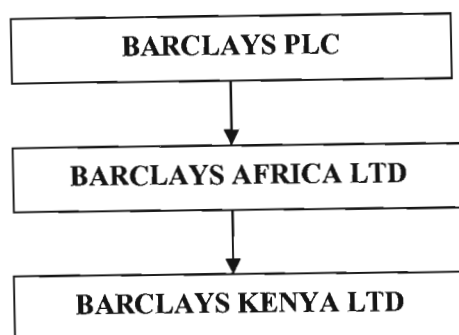
### **4.3. Barclays Bank of Kenya (BBK) Case Study**

The aim of this case study was to explore the e-banking processes at Barclays Bank and also to examine the impact of Kenya's ICT infrastructure system on e-banking services.

#### **4.3.1. Barclays Bank of Kenya Background**

Barclays Bank of Kenya is one of the leading and largest banks in Kenya. The bank is foreign owned but locally incorporated and it has operated in Kenya for 88 years continuously. Barclays bank has a three-tier structure of ownership placing Barclays Bank PLC at the top, followed by Barclays Bank Africa, and then Barclays Bank Kenya, as shown in figure 4.2. Barclays Kenya is currently the largest business unit in the Barclays Africa family in terms of contribution to profit and size of operations. In Kenya, it boasts of a balance sheet worth Ksh 75 billion (US\$ 1 billion), which is equivalent to 10% of the country's GDP, (Mutunkei, 2003).

Barclays Bank Kenya was listed on the Nairobi Stock Exchange in 1986 and currently has 34,000 Kenyan shareholders. Kenyan shareholders own 35% of Barclays Kenya Ltd., while 65% is owned by Barclays Africa. Its shares are some of the most sought after and are popular with both corporate and retail clients. In 2005, the bank had a staff compliment of 1890 with Adan Mohamed, a Harvard Business School graduate as its Managing Director. The Central Bank of Kenya and the Banking Supervision Unit supervise Barclays Bank of Kenya, ([www.barclays.com/africa/kenya](http://www.barclays.com/africa/kenya)).



**Figure 4.2: Structure of Barclays Bank Ownership.** Source:

[www.barclays.com/africa/kenya](http://www.barclays.com/africa/kenya)

Figure 4.2 shows that Barclays Africa is now divided into three major business divisions, which makes it operate as three banks in one. These divisions, each headed by a managing director at the Barclays Africa head office are: Retail Banking, Business Banking and Corporate Banking. Barclays Bank is the market leader in the retail segment in Kenya where it currently holds a market share of 30% and is aggressively growing its corporate business with numerous world-class financial services products, (Mutiga, 2003).

By 2003, Barclays Bank Kenya’s retail business segment had a significant operation spanning over 500,000 clients with a leading share in several products. Services provided by the Retail Banking Division include, savings accounts, cheque accounts, fixed deposit accounts, Barclay loan and business club, (Mutunkei, 2003). In the year 2003, the number of companies in the Business Banking category at Barclays Bank of Kenya was about 1,000, while the number of large companies in the Corporate Banking division was 90. Services being provided by the Business Banking (Corporate) Division include cash management, commercial lending, trade services, treasury services, investment management, securities, custodian and administration services, (Mutiga, 2003).

### 4.3.2. Banking Infrastructure

The direct impact of Barclays in Kenya results from such activities as the extension of its branch network, the development of e-banking, the lowering of minimum requirements for opening a bank account, and the efficient use of its ATM network. Barclays Bank PLC, which is the mother bank in the Barclays family not only invented the first cash machine but is also one of the founding members of Identrus, a technology which enables business to business high value transaction processing over the web. Barclays PLC has invested heavily in a global technology infrastructure that is duplicated by Barclays Kenya, (Emerging Market Economics, 2004). Barclays has one of the best and largest IT networks in Kenya, (Ngugi, 2003).

By 2005, Barclays Bank had 69 branches across the country and all its branches are computer linked making it possible for consumers to access their accounts from any branch as if it were their own home branch for all their cash and cheque transactions. As shown in table 4.2, Barclays Bank of Kenya has 82 ATMs, the largest number by any bank in Kenya. The total number of shared and non-shared ATMs for all banks in Kenya is 230. Barclays therefore holds 36% of all ATMs in Kenya and it has one of the best and largest IT networks in Kenya, ([www.barclays.com/africa/kenya](http://www.barclays.com/africa/kenya)).

A significant investment in information technology infrastructure also distinguished Barclays Bank Kenya, while substantial growth in unsecured loans and volume growth in sales of Barclaycards provided the bank with significant market advantage over competitors. Financial strength coupled with extensive local and international resources have positioned Barclays Bank of Kenya as a foremost provider of banking services, (Mutiga, 2003).



Profit Before Tax		Banking Institution	Total Assets	
Ranking			Ranking	
2003	2002		2003	2002
1	2	Barclays Bank of Kenya	1	1
2	1	Standard Chartered Bank	2	2
3	3	Citibank	5	4
4	45	Kenya Commercial Bank	3	3
5	5	Commercial Bank of Africa	7	7
6	4	National Bank of Kenya	6	6
7	7	CFC Bank	8	8
8	6	NIC Bank	10	10
9	14	I &M	9	12
10	8	Imperial Bank	19	19
11	12	Diamond Trust	13	13
12	10	Co-operative Bank of Kenya	4	5
13	25	Bank of India	16	17
14	19	Prime Capital & Credit	31	34
15	32	Bank of Baroda	14	16
16	9	First American	15	14
17	11	Trans-National	39	38
18	17	K-Rep	35	39
19	15	Charterhouse Bank ltd	32	36
20	21	Fina Bank	17	15
21	27	Development Bank of Kenya	33	31
22	16	HFCK	11	9
23	23	Equitorial Commercial Bank	30	33
24	13	Habib Bank Ltd	24	28
25	22	Prime bank	18	25
26	26	Middle East Bank	27	23
27	18	Habib A.G.Zurich	24	24
28	31	ABC Bank	25	26
29	29	Chase Bank	38	43
30	24	Guardian Bank	23	21
31	40	Southern Credit Bank	29	30
32	35	Credit Bank	36	37
33	33	Giro Commercial Bank	21	20
34	37	Victoria Commercial Bank	28	27
35	36	Fidelity Commercial Bank	41	42
36	20	Consolidated Bank	34	29
37	39	City Finance Bank	44	44
38	41	Paramount Universal Bank	42	41
39	42	Dubai Bank	43	45
40	30	Credit Agricole Indosuez	20	18
41	43	Industrial Development Bank	40	40
42	34	Stanbic bank	12	11
43	44	Oriental Commercial Bank	37	35
44	38	Akiba Bank	22	22
45	28	Biashara Bank	45	32
46	46	Daima Bank	46	46

**Table 4.1: Ranking of all Kenyan Commercial Banks.** Source: Market Intelligence bank of the year 2004: How the banks rank, (2004) Market Intelligence

As shown in table 4.1, a comprehensive survey of Kenya’s banking sector carried out by Market Intelligence, a leading Kenyan business and finance journal, placed Barclays Bank of Kenya in first and second position in terms of profit before tax and total assets in the year 2003 and 2002. This shows that Barclays Bank uses shareholders funds more aggressively and deploys equity more effectively to make money. In 2003, its total assets had grown by 12% to Ksh 96billion (US\$ 1.3billion). Its total liabilities also grew from Ksh 7.5 billion (US\$ 100,000,000) to Ksh 8.5 billion (US\$ 116,700,000) reflecting the rise in volume of client deposits. On the assets side, by aggressively selling the personal loans products together with newly introduced small business loan product, the bank grew its total loans and advances to clients by 12.5%, from Ksh 5.3 billion (US \$ 72,700,000) to Ksh 6 billion (US \$ 82,400,000), (Mohammed, 2004).

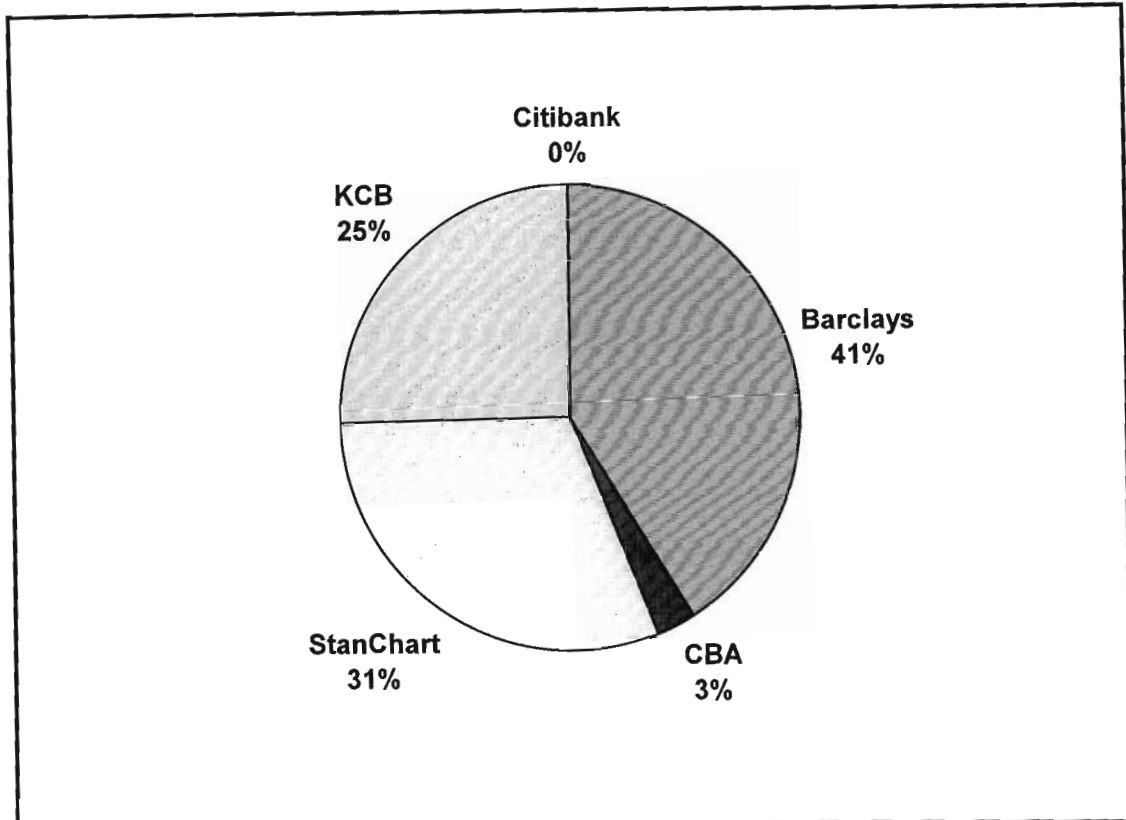
A survey of the ATM networks of the top 5 banks in Kenya was carried out in the study to determine which one was the largest in terms of number of ATMs. Kenya’s top five banks in terms of total assets and profit before taxes are, Barclays Bank of Kenya, Standard Chartered Bank, Citibank, Kenya Commercial Bank and Commercial Bank of Africa, (Market Intelligence, 2004).

Bank	ATM Network	
	Number	Percent
Barclays Bank of Kenya	82	36%
Standard Chartered Bank	62	27%
Kenya Commercial Bank	51	22.2%
Commercial Bank of Africa	6	2.6%
Citibank	0	0%

**Table 4.2: Ranking of Kenyan Banks in Terms of ATM Network**

Table 4.2 and figure 4.3 present the data collected from the top five commercial banks in relation to their ATM network. The findings from this data show that Barclays Bank has the largest ATM network with 82 ATMs. This is thirty six percent (36%) of all ATMs in Kenya. The total number of shared and non-shared ATMs for all banks in Kenya is 230. Standard Chartered Bank has the second largest ATM network with 62 ATMs, which is twenty seven percent (27%) of all ATMs. Kenya Commercial Bank is third with 51 ATMs, approximately twenty two percent (22.2%) of all ATMs. The fourth bank is Commercial Bank of Africa with 6 ATMs, approximately three percent (2.6%) of all

ATMs. Despite being one of the top five banks in Kenya, Citibank has no ATMs. The bank prefers to concentrate more on corporate than retail banking. Retail clients often require the extensive use of ATM networks.



**Figure 4.3: Ranking of Kenyan Banks in Terms of ATM Network**

#### **4.4. E-banking Services in Barclays**

In 2001, Barclays Bank Kenya embarked on an ambitious project to offer Internet banking. This project known as e-world was implemented in conjunction with Africa Online. The aim of e-world project was to educate both existing and potential Barclays Bank clients on how to use the Internet and also allow them to have access to electronic banking. Barclays Bank also gave each of the clients individual e-mail addresses from where they could access their bank accounts. E-world project was a success because majority of Barclay’s banks clients are technology literate, (Ngugi, 2003).

Barclays Bank Group has adopted a functional matrix structure, which gives the opportunity to use economies of scale, (Mutiga, 2003). Economise of scale are cost savings that accrue from increases in size or number, for example, unit costs are lower in a larger bank than in a smaller one, (Thompson and Strickland, 2001). The functional

matrix allows the bank to easily standardize. For example, the local retail director in Kenya reports to the Group retail director and electronic banking products offered to the corporate sector in Kenya are the same worldwide, (Mutiga, 2003). These products include:

#### **4.4.1. Business Master International (BMI)**

This is a cash management system that gives the client timely and accurate information needed to maximise cash efficiency, reduce exposure to exchange rate risk and minimise administration. Using this system the client can obtain balance and transaction details on local and foreign currency accounts, transfer funds between accounts and email the Bank from the convenience of their PC. The system operates within a Windows environment making it user friendly. It can also operate within a Network environment, (Mutiga, 2003).

To gain access to their accounts, a client dials the designated telephone number in the country where the client's account is maintained, from any international location. Account data can be downloaded for reconciliation; analysis and forecasting to other software packages such as Microsoft Excel or Lotus 1-2-3. The only hardware requirements that the client needs to have are a PC and a modem. Barclays Bank supplies and installs all the software. Any modern PC can be used. The minimum specifications are; 512kb RAM, 3.5" disk Drive, Hayes compatible modem with minimum speed 1200BPS, PC or MSDOS v2.1 or higher, MS Windows 3.1 or higher, (Ngugi, 2003).

#### **4.4.2. Barclays PayDirect**

This system provides the client with a simple and efficient means of making regular payments electronically, such as wages/salaries, dividend payments or any other types of volume payments. Instead of manually preparing a large number of cheques, an organisation using e-banking simply needs to load its employee or shareholder database with the new amounts to be paid and click a few times on its PC to send instructions to the Bank to pay by electronic means. Employees and other payees can be paid whether or not they bank with Barclays. If the employees bank with Barclays Kenya the payment is

immediate however if employees hold accounts with other banks, the payment takes 3 days, (Mutunkei, 2003).

There is no set-up fee for PayDirect and the Bank also provides the software free. The client does not need to purchase any special computer hardware, as the software will run on standard PCs and in the majority of cases it will co-reside with other applications. For security reasons, the organisation will have a unique client ID together with individual password control, each user with his or her own. The software enforces password changes every 30 days and also has a “file tester” facility to be used to validate files before finally instructing the bank. In addition, PayDirect provides the organisation with a full audit trail, ([www.barclays.com](http://www.barclays.com)).

#### **4.4.3. ChequeMate**

This is a solution that enables corporate clients to use modern technology to outsource cheque writing and signing to the Bank. Once the client signs up for the service, Barclays install the ChequeMate software on the client’s system and ensures that the organisations staff members are properly trained in its use. When the client is ready to make payments, he/she sends an electronic file to Barclays, which is then verified and checked against the payment limits the client has set. The processed cheques are then printed and reconciled against a report and sent to the client in a tamper-proof mailbag via a courier company, ([www.barclays.com](http://www.barclays.com)).

The client can choose to use either banker’s cheques or the client’s own corporate cheques. A full reconciliation of the banker’s cheques issued on the client’s behalf is done by the Bank who also give a further reconciliation of all the corporate cheques, including cheques issued, presented for payment and any outstanding cheques, ([www.barclays.com](http://www.barclays.com)).

To enable secure transactions, the following measures are taken:

- The client’s cheque stock is stored safely with the Bank

- The client sets both their single cheque and total payment limit, which is verified by the Bank on each payment instruction
- Cheques are printed and reconciled against a report
- All file transmissions are fully encrypted for security purposes
- All instructions to the bank are authenticated, verified and authorised before processing
- The system is password protected, allowing the client to control user access
- An audit trail report is produced to assist the client in monitoring the use of the ChequeMate facility
- ChequeMate reduces the risk of fraud, ([www.barclays.com](http://www.barclays.com)).

#### **4.4.4. Business Master TAG**

This is a ‘real-time’ treasury dealing service enabling the client to book foreign exchange deals from the convenience of their PC.

#### **4.4.5. Barclaycard Kenya**

Barclays has been in the card business in Kenya since 1990 and has a market share of 60% of the credit cards in Kenya today. Barclaycard now issues the Visa and Master card brands, which are the most widely accepted in the world. Four types of Barclaycards are also offered, namely: Classic, Gold, Prestige and Manchester United. Barclaycard benefits include convenience, security and assistance in cash flow management. In addition to the Visa and Master brands, the bank has also rolled out into the market a new state of the art form of credit financial system known as Integrated Point of Sale (POS). The POS gives the cardholder a one-stop shopping experience, which eliminates the hassles of verification and separate counters for payment, (Kenya Credit Card Association, 2004).

#### **4.4.6. Network Infrastructure-BBK**

In 2003, Barclays Bank of Kenya was granted a Very Small Aperture Terminal (VSAT) license by the Communications Commission of Kenya. The licence, which took seven years to be granted, has allowed Barclays Kenya to provide banking services using satellite technology. The banks capability has been enhanced by the use of this satellite technology, which allows on-line handling of transactions and provides clients with real time banking, wherever they transact. Barclays also intends to link all its ATMs and branches in Africa using Very Small Aperture Terminal (VSAT) technology. VSAT will enable Barclays to cut processing costs by between 20 and 25 percent as well as reduce the cost of rolling out new products, (Mohammed, 2004).

A detailed description of e-banking services with an emphasis on Barclays Bank has been provided in the previous section. The next section will address the impact of ICT infrastructure on e-banking in Kenya as well as examine the study findings on Kenya's ICT sector and the problems within the sector.

#### **4.5. ICT Sector in Kenya**

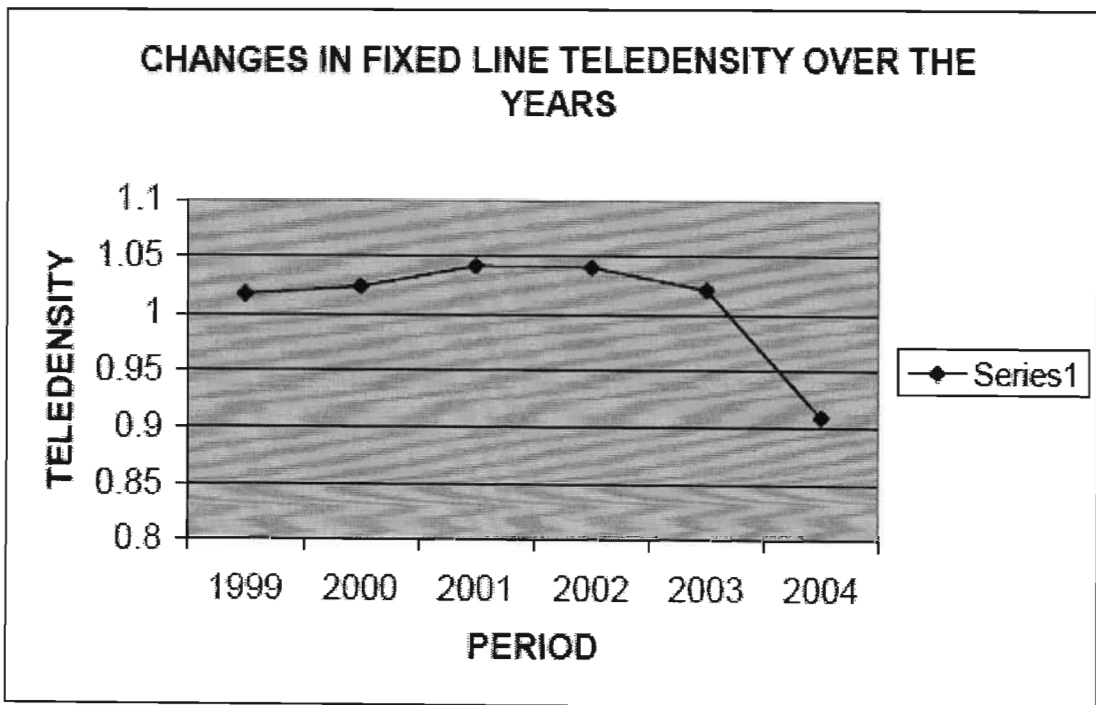
The study findings reveal that the growth of the ICT (Information Communication Technologies) sector in Kenya has been significantly influenced by both global and national trends. The sector growth can be evaluated in terms of the number of fixed and mobile telephone lines; the teledensity; the number of computers and services; Internet Service Providers (ISPs); the number of internet users; broadcasting stations; and the policy and regulatory framework governing the ICT sector, (Communications Commission of Kenya, 2004).

##### **4.5.1. Telecommunications Sub- Sector**

Liberalisation of the communications sector in Kenya began in 1999 with the split of the defunct Kenya Posts and Telecommunications Corporation into three entities. Communications Commission of Kenya (CCK) is the industry regulator, while Telkom Kenya and Postal Corporation of Kenya provide telecommunication and postal services respectively. Telkom Kenya is a government entity and is the only fixed national

operator. However, arrangements are underway to licence a second national operator. One regional telecommunications operator has been licensed to provide services in North Eastern region and the CCK is in the process of licensing additional regional telecommunications operators in eight designated geographical regions as a means towards ensuring the spread of services to all areas, (Njoroge, 2004).

Since 1999, the telecommunication industry has experienced tremendous activity. Of much significance was the growth of cellular mobile connectivity, which continued to outperform that of fixed telephony services. For instance between July 1999 and June 2004, the switching capacity of fixed telecommunications network increased from 420,370 to 531,442. The subscriber connections also grew from 296,400 in June 1999 to 328,358 in June 2003, before reducing to 299,255 by June 2004. As shown in figure 4.4, this translates to an overall fixed line teledensity of 1.02%, which is a drop from the previous year's teledensity of 1.04%, (Communications Commission of Kenya, 2004).



**Figure 4.4: Changes in Fixed Line Teledensity in 1999-2004.** Source: Communications Commission of Kenya (2004) **Annual Report.** (2003/2004).



Over the same period (1999-2004) mobile capacity increased from 35,000 to 3.9 million. The number of mobile subscribers rose from a mere 15,000 to 2.5 million by June 2004. This was a tremendous growth in spite of the late introduction of mobile services in the Kenyan market, (Communications Commission of Kenya, 2004).

#### **4.5.2. Fixed Telephony Performance**

The growth of the fixed telephone network during the year 2003/2004 was well below targets set forth in Telkom Kenya's licenses. For instance, between 2002/2003 and 2003/2004 the switching capacity of fixed network increased from 508,230 to 531, 442, whereas the subscriber connection went down by 29,133 to stand at 299,225 as at 30<sup>th</sup> June 2004, (Communications Commission of Kenya, 2004).

The study findings reveal that the poor performance of Telkom's fixed network has largely been attributed to low investment due to the delay in its privatisation. The privatisation process was expected to be complete by June 2005 but it is still on going. Telkom's privatisation was one of the conditions attached to a credit extended to the Kenya government by the World Bank. The conditions of the credit required the borrower to take all measures under its control to offer for sale 49 per cent of Telkom shares to pre-qualified bidders through an objective, transparent and competitive tender. Privatisation of the company collapsed after a stop and go affair that lasted for two years and which was characterised by intrigues by forces reluctant to let go the control of what is widely regarded as a milch cow for the country's political elite, (Kisero, 2002).

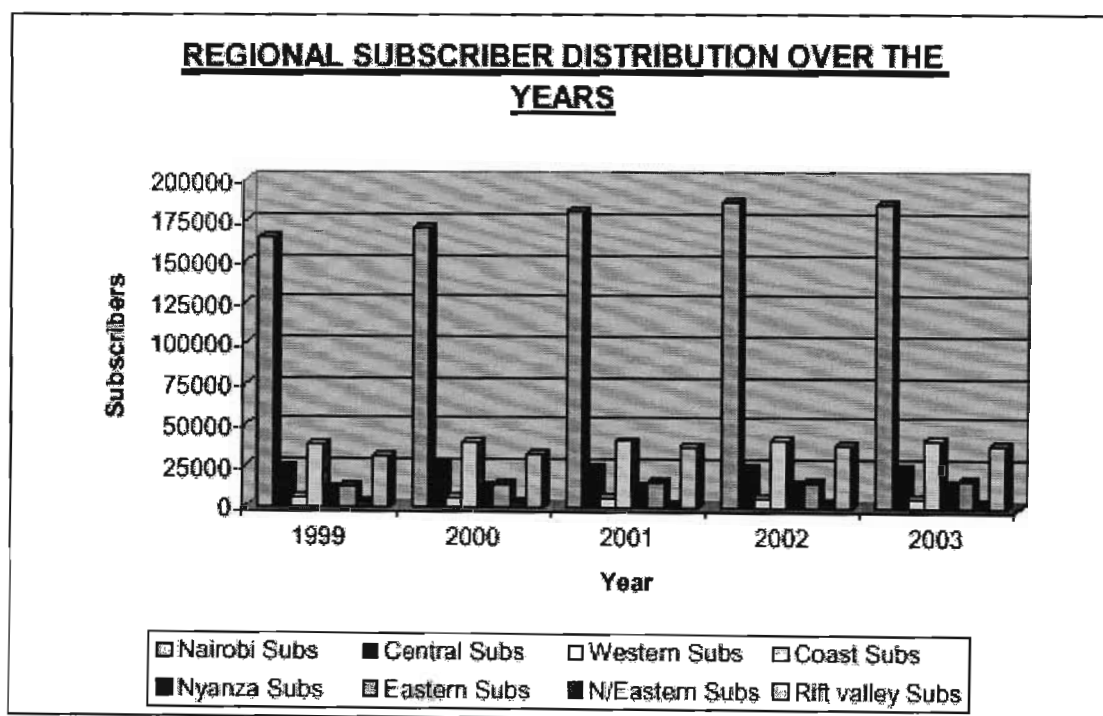
In spite of the growth in the exchange capacity and the reduction in the number of people waiting to be connected to the fixed network, Telkom has to date failed to meet its minimum targets. The CCK, in consultation with the government, is taking corrective measures to address this situation, (Communications Commission of Kenya, 2004).

The fixed line network has been the primary foundation on which all other service platforms have evolved. Mobile operators interconnect to the fixed line networks while Internet services run over fixed and to a limited extent on mobile networks. With the increase in Internet usage there is growing demand by consumers for broadband, to

deliver integrated voice, video and data services. It is expected that this demand will result in lucrative business for fixed line network operators, ([www.cck.go.ke](http://www.cck.go.ke)).

### 4.5.3. Subscriber Distribution

As shown in figure 4.5, the availability of fixed telephone services has continued to be based largely in urban areas, with Nairobi having the highest teledensity. 56% of the total subscribers in the country are in Nairobi while the remaining 44% are distributed in the rest of the country. Of this 44%, Coast and Rift Valley provinces account for 12% and 11% respectively while the remaining provinces share 21%. It is therefore evident that in the larger part of the country, telecommunication services have continued to be inadequate, and thus the need for more incentives to attract investment to address the communications needs in these areas, (Communications Commission of Kenya, 2004).



**Figure 4.5: Regional Subscriber Distribution from 1999-2003.** Source: Communications Commission of Kenya (2004) **Annual Report**. (2003/2004).

## **4.6. Telkom Kenya Services**

According to the Network Planning Manager of Telkom Kenya, Mr Olawo, over and above the provision of analog telecommunication lines known as Kenlines, Telkom also offers the following services:

### **4.6.1. Kenstream**

This is a high quality digital leased line service available for a specified monthly rental service regardless of the degree of use. It enables organisations to integrate a wide range of applications with a single access service with sufficient transmission capacity to interconnect Local Area Networks (LAN) and computing systems to create private networks based on high quality leased lines. It is useful for high volume users such as banks, which have intensive communications between their branches, (Olawo, 2003).

An optical fibre cable running through the Kenyan cities of Mombasa and Nairobi to the Ugandan City of Kampala has been added to provide broadband services and multi-media capabilities. In addition, plans are underway to lay a fibre-optic maritime cable along Eastern Africa's seaboard. This cable, that is set to be complete by the end of 2006, will be linked from South Africa to Djibouti and will later connect with the European link. It is expected to lower telecommunications costs by up to 60 per cent besides improving reliability, (Daily Nation, 2005).

Broadband technology offers the possibility of vast quantities of information transfer. The lowest speed connections allow businesses to transfer the equivalent of 150 floppy disks worth of information every day. High-speed connections see almost 10,000 floppy disks worth of information transmitted daily. Data arrives at the required location because every piece of data contains a unique tag identifying its ultimate address. Broadband technology using microwave data links is a suitable solution for banks to use in the provision of e-banking services because it is highly secure, reliable easy to install, and supports interactive services, (Olawo, 2003).

Research reports appear to concur that the total worldwide opportunity for broadband satellite service providers will reach \$ 27 billion by 2008. This demonstrates that the

market needs a cohesive product set that will enable clients, particularly in Africa, to take advantage of the benefits of satellite services, to ensure business efficiency, ([www.uunet.co.ke](http://www.uunet.co.ke)).

#### **4.6.2. Kensat**

Telkom has upgraded major exchanges and availed data services, through Kenstream and VSAT (Very Small Aperture Terminal), to clients. Kensat is a VSAT (Very Small Aperture Terminal) network service with the very best in data communications reliability and security. It extends the existing leased line (Kenstream) and packet switched (Kenpac) services to areas, which would otherwise take a long time to reach with terrestrial-based technologies, (Olawo, 2003).

Most countries in Africa such as Kenya are interconnected through terrestrial links. However, these links do not meet the required bandwidth demanded to deliver enhanced telecommunication services. Consequently, various options such as VSAT have been sought to provide the required capacity, (Njoroge, 2004).

The main Kensat applications include the following: (Olawo, 2003).

- Automatic Teller Machines
- Electronic Mail
- Wide Area Networking (WAN)
- Electronic Point of Sale (EPOS)
- Real time Market Quotation
- Credit Card Verification
- Supervisory Control And Data Acquisition (SCADA)

- Remote Printing
- High Speed Document Transfer (HSDT)
- Videos for marketing and training

#### **4.6.3. Kenpac**

Kenpac is a Wide Area Networking solution using packet switching technology. Typical applications include the following: (Telkom Kenya, 2005).

- Batch processing
- Wide area networking
- Remote data base access
- Automated Teller Machines

#### **4.6.4. Jambonet**

Jambonet is a nation-wide Internet backbone gateway for Internet Service Providers (ISP's) through dedicated digital links. It is offered in increments of 64kbps. Telkom Kenya undertook to build Jambonet to serve Internet service providers (ISPs) in the country who were previously being served through international servers, which are usually based in the US and Europe. Jambonet has since been expanded offering faster and more economical access, (Kimani, 2003).

#### **4.6.5. Safarisat**

This is a mobile handset that provides voice, fax, data, telex and emergency position indicating radio beacon (EPIRB) communication anywhere on the globe 24 hours a day, (Telkom Kenya, 2005).

#### 4.6.6. Internet Facilities and Services

The Internet facilities and services market covers Internet Services Providers (ISPs), National and International Internet Backbone Services and the Internet Exchange Point services (IXPs). The ISP and IXP markets are fully liberalised and licensing is done on a first come first serve basis. By April 2004, there were 70 registered ISPs, 16 of which are active and approximately 1,030,000 users, (Communications Commission of Kenya, 2004).

The study findings show that consumer demand for affordable, convenient and high-speed communication has led to rapid evolution in technology, which has in turn resulted in the blurring of boundaries between voice and data networks, leading to the integration of voice, video and data services, commonly referred to as convergence. VOIP (Voice Over Internet Protocol) is one of the technologies that have accelerated convergence. As a result, most regulators are realigning their regulatory and licensing frameworks to accommodate convergence. Regulatory facilitation of innovative technologies enables ease of deployment of systems and enables delivery of affordable enhanced services to end-users, ([www.cck.go.ke](http://www.cck.go.ke)).

To enable the legal provision of (VOIP) Voice Over Internet Protocol, the Communications Commission of Kenya has been involved in systematic and objective study of international best practises in the provision and regulation of the service. The Commission has also engaged all stakeholders in a public consultation process in the development of requisite commercial, technical and regulatory guidelines for the implementation and provision of VOIP services in Kenya, ([www.cck.go.ke](http://www.cck.go.ke)).

Further, in recognition of ICT trends, the Communications Commission of Kenya unveiled a technology neutral post-exclusivity licensing framework in September 2004. Under this framework operators are expected to be able to utilize any technology to deliver licensed services. It is also expected that the introduction of new technologies will ease the deployment of networks by operators and thus enable wider access to enhanced services at affordable rates, ([www.cck.go.ke](http://www.cck.go.ke)).

Competition has been introduced in various market segments particularly after the end of Telkom Kenya's exclusivity. Based on the post-exclusivity licensing strategy unveiled in September 2004, new entrants have been licensed in previously exclusive market segments; these include 5 Internet Backbone and Gateway operators, 4 Commercial VSAT Hub operators and 9 local loop operators. Significantly, the local loop operators and public data network operators will increase the accessibility of the last mile services for both voice and data services, (Communications Commission of Kenya, 2004).

The Communications Commission of Kenya has included in the licenses of the operators, quality of service targets, which the licensees should meet. The Commission periodically assesses their performance against these targets. The Commission also believes that the introduction of competition will help improve the quality of services delivered in the industry. While full competition is expected to control the quality when it takes root, CCK will still apply the set targets to ensure that the consumer is protected, (Njoroge, 2004).

The study findings reveal that the licensed network operators and service providers have tended to concentrate their operations in the urban and peri-urban areas of the country on the basis of pure business considerations. This trend has undermined the government's objectives in regard to universal access. The private sector has in the recent past began to appreciate that the rural areas are the next growth area for business and are slowly beginning to expand the reach of services to the rural areas. On its part, the Communications Commission of Kenya (CCK) intends to intervene in order to address the disparity in access to ICT services between rural and urban areas, through the universal access strategy, (Communications Commission of Kenya, 2003).

In order to make Internet services more affordable and make e-commerce and e-banking a reality, the Communications Commission of Kenya, in mid-1999 lowered licence and annual operating fees by more than two-thirds for Internet Service Providers in the expectation that this price incentive would be passed down to consumers, (Communications Commission of Kenya, 2004).

According to Mr Kimani, the Systems Administrator at Today's Online, in 2002, after fighting long and hard, the Telecommunications Service Providers of Kenya (TESPOK)

was granted a license by the Communications Commission of Kenya to operate an Internet exchange point. TESPOK is a professional, non-profit organisation representing the interests of ISPs and other telecommunication service providers in Kenya. The new exchange point known as Kenya Internet Exchange Point, (KIXP) allowed Internet Service Providers to exchange the majority of Internet traffic locally for the first time, (Kimani, 2003). An Internet exchange point operates like a clearinghouse, enabling ISPs to exchange local traffic without having to rely on expensive international links, (Daily Nation, 2002).

The aim of KIXP was to enable Internet Service Providers to keep local traffic local thereby assuring their clients of better service, lower costs, ease congestion of international links and widen capacity for local Internet applications. The introduction of the service was expected to cut costs to as much as 80% and was a milestone in the development of Kenya Internet infrastructure. Apart from the Kenyan and South African exchange point, no other African country had hosted an exchange point, (Kimani, 2003).

Before the launch of the service in 2002, efforts by TESPOK to operate the service had proved futile when Communications Commission of Kenya shut down the operation point. As per former regulation all ISPs were forced to use Telkom Kenya's Jambonet national backbone for international connectivity before the exchange point was established. This arrangement meant that traffic between the neighbouring ISPs travelled around the globe before bouncing back to their original destination. No traffic was routed locally as majority of Kenyan Internet traffic between the service providers was routed internationally, mostly to the United States of America. This traffic used up precious international bandwidth, (Kimani, 2003).

#### **4.6.7. Mobile Network Performance**

The study findings show that the Government has liberalized the mobile cellular market and currently, there are two mobile cellular operators, Safaricom and Kencell. Arrangements are underway to licence a third mobile cellular service provider. The two operators currently have a subscriber base of over 2.5 million with a combined network capacity of more than 3.9 million. As shown in figure 4.5, the mobile network is now



seven times the size of the fixed network, (Communications Commission of Kenya, 2004).

By June 2004, Safaricom had 1,627,378 subscribers while Kencell had 918,779. Telkom Kenya has 60% shareholding in Safaricom, while Vodafone UK owns 40%. In terms of roll out, both Safaricom and Kencell have covered all major towns and highways as provided for in the coverage obligations of their licences. However, the unprecedented growth in the mobile networks has not been without some problems such as reduced quality of service due to occasional congestion. The Commission has been working closely with the industry to arrest this situation, (Communications Commission of Kenya, 2004).

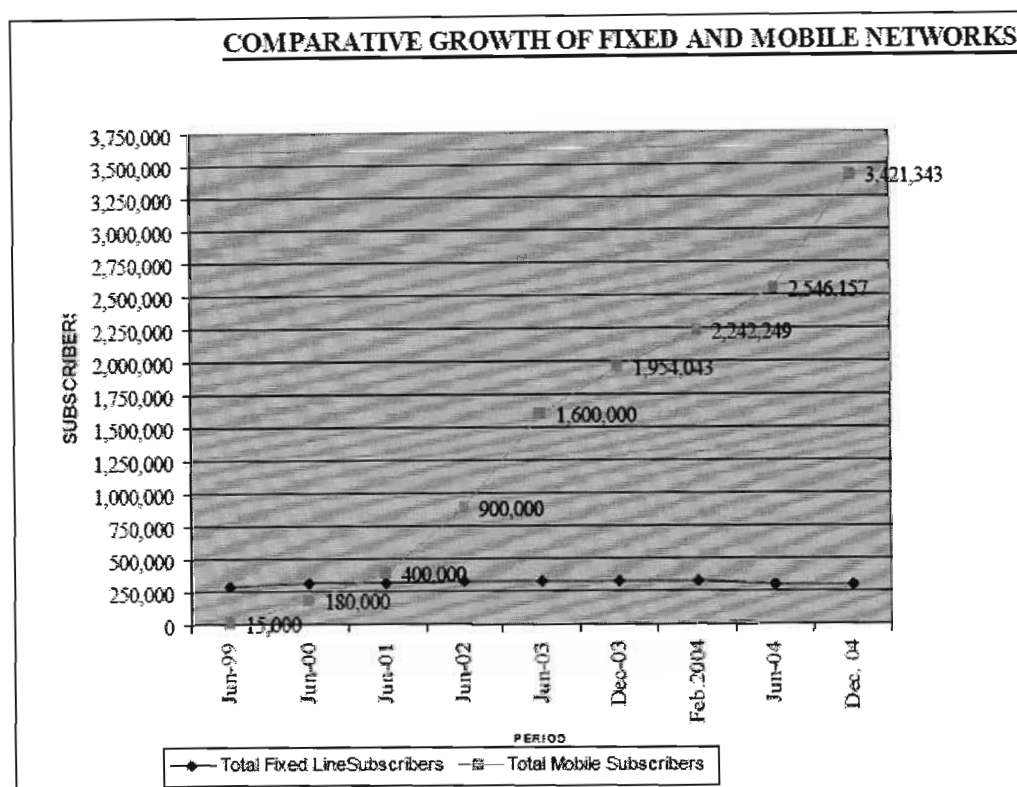
Mobile operators are also deploying technologies that will enable them meet consumer demand for one number, one handset, always on connection delivering enhanced services including Internet services. VOIP (Voice Over Internet Protocol) enables operators meet this demand and the technology is driving convergence between the fixed to mobile networks, allowing telecommunications operators to provide services to users irrespective of their location, access technology, and terminal. Fixed line operators, therefore, need to embrace new and more cost-effective technologies such as VOIP to gain competitive advantage over mobile networks, ([www.cck.go.ke](http://www.cck.go.ke)).

The study findings reveal that in 2004, Thuraya Satellite Telecommunications Company officially launched their services in Kenya. As a regional mobile satellite operator, Thuraya which is based in the United Arab Emirates aims to become a close partner to service providers within its coverage area by integrating its network capabilities and expertise to their existing infrastructures. The company plans to complement, rather than compete with, national operators, boosting their ability to extend the reach of their telecom services, ([www.thuraya.com](http://www.thuraya.com)).

Thuraya provides cost-effective satellite-based communication solutions in urban centres, as well as remote areas and villages and seas beyond terrestrial telecom networks. It offers mobile and fixed telephony, rural telephony solutions in remote areas, maritime communications, fleet management and vehicle tracking, and satellite Internet services across a vast footprint of more than 120 countries, ([www.thuraya.com](http://www.thuraya.com)).

#### 4.6.8. Other Market Segments

The industry witnessed a steady growth in the various markets, (Appendix V). For instance Value Added Services (VAS) provision such as Electronic Data Interchange; saw a tremendous increase from three to seventeen. Some of the reasons cited for the growth include ease of entry, minimal regulatory intervention and low start-up capital, (Communications Commission of Kenya, 2004).



**Figure 4.6: Comparative Growth of Fixed and Mobile Networks** Source: Communications Commission of Kenya (2004) Annual Report. (2003/2004).

#### 4.7. Security of E-banking and ICT Systems

This section addresses the risks posed to e-banking and ICT systems in order to determine whether the existing security measures in place are capable of preventing these risks. The major risks associated with e-banking and ICT systems in Kenya are classified into 5 overlapping categories namely, security, technology, operational, legal and reputation risks, (Central Bank of Kenya, 2004b). The problems that fall under these categories include, vandalism of landlines, dumping of contraband traffic on Telkoms network and

cyber crime. In addition people distrust cheque payments due to lack of meaningful legal penalties against cheques not honoured due to lack of funds. These problems are discussed further on in this chapter.

One of the key driving forces in the banking industry today is the effective implementation and deployment of technology solutions that facilitate the safe, secure and uninterrupted transmission of data between a bank and its client base, (Messer, 2004). Security risks may arise from denial of service attacks where hackers deprive users of computer network services, such as email, to which they would normally expect to have access, (Monetary Authority of Singapore, 2003). A hacker is a person, who tries to break into computer systems illegally, (Lawrence *et al.*, 2002).

Security risks may also arise when legitimate user authorisation is misrepresented through a variety of techniques known as spoofing and sniffing. Spoofing is impersonating a legitimate client through use of his/her account number, password, personal identification number (PIN) or email address. A sniffer is a device that is capable of eavesdropping on telecommunications traffic, capturing passwords and data in transit. Mutating virus and worms are other malicious or fraudulent acts that pose heightened security risk levels which banks would have rarely encountered in the past, (Basel Committee on Banking Supervision, 2003b). Banks moving towards e-banking are also exposed to security risks such as cyber crime, (Kitau, 2005).

Technology risks relate to any damage, loss, disruption, violation, irregularity or failure arising from the use of or reliance on computer hardware, software, electronic devices, online networks and telecommunications systems. These risks may also be associated with system failures, processing errors; software defects, operating mistakes, hardware breakdowns, capacity inadequacies, network vulnerabilities and control weaknesses, (Monetary Authority of Singapore, 2003). The integration of e-banking applications with legacy systems also poses technology risks for banking institutions. Legacy systems are company databases that often have been developed in third generation languages such as COBOL, (Lawrence *et al.*, 2002).

Operational risks refer to the current or prospective risks to earnings and capital arising from failures in transactions with clients or counter parties, ineffective decision making,

and inadequate, insufficient human resources in banking institutions, (Central Bank of Kenya, 2004b).

Legal and reputation risks relate to failure by banking institutions to ensure privacy of client data and comfort regarding client information disclosure. These risk also refer to lack of a banks capacity to ensure availability of e-banking systems and services, business continuity and contingency planning, (Basel Committee on Banking Supervision, 2003b). It is imperative that banks implement sound security measures that can adequately address and control all the five categories of risks, (Basel Committee on Banking Supervision, 2003b).

In an attempt to curb the problem of insecurity of e-banking systems, the Central Bank of Kenya has initiated the National Payment System (NPS) project. This project seeks to bring together all the systems, mechanisms, institutions, agreement procedures, rules and laws that enable the exchange of value, both in cash and non-cash terms. The benefits that are expected to accrue from this project include; the reduction of risk arising from payment exposure for both the public and banks, safe and efficient means of exchanging value between transacting parties, privacy of all transactions and promotion of Kenya as an international market and regional financial centre. The project also seeks to ensure a high degree of security and operational reliability and that banks have contingency arrangements for timely completion of daily processing, (Central Bank of Kenya, 2004a).

In addition, one of the key objectives of the Central Bank of Kenya is to fully adopt the Principles for Effective Banking Supervision as spelt out by the Basel Committee. The rationale for this objective is drawn from Central Bank of Kenya's appreciation of a number of global developments in the banking environment. Advancement in technology, telecommunications and markets have changed the way banks collect, measure and manage their risks, leading to the use, by banks, of increasingly sophisticated approaches in their assessment of various risks, (Central Bank of Kenya, 2004b). The impact of the risks can be measured in terms of damaging value or level of confidence in the financial systems. To ensure a smooth and reliable financial system it is important to identify measure, contain and manage these risks, (Central Bank of Kenya, 2004a).

In order to identify the needs of the local banking sector with regards to risk management, the Central Bank of Kenya conducted a survey in September 2004 that would provide a status position on the extent to which risk management is practised in the financial institutions operating in Kenya. The survey revealed that there is a high level of awareness in banking institutions on the importance of employing systematic methods of identifying, analysing, controlling and mitigating risks. However, few institutions have committed resources to build capacity on risk management, generate effective reports, apply risk management tools, and ensure independent review of their risk management functions. There have been inadequate efforts made to manage risks, especially security and technology risks in banking institutions, (Central Bank of Kenya, 2004b).

The survey on risk management practises in banks explored the extent to which banking institutions in Kenya have adapted to the demands for new approaches to managing banking business that lay emphasis on risk identification, measurement, monitoring, and control/mitigation. The survey covered the following aspects: (Central Bank of Kenya, 2004b).

- Existence of clearly defined risk management guidelines
- Spectrum of risk categories covered
- Type of risk management structures adopted
- Risk management systems employed
- Nature of independent review of risk management activities conducted
- Size of budgetary allocations to risk management functions

Forty-one out of Kenya's forty-eight banks (85%) responded to the questionnaire sent out by the Central Bank of Kenya. The responses highlighted a number of gaps that demonstrate the need for enhancing risk management in financial institutions. These include: (Central Bank of Kenya, 2004b).

- Inadequate risk management policies and procedures
- Not all institutions have functions and personnel dedicated for risk management
- Several institutions have not developed their own risk management reports and are relying only on Central Bank of Kenya prudential returns to monitor risks
- Besides contingency planning, the other risk management tools are not commonly applied
- Not all institutions utilise independent review of their risk management functions
- A number of institutions have not set aside specific budgetary allocations to fund risk management activities

In response to the need for a stronger risk management regime among financial institutions in Kenya, the Central Bank of Kenya will, in 2006, change its supervisory approach from the traditional methods to Risk Based Supervision, which places strong emphasis on understanding and assessing the adequacy of each bank's risk management systems in place to identify, measure, monitor and control risk in an appropriate and timely manner, (Central Bank of Kenya, 2004b).

#### **4.8. Policy and Regulatory Framework**

This section examines the extent to which the existing policy and regulatory framework in Kenya governs e-banking and ICT services. The study findings show that there is no law that explicitly and exclusively deals with financial systems in Kenya. However, in its current form, the Central Bank of Kenya (CBK) Act, as amended in 1996, gives the Bank powers to oversee and regulate the financial systems. The Banking Act and Central Bank of Kenya (CBK) Act (1996), governs banking business and the conditions in which banks operate in Kenya. Other legislation includes Bills of Exchange Act (1882) Companies Act, Building Societies Act and Cheques Act (1957), among others. Laws relating to the use of cheques are derived from the English law mainly the Cheques Act and the Bills of Exchange Act, (Central Bank of Kenya, 2004a).

The Minister for finance announced measures in the financial year 2003/2004 Budget Speech to help consolidate progress made in modernisation of the country's National Payments System, including amendment of the CBK Act to give the Central Bank oversight powers over the NPS and enactment of both the NPS Act and Electronic Funds Transfer (EFT) Act. According to a report on National Payment Systems in Kenya prepared by the CBK in September 2003, the bank is working together with the Kenya Bankers Association to develop an explicit legal framework as an NPS Act. The legislation is expected to come into place in tandem with the law governing information and communications technology. Currently, Kenya also lacks an ICT policy, (Market Intelligence, 2004).

The Central Bank of Kenya, (CBK) has continued to co-operate with member Central Banks of East African Community (EAC) to harmonize the payment system practices. The CBK is also in consultation with other stakeholders participating in the introduction of an Electronic Transactions Law to cover e-banking, e-commerce, and e-signatures among other products. The Bills of Exchange Act was also amended in 1999 to allow for the electronic presentation of data for clearing purposes. An Electronic Funds Transfer (EFT) bill has also been drafted and is awaiting presentation to the Attorney General's Chambers. The bill is intended to provide a basic framework establishing the rights, liabilities and responsibilities of participation in electronic funds transfer systems, including ATMs and pre-authorized Credit/Debit transfers. The government has also adopted the UNCITRAL Model Law on e-commerce and e-Systems; ICT Act 2003 draft is under discussion by the major stakeholders, (Central Bank of Kenya, 2003).

There have been numerous amendments to the Banking Act and the CBK Act to deal with issues of insider borrowing, capital adequacy, interest rate regulation, licensing requirements, among other issues. Both Acts have been reviewed from time to time. Amendments are normal and inevitable in order to keep pace with the changes in policy, technology and international best practise. Every year, parts of both Acts are either amended, or new ones introduced or some parts revoked altogether. This is a continuous process, and it does not imply the existence of fundamental problems in the banking sector, (Mulei, 2004).

In regards to ICT infrastructure the research findings show that Kenya lacks an ICT policy and regulatory framework. However, the Government has realised the importance of ICT and is currently coming up with an ICT National Policy that will ensure that the ICT sector integrates most spheres of the countries socio-economic life. Currently, ICT issues are considered under various legislation including The Science and Technology Act of 1990, the Kenya Broadcasting Act of 1990 and the Kenya Communications Act of 1998, which are inadequate in dealing with emerging issues such as liberalisation of e-commerce, e-banking and e-government and risks associated with Kenya's Payment Systems, (Ministry of Information and Communication, 2004).

Kenya's communications market began full liberalisation in 1999, when policy and regulatory functions were de-linked from mainstream operation. As a result, the Communications Commission of Kenya (CCK), an independent regulatory authority, and the National Communications Secretariat (NCS), a policy advisory arm, were created, (Communications Commission of Kenya, 2004).

The Communications Commission of Kenya (CCK) is responsible for developing and co-ordinating the policies and strategies with respect to development and operation of telecommunications services in Kenya. In this regard, the Commission licenses telecommunications operators and service providers, and monitors their performance on a continuous basis to ensure that they discharge the obligations as stipulated in their licenses, and in keeping with the provisions of the Kenya Communications Act 1998 and the Kenya Communications Regulations 2001, (Njoroge, 2004).

#### **4.9. Impact of ICT Infrastructure on E-banking**

The study findings reveal that Kenya's ICT and e-banking sectors are faced by numerous problems such as lack of the appropriate equipment to serve a modern financial system and provide the full range of e-banking services, inadequate telephone landlines, lack of reliable Internet connections, high access costs for landlines and Internet. It also reveals that there is inadequate capital for the provision of ICT services, dumping of contraband traffic, cyber crime, and lack of a suitable policy and regulatory framework for e-banking and ICT services.



#### **4.9.1. Lack of Appropriate Equipment for E-Banking**

The study findings reveal that some banks in Kenya lack appropriate equipment to serve a modern financial system and provide the full range of e-banking services. Other problems related to the lack of appropriate equipment by banks include inability to properly harmonise technical IT standards and protocols, improper linkages between the various payment and settlement systems, open access to the systems. The shortage of funds is the main difficulty in modernizing the financial system and enhancing e-banking services at many banks especially the local banks and more so the indigenous banks, (Central Bank of Kenya, 2004b).

Lack of proper ICT equipment in the banks has also led to a negative impact on the banking industry. For instance, prior to acquiring a VSAT licence in 2003, Barclays Kenya was unable to provide many of the e-banking services, such as the Debit Card, due to the unreliability of terrestrial lines currently in place in Kenya. The Bank also experienced a collapse of its electronic Credit Card system making it impossible for it to transfer funds from cardholder's accounts to merchants account for a whole month. Barclays Bank ATM's were also unreliable and the Bank was unable to offer smoother cross-border transactions, (Kathuri, 2004).

Further, one of the most important technology solutions that banks such as Barclays use is the Credit Reference Bureau provided by CRBAfrica Ltd. This is a multi-national organisation that compiles and distributes credit information. It uses the power of information via a financial database to assist its clients, for example banks, credit card companies, financial institutions and commercial enterprises, in making accurate and responsible decisions when companies or individuals apply for cash or goods and services on credit. It also helps creditors guard against fraud, which is a growing and serious problem that ultimately affects all consumers, (Credit Reference Bureau Ltd, 2005).

High-speed access to this database allows banks to make sound financial decisions and minimise bad debts. Many banks in Kenya are faced with the problem of non-performing loans that they have to write off as bad debts yet few of them are registered with the Credit Reference Bureau because they lack a high-speed connection and access to this database, (Messer, 2004).

#### 4.9.2. Inadequate Telephone Landlines

An inadequate number of telephone landlines results in heavy congestion and periodic disruptions. The failure rate of Kenyan telephone lines while mostly due to poor maintenance and lack of network expansion on the part of Telkom Kenya is exacerbated by widespread and wanton vandalism of telephone cable wire, (Kibathi, 1999). Telkom Kenya's failure to expand its network has also been largely attributed to low investment due to the delay in its privatisation, (Kisero, 2002). However, arrangements are underway to licence a second national operator so as to increase the number of telephone lines and improve the quality of service, (Njoroge, 2004).

Vandalism has impacted negatively on service delivery and businesses and individuals also suffer from frequent lack of communication, (Richardson, 2005) Telkom Kenya lost a colossal 400 million shillings (5 million US\$) in 2004 after vandals stole a load of copper wire. Thieves looking to make some money have been ripping out Telkom's copper cables from overhead and underground lines and it is costing the business a fortune. In an attempt to curb the problem of cable theft, Telkom Kenya is taking the following measures:

- Appealing to the government to ban the trading of copper
- Proposing for the cancellation of licenses for scrap metal dealers found with vandalised telephone cables
- Consulting with relevant ministries to ensure that their appeals are given priority, (Richardson, 2005).

The challenge faced by banks is that the fixed line teledensity of 1.02% in Kenya is currently very low. There are currently slightly fewer than 400,000 fixed lines for 30 million Kenyans. This situation limits the provision of some e-banking services such as telephone banking, which allows clients access to their accounts 24 hours a day. It is important for the necessary ICT infrastructure to be put in place so as to enable e-banking services to be provided efficiently in Kenya, (Ngugi, 2003).

The officials interviewed from all the commercial banks all concurred that there are severe delays at Telkom Kenya when it comes to installation of telephone lines in their premises and this is also major problem. Once the banks have applied for telephone lines it can take as long as one year before Telkom Kenya installs them. On many occasions these telephone lines also get disconnected due to technical problems. Further, due to the problems faced in the ICT sector, Kenyan telecommunications are below world standards in terms of service quality, (Telecommunication Service Providers Association, 2004).

Another problem related to the installation of telephone cables in Kenya is that some of the buildings in the outskirts of the central business district are built on top of underground telecommunication cables installed by Telkom Kenya. This means that if there is a problem with the cables, Telkom engineers cannot rectify them since the cables are buried under buildings, (Olawo, 2003). Underground cable ducts are also susceptible to clogging during periods of heavy rainfall, (Kimani, 2004). ICT services in such areas therefore remain underdeveloped, (Olawo, 2003). In some instances landlines also become damaged. This damage is probably due to wear, weathering, age and as a result of inadvertently being cut by construction and agricultural workers, (Telecommunication Service Providers Association, 2004).

Inadequate telephone lines in Kenya can also be attributed to the lengthy procedures adopted by Telkom. Telkom being a government entity abides by government regulations and procedures. Some of these procedures can be very lengthy and bureaucratic leading to delays in procurement of ICT equipment and installation of ICT services such as telephone lines. These delays contribute to the poor ICT infrastructure because they prohibit the provision of ICT services in an efficient and speedy manner, (Olawo, 2003).

#### **4.9.3. Lack of Reliable Internet Connection**

Due to regulatory limitations, access to the Internet by the ordinary users is mainly via telephone lines and these can be highly unreliable. Most organizations rely on telecommunications to conduct business. Without a telephone line and access to reliable Internet connection and email, one is certainly not ready to compete in today's global

village. Most of these lines are in the capital city Nairobi. However, a number of organizations in the central business district and majority of businesses outside the city are not able to obtain a reliable, dedicated Internet connection vital for their communication needs due to lack of telephone lines, (Telecommunication Service Providers Association, 2004). There are currently cheaper and faster ways of connecting to the Internet such as use of wireless radio and Very Small Aperture Terminal (VSAT) technology but these require regulatory approval by the Communications Commission of Kenya, (Kimani, 2004).

Unreliable Internet connection in Kenya can also be attributed to Jambonet, the nationwide Internet backbone gateway for Internet Service Providers, which has had its share of problems, (Kimani, 2004). Initially when the gateway was installed in Kenya, the training provided to staff supporting the system was very elementary and they took time to master the system because the installers left the country immediately after the installation was completed. This led to delays in rectifying any problems that arose within the gateway. Further, other ICT providers such as ISPs often poach Jambonet staff, who have been trained and have mastered the system. Jambonet is therefore forced to hire new staff that are not very familiar with the system, leading to delays in rectifying any problems that arise and ultimately longer Internet downtime periods, (Olawo, 2003).

ISPs in Kenya have been complaining that Telkom services are slow and inefficient, (Kimani, 2004). However according to Telkom Kenya's Network Planning manager, Mr Olawo, (2003), Telkom services are efficient and adequate enough to serve the ICT market and the ISPs are to blame for requesting for inadequate bandwidths that are not good enough for their clients. The ISPs do this so as to make higher profits and this leads to connectivity problems because too many clients are competing for inadequate bandwidth provided by the ISPs, (Olawo, 2003).

#### **4.9.4. High Access Costs for Landlines and Internet**

High Internet access costs due to the high cost of local telephone calls and lack of telephone capacity in most parts of Kenya are yet other problems faced by the banking and ICT sectors. This leads to low level of Internet access. From its early beginning in 1994 to date, the level of Internet access in Kenya is still very low compared to other

countries such as South Africa, Malaysia and Australia. According to a Citibank/ACNielsen survey, 86 per cent of Australians had used Internet banking at least once by 2003. This gives Australia the second-highest usage of Internet banking in the Asia-Pacific region, behind South Korea, (Derkley, 2003). However the number of Kenyans who have used Internet banking is negligible. By 2004 Internet users in Kenya was a paltry 1% with approximately 900,000 users, (Telecommunication Service Providers Association, 2004).

The majority of users in Kenya access the Internet through cyber cafes and via their places of employment. By 2004, there were over 200 cyber cafes in Kenya and 30,000 dial-up subscribers to the Internet and this number has been stagnant since 2002. The reason for this stagnation is lack of telephone capacity in towns outside the city, most residential areas and some parts of the central business district, (Kimani, 2004).

Another reason for the high Internet access costs is the high cost of satellite infrastructure in the Kenyan market. First, the regulatory environment with regard to the cost of equipment for satellite infrastructure is not conducive. Importation and shipping costs are prohibitive. Import duty and other tax penalties are quite high, causing a lot of concern. The other issue relates to the low level of services support. There are few local companies offering the technical support required to implement and maintain satellite infrastructure. As such, the associated costs are high owing to the limited choice range even in the case of poor service, ([www.uunet.co.ke](http://www.uunet.co.ke)).

#### **4.9.5. Inadequate Capital Investment for ICT Services**

Lack of enough capital to purchase ICT equipment and provide services efficiently and quickly to clients is also a major challenge for Telkom Kenya. This problem has been attributed to the over reliance by Telkom on World Bank funding to develop its network. However, due to poor governance in Kenya this funding is sometimes suspended. Most of Telkom's planned projects have therefore been left unfinished while the demand for ICT services continues to rise, (Olawo, 2003).

#### **4.9.6. Dumping of Contraband Traffic**

Security measures can no longer be ignored in the development and implementation of information technology solutions. According to PKF consulting, the audit firm appointed by the Kenya government to advise on how to restructure Telkom Kenya, an internal investigation has revealed that criminals working in collusion with insiders have been dumping hundreds of millions of shillings' worth of international contraband traffic on Telkom's network. This has seriously affected Telkom's financial situation because the company has been charged for interconnect fees by operators from Europe, USA and Asia on traffic from which it had not earned any revenue. Dumping of contraband traffic is a highly lucrative business. Criminals make huge profits by installing illegal telephone exchanges that allow them to terminate international traffic into the country without having to pay interconnection charges, (PKF Consulting, 2005).

The organised crime syndicates direct the traffic into Kenya by colluding with insiders working at Telkom's international exchanges to gain access to international and local links, allowing them to dump traffic within Telkom's network without being billed. The technology of choice for the criminals is the Very Small Aperture Terminals (VSAT). The criminals interface fixed wireless terminals with Internet leased lines routed into Telkom Kenya's network, (PKF Consulting, 2005).

When the financial impact of this fraudulent activity on Telkom's finances was calculated, the investigation discovered that Telkom is presently paying interconnect fees at approximately Ksh 51 million (\$690,000) per month on contraband traffic for which revenue had not been received. What this means is that criminals have discovered a way of terminating international traffic in the country, clandestinely dumping it onto the Telkom network and leaving it to Telkom to pay the interconnect charges and fees, (PKF Consulting, 2005).

Telkom can save up to Ksh 1.2 billion (\$16.2 million) per year, if it were to systematically conduct audits and prevent these leakages throughout its infrastructure. Progress in dealing with the problem will depend on Telkom's ability to monitor and track operations of firms with excessive digital lines, and clients whose monthly bills exhibit a tendency to experience sudden upsurges, (PKF Consulting, 2005).



#### 4.9.7. Cyber Crime

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The problem of security and integrity from the PC or telephone to the banking system has also become paramount, as more people want to use the Internet for secure transactions. A major problem currently facing Kenyan banks and firms is cyber crime, (Mekonnen, 2005). Cyber crime was comprehensively defined in 1979 by the US Department of Justice. The issue was discussed again during the World Summit on the Information Society thematic meeting held in Geneva in July 2005. During this meeting, cyber crime was defined as illegal access, illegal interception, data interference, system interference, misuse of devices, Internet forgery and Internet fraud, (Kitau, 2005).

South African business people are weary of purchasing goods from countries such as Kenya through the Internet due to rise in cyber crime; Kenya has no legislation on cyber crime compared to South Africa. This means that cyber crime is against the law in South Africa but there is no law against it in Kenya. This is dangerous because it portrays Kenya as an ideal country for computer hackers to begin their criminal careers. The Kenyan Government needs to do some damage control because with reports like this one from South Africa, it will become increasingly difficult for investors and entrepreneurs based in Kenya to be trusted. This will impact negatively on e-banking, employment, Government revenues and overall economic development of the country, (Kitau, 2005).

In Kenya, cases of fraud remain a major threat for most financial institutions. Banks moving towards e-banking are exposed to the risk of fraud through data hacking. Data hacking is gaining unauthorised access to data on a computer system. As more banks turn to ICT to support their objectives, the threat of data loss that could result from a virus attack is also very serious. This makes data security an integral aspect of IT solutions. Most software packages and hardware on the market are one-size-fits-all solutions designed to work in any bank. However, security specialists predict that these products leave open many avenues of attack and threat. This then compels banks to go for customised security solutions that are certainly more effective but also more expensive, (Daily Nation, 2002).

Another option is for a bank is to outsource the management of its computer security. While this may pose a new security threat altogether, some of the factors one would have

to consider before outsourcing include the vendor and the nature of contract awarded him. Espionage is another security threat faced by Kenyan banks. This may happen when an unauthorised person walks out of a bank with a disk containing vital information. A little initiative by computer users such as changing passwords regularly would go a long way in minimising this type of security risks, (Daily Nation, 2002).

It is unfortunate that some security challenges in Kenyan banks include top management's ignorance of both threats and solutions. This situation has inspired ISP's and computer companies to roll out security solutions in an attempt to guarantee secure browsing, (Kimani, 2004). In 2002 Africa Online, an ISP based in Kenya, launched antivirus software embedded in its e-mail server. UUNET, another ISP, launched its UUSecure service, which conceals a bank's internal network and protects internal resources from attack. UUSecure includes firewalls, virus scanning, content screening and intrusion detection and is targeted at corporate users. Most of the security solutions in the market target viruses estimated to have cost Kenya approximately Ksh 3.5 billion (US \$ 48,000,000) in terms of loss of productivity and material damage, (Daily Nation, 2002).

#### **4.9.8. Lack of a Suitable Policy and Regulatory Framework**

The major problem with the policy and regulatory framework is that Kenya lacks an ICT policy and there is also no law that explicitly and exclusively deals with e-banking. In coming up with an adequate e-banking and ICT policy framework, the following challenges will have to be addressed by the Kenya Government:(Ministry of Information and Communication, 2004).

- Developing an appropriate mechanism for ICT policy formulation coordination and implementation
- Dealing with issues of confidentiality of transactions, privacy, security, cyber crimes, ethical and moral conduct, encryption, digital signatures, copyrights, intellectual property rights and piracy
- Participating in regional and global governance of ICT, and promoting more efficient broad based participation in international forums on ICT policy formulation



#### **4.10. Concluding Remarks**

This chapter has presented and analysed the study findings on the basis of the feedback given by management and technical personnel at Barclays Bank of Kenya, Central Bank of Kenya, Telkom Kenya, Communications Commission of Kenya and Today's Online. In addition an analysis of the data collected from four other top commercial banks, namely, Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa was done. Sources from the library, archival records, the Internet and documents provided by all the organisations interviewed were also analysed.

The next chapter will discuss the results and findings of the study and draw conclusions from the findings. Recommendations for improvement and for further research will also be discussed.

## **Chapter Five: Discussions, Conclusions and Recommendations**

This chapter will endeavour to provide a summary of all the important elements in this study, discuss the findings of the study and provide an interpretation of the findings by comparing them with previous studies presented in the literature review. Conclusions will then be drawn from these findings and recommendations provided. The framework of this chapter will therefore include introduction, summary, discussion, conclusions and recommendations.

### **5.1. Summary**

The title of this study is “The impact of ICT infrastructure on e-banking in Kenya.” As indicated by the title, the purpose of this study was to explore the extent to which the existing ICT infrastructure in Kenya affects the provision of e-banking services. The research questions as outlined in chapter one were:

- To what extent do Kenyan banks offer e-banking services?
- How does the existing ICT infrastructure system affect the provision of e-banking services in Kenya?
- Are the existing security systems for ICT and e-banking capable of preventing theft and fraud?
- To what extent does the Policy and Regulatory framework in Kenya govern e-banking services?

Chapter two covered the literature review, which was based on work and studies done by other scholars and researchers in this discipline and in related fields. The literature review provided adequate knowledge of the research topic and issues arising from the research questions.

A qualitative research methodology was adopted for this study. This was described in detail in chapter three. Barclays Bank of Kenya (BBK), which is one of the leading banks in Kenya with the largest ATM network of 82 ATMs, was examined as a typical case

study. In addition, in order to get a clearer understanding of the ICT and e-banking systems in Kenya, the activities of key industry players, Telkom Kenya, Communications Commission of Kenya, Today's Online, and Central Bank of Kenya, were also critically examined. A further analysis of the data collected from four other top commercial banks which compete with Barclays, was done. These banks are Standard Chartered, Citibank, Kenya Commercial Bank and Commercial Bank of Africa.

The methods used for data collection were desk research and field research. Desk research involved literature review and content analysis. This was carried out through the collection and analysis of primary and secondary data on the discipline and other related fields, using sources from the library, archival records, the Internet and documents provided by the organisations that were studied.

Field research included face-to-face in-depth interviews with management and technology personnel at the organisations studied. Open-ended semi-structured questions were used to administer the interviews. In order to ensure that the interpretations of the data collected were both reliable and valid, the results obtained from primary and secondary sources were balanced with those obtained from the interviews. Validity was ensured by fully addressing the research questions and objectives the researcher had defined. Reliability entailed being consistent and ensuring that other researchers could use the research design to obtain similar results if they were to replicate this study using other Kenyan Banks, (White, 2000).

Chapter four presented the study findings in the form of analytical descriptions, figures and tables. The study findings reveal that Kenya's e-banking and ICT sectors are faced by numerous problems such as lack of appropriate equipment to serve a modern financial system and provide the full range of e-banking services, inadequate telephone landlines due to vandalism, lack of a reliable Internet connection, high access costs for landlines and Internet. In addition, there is inadequate capital for the provision of ICT services, dumping of contraband traffic, cyber crime, and lack of a suitable policy and regulatory framework for e-banking and ICT, (Telecommunication Service Providers Association, 2004).

In Kenya, the major risks associated with the financial systems are categorised as security, technology, operational, legal and reputation risks, (Central Bank of Kenya, 2004a). In order to curb these risks effectively, one of the key objectives of the Central Bank of Kenya is to fully adopt the Principles for Effective Banking Supervision as spelt out by the Basel Committee, (Central Bank of Kenya, 2004b).

The study findings also show that there is no law that explicitly and exclusively deals with financial systems in Kenya. However, the Central Bank is in consultation with other stakeholders is participating in the introduction of an Electronic Transactions Law to cover e-banking, e-commerce, and e-signatures among other products, (Central Bank of Kenya, 2004a).

Kenya also lacks an ICT policy framework. However, the Government has realised the importance of ICT and is currently coming up with an ICT National Policy that will ensure that the ICT sector integrates most spheres of the countries socio-economic life, (Ministry of Information and Communication, 2004).

## **5.2. Discussions**

### **5.2.1. E-Banking Services Provided by Kenyan Banks**

The study findings show that currently all the 46 commercial banks provide most forms of e-banking services. The proliferation of computer applications and Information Communication Technology within Kenya's financial system has resulted in enhanced paper-based payments correspondingly evolving into electronic forms. These different forms of e-banking include PC banking, telephone banking, mobile banking, EFT, (Electronic Funds Transfer), ATM, (Automated Teller Machines), EFTPOS, (Electronic Funds Transfer at Point of Sale) and SWIFT, (Society for Worldwide Interbank Financial Telecommunication), (Central Bank of Kenya, 2004a).

The crucial thing is that these Kenyan banks are not just substituting the service delivery process with technology and replacing people; they are adopting completely new business models since the success of any new service is derived from strategy, (Mathewman, 2004). The business model, which refers to the exact means by which banks make money,

has been undergoing dramatic shifts in response to a changing technology and regulatory environment, (The Standard, 2005).

However the key problems faced by Kenyan banks in the provision of these e-banking services are, lack the appropriate equipment to serve a modern financial system and provide the full range of e-banking services due to shortage of funds, poor state of the existing ICT infrastructure, lack of proper e-banking security systems and lack of a sound policy and regulatory framework for e-banking and ICT. (Central Bank of Kenya, 2004a) The officials interviewed from the five commercial banks, including Barclays Bank all indicated that the researcher had identified the problems faced by banks in the provision of e-banking services and that the research was on the right track.

Despite these problems, Kenyan banks have come a long way in terms of e-banking. In the past, sophisticated financial services and banking networks, ranging from SWIFT coverage to Internet consumer banking, seemed incomprehensible to most Kenyans. Many people, unfamiliar with the realities of the day, still imagined primitive, creaking banking systems. These clichés, however, are no longer accurate. Overall, analysts are convinced that Kenya is poised for high growth in electronic banking and the country is capable of emerging as just the place for new generation financial infrastructure. Even as the bigger multinational banks like Barclays Bank are adopting technologies from their mother companies, the smaller indigenous ones are not to be left behind, (Ngugi, 2003).

The study findings show that there are clear signs that the payment system in Kenya is ready for consolidation. In recognition of the pivotal role of an efficient payment system, the Central Bank of Kenya, working in collaboration with the Kenya Bankers Association (KBA) is in the process of modernising the National Payments System. This is exemplified by the full automation of the Clearing House and the introduction of the Real Time Gross System (RTGS). This modernisation will enhance effectiveness, security and reliability of the settlement system on a real time basis, (Central Bank of Kenya, 2004a).

Some observers estimate that the total cost to an economy of maintaining a cash-based payment system can be as much as 5% of gross domestic product (GDP). While it is difficult to put an exact figure on the impact which electronic payment systems and new banking technologies will have on Kenya's economic growth, it is clear that the resulting



lower transaction costs and higher levels of competition will significantly enhance economic growth, enabling the Kenyan economy to achieve the rates of growth needed to defeat poverty. High costs of financial services and inadequate access to banking accounts have traditionally undermined this goal. New and cheaper banking technologies, including credit and debit cards, offer a means to bring Kenya's citizens into the formal financial services system, (Clark, 2005).

According to Visa International head of corporate communication, Dr Jeremy Reynolds (2005), a study conducted by Global Insight for Visa, showed that a 10 % increase in the share of electronic payments would raise consumer spending by more than 0.5% a year. This shows a positive effect between increased use of electronic payments and economic growth. For modernizing economies like Kenya, increased use of electronic and card payments could lead to economic growth and also lower transaction costs, increase efficiency and consumption, save the exchequer money for printing and minting money, reduce corruption and increase savings and investment, (Oyuke, 2005).

Functioning electronic payment systems also encourage the movement of cash into banks. A 10 per cent shift of cash into deposits or other reserves that can be used for loans and other productive purposes may increase GDP by more than one per cent annually. Cashless payments in the form of Internet banking, electronic payments and cards have a positive effect on the rate of growth of GDP. For Kenya to attain the seven per cent economic growth target identified by New Partnership for Africa's Development (NEPAD) as a requirement to defeat poverty, cashless transfers must play their part, (Clark, 2005).

The study findings have shown that electronic payments and transfers handled by ATMs, the Internet and other methods are more cost effective than paper-based systems, particularly when it comes to point of sale transactions, recurring payments, employee salaries and the transfer of large sums. An electronic payment costs about one-third as much as a paper-based transaction, (Clark, 2005). The senior officials interviewed from the five commercial banks including Barclays Bank confirmed these findings.

Electronic payments also offer the same freedom as bank notes, but without the associated risks of holding cash for transacting. For those people who fear being robbed

of their cash while walking to the supermarket, cards offer a risk-free solution. Moreover electronic payments provide a means to track the money one spends. Unlike cash that just slips through ones fingers, a debit or credit card statement provides a clear record of expenditure, which can be particularly useful for accounting purposes, (Clark, 2005).

However, the Kenyan public acceptance of e-banking services has been slow. Old habits die-hard and accordingly, some segments of our society are reluctant to give up paper for electronic systems. This reluctance is due to the occasional unreliability and insecurity of payment instruments and the quality of banking services that do not always meet the needs of clients. Clients require a low cost, convenient, safe and reliable payment medium, which is essential to a market economy. In addition, because the use of payment instruments is sometimes complicated, many people prefer cash to non-cash instruments when conducting payment transactions, (Central Bank of Kenya, 2004a).

The debate in the world of central banking about the introduction of e-money has not only been about the effects it might have on the use of, and the demand for bank notes and coins, but also how it will change the role of monetary policy. Will it still be possible, for example to maintain control over the creation of money and the total money supply? How will it affect the spending habits of people? How will it influence cross-border trade and the balances of payments between the countries? How will it change the velocity of circulation of money, and the savings of the community, (Mulei, 2004)?

With changes in the concept of money and the use of coins and bank notes, and with the introduction of electronic payment systems, satellite communication and financial globalisation, central banks and the modus operandi of monetary policy will also have to change to adapt to the new environment. It will no longer be sufficient to define money-creating institutions (banks), and to manage the defined monetary liabilities of these institutions in an effort to protect the value of the currency, (Mulei, 2004).

The effective definition of money as a means of payment has changed over the centuries from objects of value (gold and silver), to fiduciary issues (bank notes and coins), and then to deposit money created by banking institutions. To this will now be added e-money and payments made through electronically operated global systems (the Internet). The Central Bank of Kenya will therefore have to adjust its monetary policies to reflect these

new methods of payment and the creation of additional power. Central Bank will have to operate more on a universal basis, as the banks and the suppliers of conventional and new money instruments will operate globally and beyond the borders of any individual nation-state. It is therefore imperative that the Central Bank of Kenya sets up its National Payment System with speed so as to find solutions to the questions raised by the introduction of e-money and e-payments worldwide, (Market Intelligence, 2004).

According to Mr Owino, (2005) Head of Institutional Banking at Standard Chartered Bank, in Kenya today, client demands are hinged a lot on the changing lifestyles and the exposure to other banking systems. People travel outside the country and since Kenya has become the East and Central African financial hub for most financial institutions, Kenyan banks have been forced to quickly adopt global banking practices and technology.

There are 46 commercial banks in Kenya all of which compete for the same small cake, alongside other players like micro-finance institutions that include Equity Building Society and Family Finance. These smaller banks are able to lend their money in small amounts that the larger commercial banks are unable to. Yet the commercial banks want the smaller deposits. In the new era of fee-based income, commercial banks can only generate substantial revenue if they have volumes i.e. clients using those products and services, (Market Intelligence 2004). By utilising technology, Kenyan Banks can increase the number and frequency at which their clients use their products and services, thereby generating substantial revenues through the fees they charge.

Given that majority of the largest banks in Kenya, such as Barclays Bank, are international banks that are locally incorporated; their use of technology is extensive in line with what goes on globally. Kenyan banks in general are also providing more electronic payments services to their clients. This matches trends found elsewhere in the world. In South Africa, for example, the value of electronic payments between 1989 and 2003 rose from 2.8 per cent to 61.4 per cent, (Clark, 2005). Commercial banks in Kenya are battling it out with ATMs and other advanced electronic payments services for clients, which can only exist on top of solid software, networks and technical staff, (Ngugi, 2003).



In devising the business strategy that will entail the use of technology, banks must ask themselves how they want to be different while targeting the market positively. They need to ask themselves, for example, what ATMs will do for them, where the most profitable locations are, which models suit the location, a cost versus revenue analysis and whether they want to outsource the servicing and support of technology or employ staff, (Mathewman, 2004).

The new trend appears to be outsourcing the electronic banking technologies that add value to bank clients. In addition to purchasing the technology, the bank has to go beyond and ensure that it is not just buying a product but that the requisite skills are in place to ensure that the technology is maximised. For banks, outsourcing typically leaves it with resources to better serve its clients. Most banks are moving towards electronic delivery of services because they realize that clients are beginning to demand this, (Mathewman, 2004).

That Kenyan banks understand the key role of outsourcing technology is demonstrated by the launch of Kenswitch, which is a financial network that allows participating banks to interconnect their service platforms, (Messer, 2004). Kenyan banks are also currently working towards adopting a new automated teller machine (ATM) service under the name PesaPoint that was developed by a company known as Paynet. A similar example is the SASwitch shared ATM network developed by South African Banks, (Central Bank of Kenya, 2004a). The study findings show that with the exception of Cititbank, all the officials of the commercial banks interviewed are in agreement that the PesaPoint system will enable them to increase profits due to increased transactions and fees charged for these services.

The larger banks like Barclays Bank have realised that their extensive branch networks and acquisition of a VSAT license confer competitive advantage in the provision of electronic banking, both nationally and internationally, (Market Intelligence, 2004). On the other hand, the smaller banks such as Equity Bank could develop a product-market strategy to compete with the larger commercial banks through the use of technology, (Southard and Siau, 2004). For example, these smaller banks are able to lend their money in small amounts that the larger commercial banks are unable to. These smaller banks

could also generate revenue through increased account access fees, and benefit from promotional opportunity to cross-sell products such as credit cards, (Mutunkei, 2003).

Banks should use e-banking to focus on client needs in order to gain the strongest competitive advantage, (Southard and Siau, 2004). In the long term and with competition stiffening in the banking industry, competitive advantage will come from providing innovative services, or services that are uniquely bundled, through the banks Web site. The innovations to consider should not be limited to the banking industry. Banks should examine other technologically advanced industries for ideas. Successful Web-based companies, such as eBay and Priceline.com, have established profitable business models that may include features that banks could adapt, such as mortgage applications and transactional processes, (Southard and Siau, 2004).

Winning business strategies are grounded in sustainable competitive advantage. A company has competitive advantage whenever it has an edge over rivals in attracting clients and defending against competitive forces. There are many routes to competitive advantage, but the most basic is to provide clients with what they perceive as superior value. Examples include, a good product at a low price, a superior product that is worth paying more for, or a best-value offering that represents an attractive combination of price, features, quality, service, and other attributes buyers find attractive, (Thompson and Strickland, 2001).

The opportunities for banks in the Internet arena are varied as they can become technology providers by spinning off technology resources to start up new business streams, become content providers for information regarding products, indices etc, context providers for setting up e-market spaces, and enablers by providing backbone systems to support multiple payment system alternatives, (Stamoulis, 2000).

The future of e-banking will continue to depend heavily on the future development of technology. The one certainty is that it will continue to offer new delivery methods for banking services, (Southard and Siau, 2004). Technology enhances service delivery and efficiency and contrary to popular belief, the employment of technology does not decimate jobs. People will always be there because at the end of the day, the client will always seek service and the human face of the bank, (Mutunkei, 2003).

By strengthening the operational capacities of banks, and enabling them to provide a range of new innovative e-banking services to their clients, the future of Kenya's financial system will meet the demands of a fast growing market-oriented economy and align itself to internationally accepted best practice, (Central Bank of Kenya, 2004a).

### **5.2.2. Impact of the ICT Infrastructure on E-Banking Services**

The study findings reveal that the current ICT infrastructure in Kenya is not adequate nor is it efficient enough to satisfy the drastic rise in demand for both voice and data communications required for the provision of e-banking services. This is due to the fact that Kenya's ICT sector is faced by numerous problems such as inadequate telephone landlines, lack of a reliable Internet connection, high access costs for landlines and Internet. It also reveals that there is inadequate capital for the provision of services, dumping of contraband traffic, cyber crime, and lack of a suitable policy and regulatory framework for ICT, (Telecommunication Service Providers Association, 2004).

Banks trade money based on information and therefore communications, especially data communications, drive all bank products and services. Information Communication Technology (ICT) infrastructure is a key player in the day-to-day operations of a bank because it provides efficiency and security. ICT allows banks to accelerate the lending process and is a core component in transaction monitoring, allowing banks to check on the validity of transactions or compliance with regulations on money laundering, (Messer, 2004).

In relation to the problem of inadequate landlines, the fixed line teledensity of 1.02% in Kenya is very low and current policies and regulations are still prohibiting full competition and expansion in the ICT sector thereby hindering the provision of e-banking services such as telephone and Internet banking, (Kimani, 2004). The gradual introduction of competition in the ICT sector is expected to lead to the reduction of prices of bandwidth and general ICT access. It is also expected that the competition will ensure that ICT systems are expanded as dictated by the forces of demand and supply. IT literacy is also expected to improve with the introduction of more computer training institutions in many parts of Kenya especially the rural areas, (Njoroge, 2004).

Lack of reliable Internet access is another major problem in Kenya. This problem can be attributed to the under utilisation and under development of high-speed (broadband) connections such as microwave radio, satellite and optical fibre. For instance, many banks in Kenya are faced with the problem of non-performing loans that they have to write off as bad debts yet few of them are registered with the Credit Reference Bureau because they lack a high-speed connection and access to this financial database, (Credit Reference Bureau Ltd, 2005).

Another related problem is that few credit card terminals in Kenya take advantage of broadband and satellite technology, which would accelerate transactions. The majority of transactions are verified using telephone technology. As the sophistication of credit card authentication grows, largely due to more comprehensive verification techniques, credit card transactions are expected to take longer, (Central Bank of Kenya, 2004a). Internet-based credit card transactions can take as little as 3-5 seconds processing time and this would be an effective option for Kenyan banks to use, (Messer, 2004).

In order to curb the problem of lack of a reliable Internet connection and high access costs for landlines and Internet, the Communications Commission of Kenya licensed an Internet exchange facility known as Kenya Internet Exchange Point (KIXP) in 2002. Despite the gesture, the move to license an exchange point might not make much impact in the ICT sector unless ISPs and other ICT players are given a free hand to own and operate peered, wireless networks and VSATs, (Very Small Aperture Satellite Terminals). VSATs are effective as points-of-presence outside major towns in Kenya where infrastructure is not fully developed, (Kimani, 2004).

The use of VSAT would also improve accessibility to reliable and secure telecommunication services especially in remote areas. In addition, VSATs would enable decentralised corporate organisations and financial institutions to interconnect their branch offices, increasing efficiency and reducing the cost of communication services, ([www.cck.go.ke](http://www.cck.go.ke)).

The study findings reveal that wireless broadband technology; using microwave radio or satellite systems for data transmission would be the most sensible technology for Kenyan banks to use because these data links are highly secure, reliable, easy to install and can

support interactive services. Broadband technology also offers vast quantities of information transfer, (Olawo, 2003).

Successful banking demands secure, reliable, efficient data communications. ICT infrastructures such as broadband solutions give banks the velocity and accuracy of data communications. Properly implemented broadband solutions also give banks an amazing amount of flexibility in their operations. Business processes depend on the flow of information. Distributing information more rapidly and widely speeds up the entire business cycle, (Messer, 2004).

Broadband technology allows banks to distribute their own IT resources efficiently. For instance technicians are able to troubleshoot and repair problems at remote branches. Security of data, intrusion monitors and CCTV cameras in the banks can also be monitored. Further, if bank branches are linked by broadband technology, clients will see more rapid service delivery for items such as account queries. Information flows quicker, so decisions get made faster, (Messer, 2004).

There are also a number of benefits in the use of satellite technology by Kenyan banks. These include; increased reliability, cost –effective bandwidth prices; higher quality service, the ability to provide differentiated services and provision of services in remote areas previously not served. Broadband access satellite services such as the ones being offered by UUNET South Africa would result in cost effective alternatives to solutions such as DSL (Digital Subscriber Line) and cable modem services, ([www.uunet.co.ke](http://www.uunet.co.ke)).

The benefits of wireless access networks are also evident in the exponential growth of mobile subscribers in Kenya, which was more than seven times the size of the fixed line subscribers by June 2004, at 2.5 million and 299,255 subscribers respectively. With the liberalisation of the ICT sector and licensing of many players, wireless technology will certainly be widely available for access as players seek to roll out networks fast in a bid to capture the market share, (Communications Commission of Kenya, 2004).

However, wireless technologies will only complement wired platforms and not replace them completely due to the spectrum resource constraints. Wireless technology though admittedly faster than wired platforms, has numerous limitations including interference

arising from crisscrossing lines, and instability, whereby strong winds may move the antennae, (www.uunet.co.ke).

### **5.2.3. Security of E-banking and ICT Systems**

The study findings reveal that the existing security measures for landlines and e-banking systems in Kenya are incapable of preventing most forms of risks and threats that are posed to these systems. In Kenya, the security problems that face e-banking systems and landlines include vandalism of telephone landlines, dumping of contraband traffic on Telkoms network and cyber crime, (Kitau, 2005). The major risks associated with landline and e-banking systems are categorised as security, technology, operational, legal and reputation risks, (Monetary Authority of Singapore, 2003).

Kenya faces the problem of vandalism of telephone cable wire which is a key reason leading to the poor ICT infrastructure in the country. Vandalism has also impacted negatively on e-banking service delivery. In addition businesses and individuals also suffer from frequent lack of communication. Wireless network technologies such as microwave radio and satellite can help solve this problem because they are not susceptible to vandalism and are also cost-effective to manage. Wireless network technologies also have the advantage of, increased access, low cost, easy installation, flexible on geographical positioning, and fast rollout compared to wired technologies. Due to these advantages, it has become the preferred technology for public data network operators and even the local loop operators and no doubt will surpass the wired infrastructure in the access domain, (Njoroge, 2004).

Dumping of contraband traffic is also another problem affecting Kenya's ICT sector especially Telkom Kenya. Progress in dealing with this problem will depend on Telkom's ability to monitor and track operations of firms with excessive digital lines, and clients whose monthly bills exhibit a tendency to experience sudden upsurges, (PKF Consulting, 2005).

In regard to cyber crimes, the officials interviewed from the commercial banks stated that unlike the past, cyber crime and hacking of e-banking systems has increasingly becoming a major problem that should be tackled before it gets out of hand. According to Ms.

Ngare, Operations Manager at Kenya Commercial Bank, there is no reason why Kenyan laws should not stay in tune with the rapidly growing and changing computer technology. The way forward is for law-enforcers to join the race against the law-breakers.

According to Kitau (2005), the first step to curb the problem of cyber crime should be to establish an Internet fraud complaint centre to provide an avenue for victims of online crime to file complaints and submit information. This should be managed by the Criminal Investigation Department (CID) in partnership with a local university involved in e-commerce and research. The CID officers should be graduates who understand the scope and nature of online fraud as well as how to track and preserve evidence of this nature.

The second step is to establish a cyber crime expert committee. This committee should comprise of the law enforcement community, the consumers of e-commerce and online systems, and IT professionals who run e-commerce and e-banking services. In the meantime the Government should issue a press release assuring international investors that action has been taken and Kenya will not be a breeding ground for computer hackers, (Kitau, 2005).

The impact of security, technology, operational, legal and reputation risks can be measured in terms of their damaging value or level of confidence in the financial and ICT systems. It is important to identify measure, contain and manage these risks so as to ensure smooth and reliable financial and ICT systems, (Central Bank of Kenya, 2004a). In order to effectively deal with these risk and threats posed to e-banking and ICT systems, Kenyan banks should seek answers to certain questions such as: Who is attacking the banks network? What is the attacker trying to achieve? Where is the abuse/attack taking place? How is the attack accomplished? ([www.uunet.co.ke](http://www.uunet.co.ke)).

Most network attacks are instigated by well-placed spies or moles who make every effort to disrupt network traffic flows, or bring attention to their work as they slowly and methodically try to gain access to databases and information stored on sensitive servers. Corporate espionage, a disgruntled employee, hobby hacker, an internal spy or mole could instigate such attacks. Much of the attention in the press focuses on hackers trying to take corporate sites out of commission, and that is a serious threat. This can translate into a significant loss of revenue in case the corporate is a financial institution. However,

gaining access to sensitive corporate information is also the subject of attacks. Getting into a military installation database or a banks database might be more rewarding, so to speak, than just messing up access on <http://www.yahoo.com/>, ([www.uunet.co.ke](http://www.uunet.co.ke)).

Security measures are needed to prevent the risks and associated costs from occurring. The security measures however also impose a certain cost by themselves .A proper balance should therefore be made between the investments in security measures and the potential costs that a bank might have to cope with due to potential risks without security measures in place. Particularly in e-banking systems, the extra cost at the client side should be reduced as much as possible. Users should be able to perform e-banking with the standard infrastructure and software that is already available. This makes the e-banking service more attractive, but might unfortunately have an impact on the security level this service can offer. In practise, banks try to have a minimal level of security alleviating most of the risks, with maximum level of convenience, (Claessens *et al.*, 2001).

In order to develop a master plan in effective risk reduction, it is essential for Kenyan banks to also identify their most critical technical and informational systems, their qualitative or quantitative value, the potential security, technology, operational, legal and reputation risks and finally solution scenarios and counter-measure plans available. It is only after this evaluation that bank mangers will be in a position to develop the necessary budgets to achieve the sufficient comfort level as well as maximum reduction of the potential financial and ICT systems risks, ([www.uunet.co.ke](http://www.uunet.co.ke)).

#### **5.2.4. Policy and Regulatory Framework Governing E-Banking Services**

The study findings show that the existing policy and regulatory framework governing e-banking and ICT services is inadequate in dealing with security risks and threats posed to these systems. These risks and threats include vandalism of telephone landlines, dumping of contraband traffic on Telkoms network and cyber crime. These problems can be attributed to the fact that Kenya lacks a sound policy and regulatory framework for payments systems and ICT services, (Njoroge, 2004).



Further, ICT issues in Kenya are currently considered under various legislation including the Science and Technology Act of 1990, the Kenya Broadcasting Act of 1990 and the Kenya Communications Act of 1998, which are inadequate in dealing with emerging issues such as e-banking, liberalisation of e-commerce and e-government, (Ministry of Information & Communication, 2004). Several changes are also happening in Kenya with regards to technological ways of settling payments, yet they are not regulated (Central Bank of Kenya, 2004a).

Countries with a stable regulatory framework and friendly licensing policies tend to attract more financial and ICT investments. This would help curb the problem of lack of capital to purchase equipment for the e-banking and ICT industries. A good regulatory framework also creates an enabling environment for private sector participation through putting in place structured market segmentation and a level playing ground, (Njoroge, 2004). It also ensures legal certainty in respect of industry practises especially in areas of risk containment. For the financial and ICT sector to function and thrive in a competitive global environment, an enabling legislative framework must be put into practice to protect not only the financial sector, but also Kenyan citizens, (Omondi, 2003).

For instance, Kenya has no legislation on cyber crime compared to countries like South Africa. This means that an action considered as a violation of cyber law in South Africa is permissible in Kenya. This is dangerous because it portrays Kenya as an ideal country for computer hackers to begin their criminal careers. Due to the increasing cases of cyber crime, policies on security of computer systems need to be formulated in Kenya, (Kitau, 2005).

Another example is the Asian economy that has grown very rapidly due to flexible and open telecommunication policies. Emerging markets in the telecommunication sector that have created employment in these regions are areas which Kenya can outperform these countries due to its inherent advantage of a large educated workforce with a good command of English, a key requirement for the service industry, (Telecommunication Service Providers Association, 2004).

The study findings show that the government has initiated moves in which stakeholders have been invited to attend consultative meetings and workshops with the policy-makers.

This indicates that the industry players are being allowed to play their role in the policy-making process, (Njoroge, 2004). The challenge is for the government and industry players to establish an adequate legal framework and capacity to deal with security problems such as vandalism of landlines, dumping of contraband traffic on Telkom's network and cyber-crime. Policy-makers should also establish mechanisms for international cooperation to combat cross-border crimes, (Ministry of Information & Communication, 2004).

Kenya should borrow a leaf from countries like Botswana and Mauritius. These are small countries with progressive economies. Yet in spite of their small sizes, they have financial institutions that take governance seriously. The governance takes into account aspects like value added, the roles of the various committees, risk management, regulatory responsibilities and general oversight. There is information on board and committees attended by each board member, remuneration and interest if any that could lead to conflict of interest. These are the kind of corporate governance standards that are long overdue in Kenya, (Market Intelligence, 2004).

### **5.3. Conclusions**

#### **5.3.1. E-Banking Services Provided by Kenyan Banks**

Currently, all the 46 commercial banks in Kenya are providing most forms of e-banking services. The level of competition has increased significantly and the financial systems currently include the use of ATMs, debit and credit cards, execution of payments through Electronic Funds Transfers, Web-based Internet banking, online banking, mobile and telephone banking practices. These are electronic services where the clients can instantly access their account balances and other banking information as well as transfer funds on an on-line basis using a telephone and a personal computer, (Central Bank of Kenya, 2004a). In order to gain a competitive edge, generate higher revenues and lower operational costs, banks in Kenya are also placing more resources into electronic banking in line with trends worldwide, (Mathewman, 2004).

The study findings show that the key problems faced by Kenyan banks in the provision of e-banking services include, the poor state of the existing ICT infrastructure, lack of

proper e-banking security systems and lack of a sound policy and regulatory framework. Many banks also lack the appropriate equipment to serve a modern financial system due to lack of enough capital, (Central Bank of Kenya, 2004a)

### **5.3.2. Impact of the ICT Infrastructure on E-banking Services**

The existing ICT infrastructure in Kenya is in a state of crisis and it requires to be upgraded. The poor ICT infrastructure has led to a negative impact on the banking industry because it is neither adequate nor efficient enough to satisfy the demand for voice and data communications required for the provision of e-banking services. The study findings show that unless the ICT sector is improved, the potential for e-banking in Kenya will remain crippled by the poor state of the ICT infrastructure, especially the absence of broadband technologies, (Telecommunications Service Providers Association, 2004).

The ICT sector in Kenya is faced by numerous problems such as inadequate telephone landlines, lack of a reliable Internet connection, high access costs for landlines and Internet. It also reveals that there is inadequate capital for the provision of services, dumping of contraband traffic, cyber crime, and lack of a suitable policy and regulatory framework for ICT, (Telecommunication Service Providers Association, 2004).

However, the Government recognises that the provision of modern ICT infrastructure and information networks is the key to rapid development of e-banking services. The overall Government objective is to ensure the availability of efficient, reliable and affordable ICT services throughout the country, (Ministry of Information and Communication, 2004).

### **5.3.3. Security of Landlines and E-banking Systems**

The study findings reveal that the existing security measures for landlines and e-banking systems in Kenya are incapable of preventing most forms of risks and threats that are posed to these systems. In Kenya, the security problems that face e-banking systems and landlines include vandalism of telephone cable wire, dumping of contraband traffic on Telkoms network and cyber crime, (Kitau, 2005). Better security systems for tracking

down criminals who are involved in the theft of ICT and e-banking equipment and data should therefore be implemented.

The major risks associated with landline and e-banking systems are categorised as security, technology, operational, legal and reputation risks, (Monetary Authority of Singapore, 2003). The impact of these categories of risks can be measured in terms of their damaging value or level of confidence in the financial and ICT systems. It is important to identify measure, contain and manage these risks so as to ensure smooth and reliable financial and ICT systems, (Central Bank of Kenya, 2004a).

#### **5.3.4. Policy and Regulatory Framework Governing E-banking Services**

The existing policy and regulatory framework governing e-banking and ICT services in Kenya is inadequate in dealing with security risks and threats posed to these systems. These risks and threats include vandalism of telephone landlines, dumping of contraband traffic on Telkoms network and cyber crime. These problems can be attributed to the fact that Kenya lacks a sound policy and regulatory framework for payments systems and ICT services, (Telecommunication Service Providers Association 2004).

Regulatory facilitation of e-banking and ICT technologies enables ease of deployment of systems and enables delivery of affordable enhanced services to end-users. The challenge is for the Kenyan Government to establish an adequate policy and regulatory framework and capacity to deal with e-banking and ICT services. This framework should take into account constitutional rights as well as the provisions of criminal, civil, commercial and other laws. A key element of the ICT policy should also be to attract foreign direct investment and stimulate domestic investment, (Communications Commission of Kenya, 2004).

## **5.4. Recommendations for Improved Service Delivery**

### **5.4.1. E-banking Services Provided by Kenyan Banks**

Having researched the industry the researcher proposes the following suggestions and recommendations. Some of these recommendations appear to be solutions but they require further research and testing:

- Kenyan banks should conduct a careful cost-benefit analysis before they launch an e-banking initiative. A cost benefit analysis is done to determine how well, or how poorly, a planned action will turn out. The cost to enter the target market should not be so high as to erode the potential for good profitability. The more attractive the industry, the more expensive it can be to get into, (Thompson and Strickland, 2001). The commercial bank officials interviewed all concurred with the researcher on this recommendation. They agreed that conducting a cost-benefit analysis before pursuing an e-banking initiative would enable them to assess in advance if they would make profits or incur losses and therefore make wise decisions
- Kenyan banks should learn from the successes and failures of existing and previous e-banking initiatives worldwide before implementing their own. This will ensure that they do not make the same mistakes as other banks
- Kenyan banks should invest in promoting e-literacy both among their staff and to the general public. For example the banks should invest in building colleges that offer ICT related courses to the public. If more Kenyans are computer literate the number of people willing to use e-banking services will increase. Banks will benefit from larger numbers in terms of profits made through fees charged for these services

### **5.4.2. Impact of the ICT Infrastructure on E-banking Services**

In relation to ICT infrastructure, the researcher proposes the following recommendations

- Affordable Internet access should be provided all over the country. Cheaper access to the Internet would mean lower operating costs for most banks thereby strengthening

their performance. Several new businesses would be started due to the entrepreneurial ability of the Kenyan worker. Licensing more VSAT operators and appointing other International Gateway providers, would greatly reduce the cost of Internet access in Kenya

- ICT capacity in terms of bandwidth and penetration of services should be increased by ICT industry players in order to ensure that ICT services are accessible to increasingly more and more Kenyans
- Improvement of ICT information management by providing training in ICT areas so that the Kenyan economy is less reliant on foreign expertise and skills. Training in ICT related areas would also generate additional employment and promote entrepreneurship for the digital economy. With the current economy requiring computer literate workforce, there is a great need for IT training in Kenyan schools and Universities so as ensure that students who leave these institutions have sufficient computer knowledge to enter the labour market
- The Government should encourage the private sector and development partners to invest in ICT infrastructure and services. Development partners and donor agencies are keen and willing to provide funds to speed up the improvement of Kenya's ICT infrastructure. However these donors are reluctant to commit funds to Kenya because of the existing telecommunication policies that favour government monopoly over the sector. Such donors feel that their funds would simply enrich the monopoly telecommunication providers without making any impact to the ordinary user. They would prefer to channel funds through the participation of the private sector
- Awareness on the potential opportunities presented by ICT such as e-banking and e-commerce should be created among leaders, the public and private sector. This awareness will facilitate the implementation of more ICT related initiatives which will help develop the Kenyan economy

In striving to find solutions to the ICT infrastructure problems in Kenya, the Kenyan Government, Telkom and the private sector have proposed to adopt the following strategies

- Limit the trading of copper and cancel licenses for scrap metal dealers found with vandalised telephone cables, (Richardson, 2005).
- Duty exemptions on IT equipment to enable importation of IT equipment, (Telecommunication Service Providers Association, 2004)
- Improve the country's teledensity, expand the existing telecommunications network and develop national broadband infrastructure. In addition, the Government plans to enhance and prioritise the ICT sector through proper planning and adequate resource allocation, (Ministry of Information and Communication, 2004)
- Restructure Telkom Kenya in preparation for privatisation and sale of a proportion of the company's shares. Privatisation and sale of shares would raise capital for Telkom and this would solve the financial problems faced by the organisation, (Ministry of Information and Communication, 2004)
- Support regional projects such as East African Digitisation project, the African Satellite project (RASCOM), the East African Submarine System (Eassy) cable project that will provide connectivity to the submarine fibre optic cable system and PANMSAT, which provides global video and data broadcasting services via satellite, (Ministry of Information and Communication, 2004)
- There are also initiatives under the East Africa Regulatory, Postal and Telecommunications Organization (EARPTO) to interconnect telecommunication networks in the three east African countries. (Kenya, Uganda and Tanzania) One such initiative is the interconnection of the three Internet exchange points to enable exchange of regional Internet traffic, ([www.cck.go.ke](http://www.cck.go.ke))

#### **5.4.3. Security of E-banking and ICT Systems**

In regards to security of e-banking and ICT systems, the researcher has proposed the following recommendations:

- In addition to the security measures that Kenya has put in place to curb the problem of theft of telephone landlines, Kenya should also borrow a leaf from South Africa and implement similar security measures. These include, installing of alarm systems on the telephone lines and initiating armed patrols to guard the lines, initiating closer association with local communities so as to reduce cable theft and replacing copper landlines with microwave radio link, fibre optic cables, satellite or other wireless systems. Kenya should also develop stricter legislation concerning the sale and purchase of second hand materials and goods, (Paynter, 2005)
- In relation to cyber crime and dumping of contraband traffic on Telkom's network, the Kenyan government should undertake more research on these security risks to establish how they are carried out and who the key perpetrators are. This type of research would also expose the vulnerabilities and weaknesses of the current security systems
- Kenyan mobile network providers should research ways of installing anti-virus software in their handsets and cellular networks. They would be following a trend set by Japan's DoCoMo, which has already suffered virus infections on its network. In the next two years, two global cell phone manufacturers in Japan have announced deals to embed anti-virus software in their handsets, ready to fend off the inevitable virus attacks over the cellular airwaves, (Stones, 2005). In countries such as Kenya where people use their cell phones for Internet banking, this type of anti-virus would reduce the risk of e-banking fraud

In an attempt to find solutions to the security problems in the e-banking and ICT sectors, the private sector recommends that an Internet fraud complaint centre should be established to provide an avenue for victims of online crime to file complaints and submit information, (Kitau, 2005)

#### **5.4.4. Policy and Regulatory Framework for E-banking and ICT**

In relation to the policy and regulatory framework, the researcher has proposed the following recommendations:



- A Telecommunications Convergence Bill, such as the one found in South Africa, (Krupp, 2004), should be enacted in Kenya. This Bill, which follows trends in the international telecommunications market, is essentially technology driven, (Krupp, 2004). These technologies, make rolling out a data and voice network, such as VOIP, (Voice Over Internet Protocol), exponentially cheaper because it requires far less infrastructure. The infrastructure is also cheaper to operate. However laws implemented to protect Telkom Kenya's monopoly of the telecommunications market have stopped the natural progression of the technology locally
- Promoting competition in the industry and ensuring both affordability and ICT access in the community. The aim of this would be to promote efficiency in the sector
- Research in ICT-related policy, legal and regulatory issues should be undertaken. Telecommunications is a key pre-requisite for other ICT technologies. Research and development in the sector should therefore be encouraged. Steps should also be taken to ensure that the industry invests adequately in research and development to promote local industrial growth and hasten technology transfer

According to the Ministry of Information & Communications (2004), the government plans to implement the following strategies in regards to ICT policy and regulatory framework:

- Introduce an ICT National Policy and also an Electronic Transactions Law covering e-banking
- Fully liberalise the telecommunications sector and provide an environment for the exploitation of existing opportunities and a level playing field to all players in various market segments
- Licensing of additional operators in the provision of systems and services in the Local, National and International telecommunications market segments, as well as promoting network and service unbundling

## **5.5. Recommendations for Further Research**

The study focused on Kenya's ICT infrastructure and its effect on e-banking services. Other areas that were not addressed but could be suitable topics for further research include:

- A larger study that would evaluate in details the operations of all Kenyan banks and their individual capacity to provide e-banking services. This may unearth issues which though not major factors would be relevant to smaller banks. These issues could include an analysis of the cost of e-banking infrastructure versus the revenue earned from the e-banking transactions.
- The findings show that Internet Service Providers (ISPs) in Kenya have been complaining that Telkom services are slow and inefficient. However Telkom maintains that the ISPs are to blame for requesting for inadequate bandwidths that are not good enough for their clients. This is an area for further research in order to determine exactly whether the problem lies with Telkom or the ISPs.
- Consumer concerns arising from new e-banking services
- Impact of ICT infrastructure on insurance and stock exchange services provided electronically
- Factors such as profitability which affect banks decision to offer e-banking services

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## Appendix I: Schedule of Interviewees

<b>Name</b>	<b>Date</b>	<b>Job Title</b>	<b>Organisation</b>	<b>Industry</b>
Francis Ngugi	Nov 2003	Technical Advisor	<b>Barclays Bank of Kenya</b>	Banking
Moses Mutiga	Nov 2003	Business Banking Manager	<b>Barclays Bank of Kenya</b>	Banking
Rosemary Mutunkei	Nov 2003	Operations Manager	<b>Barclays Bank of Kenya</b>	Banking
David Kwendo	Dec 2005	Deputy Head, Open Market Operations	<b>Central Bank of Kenya</b>	Banking/ Regulation
Esther Ngare	Jan 2006	Operations Manager	<b>Kenya Commercial Bank</b>	Banking
Jacob Owino	Jan 2006	Head of Institutional Banking	<b>Standard Chartered Bank</b>	Banking
Margaret Wamaitha	Jan 2006	Corporate Relationship Manager	<b>Citibank</b>	Banking
William Oluoch	Jan 2006	Head of Information Communication Technology	<b>Commercial bank of Africa</b>	Banking
Stephen Olawo	Dec 2003	Network Planning Manager	<b>Telkom Kenya</b>	ICT
Micheal Kimani	Feb 2004	Systems Administrator	<b>Today's Online</b>	ICT
Charles Njoroge	Jan 2004	Manager, Licensing Compliance and Standards	<b>Communications Commission of Kenya</b>	ICT/ Regulation
Don Paynter	Nov 2005 (Email correspondence)	Former President	<b>Zululand Chamber of Business, South Africa</b>	Business/ ICT

## Appendix II: Sample of Introduction Letter

Catherine.W. Nderi  
P.O Box 11933  
GPO 00100 Nairobi  
Tel: 443 2766  
Cell: 0722 650 177

7<sup>th</sup> November 2003

The Branch Manager,  
Barclays Bank of Kenya,  
Queensway Branch.

Dear Sir

### **RE: REQUEST TO CARRY OUT RESEARCH AT BARCLAYS BANK**

I would like to kindly request you to grant me permission to carry out a case study of Barclays Bank e-banking activities. I am currently pursuing a Master of Business Administration Degree specialising in Information Management and E-commerce. It is a requirement of this MBA degree that I undertake a practical research project and I have selected Barclays Bank as my case study.

The study will involve conducting interviews with three senior personnel at your branch, namely, the Technical Advisor in charge of Information Technology, the Operations Manager and the Business Banking Manager. Relevant documents received from your branch will also be very helpful.

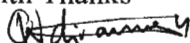
Due to the strategic importance of this study, any information that is deemed sensitive by Barclays Bank will be treated as confidential data. In addition, anonymity of the respondents will be protected if required. Participation in this study is voluntary and interviewees are free to withdraw from the study at any stage and for any reason

The title of the study is "The impact of Information Communication Infrastructure on e-banking in Kenya." The aim of this case study is to explore the e-banking processes at Barclays Bank and also to examine the impact of Kenya's ICT infrastructure system on e-banking services.

The study will be carried out using the research questionnaire attached. Note taking and tape recording will be the principle techniques used in data collection. The recorded interviews will then be transcribed and analysed.

Your permission in granting access to your organisation will be highly appreciated.

With Thanks



Catherine. W. Nderi

## **Appendix III: Sample of Interview Questions**

### **Impact of ICT Infrastructure on Electronic Banking in Kenya**

#### **Section One**

Name of Organisation: **Barclays Bank of Kenya**

Name of Interviewee: **Francis Ngugi**

Position held in organisation: **Technical Advisor**

#### **Section Two**

1. Please give me an overview of e-banking services at Barclays Bank
2. The concept of electronic banking is picking up very much in Kenya. What is Barclays Bank doing about it?
3. What was the primary motivation behind the introduction of e-world?
4. What infrastructure systems are required for electronic banking to take place in Barclays Bank?
5. What are the main challenges being faced by Barclays Bank in providing e-banking?
6. Does BBK have a problem with the ICT infrastructure that is currently in place for e-banking?
7. What is the role of ISP's in relation to BBK electronic banking services?
8. Would you say ISP's services have been satisfactory? Please explain.
9. What is the role of Telkom Kenya in relation to BBK electronic banking services?
10. Would you say Telkom's services have been satisfactory? Please explain.
11. What is the impact of the current infrastructure system in Kenya on electronic banking in BBK?
12. Would you say that the current ICT infrastructure in Kenya is ready to handle electronic banking? Please explain.
13. What changes would you like to see in the current infrastructure system that would help improve electronic banking services?

14. Is wireless data communication an option in electronic banking at BBK? Please explain.
15. I understand that BBK intends to link all its ATM's and branches in Africa using (VSAT) Very Small Aperture Terminal technology. How will this new technology work?
16. There is a consortium of banks that is working towards implementing a shared ATM network called Kenswitch, Is BBK part of it?
17. What is the role of Central Bank
18. What security measures has BBK put in place to prevent fraud in electronic banking?
19. What policy and regulatory framework is in place for e-banking in Kenya?
20. What does the scenario look like for the future of electronic banking in BBK?
21. Is there anything else that you would like to add?

#### Appendix IV: Barclays Kenya ATM distribution

Nairobi Location	No	Up Country Location	No	Coast Location	No
ABC Place	1	Bungoma	1	Bamburi	2
Aga Khan	1	Eldoret	2	Changamwe	1
Avon Centre	1	Embu	1	Diani	1
Buru Buru	1	Homa Bay	1	Digo	2
Enterprise Road	1	Kakamega	1	Kilifi	1
Hail Selassie Avenue	2	Karatina	1	Malindi	1
Harambee Avenue	2	Kericho	1	Nkurumah	2
Hurlingham	1	Kerugoya	1		
JKIA	2	Kiambu	1		
Karen	1	Kisii	1		
Kenol	1	Kisumu	2		
Lavington	1	Somken	1		
Market	3	Kitale	1		
Moi Avenue	6	Limuru	1		
Muthaiga	1	Machakos	1		
Nakumatt	3	Meru	1		
NIC	1	Muranga	1		
Plaza Corporate	2	Naivasha	1		
Queensway	6	Nakuru East	2		
Ruaraka	2	Nanyuki	1		
Sarit	1	Nyahururu	1		
Uchumi Langata	1	Nyeri	1		
Village Market	1	Sotik	1		
Westlands	1	Thika	2		
Yaya Centre	1				
<b>Nairobi Total</b>	<b>44</b>	<b>Up Country Total</b>	<b>28</b>	<b>Coast Total</b>	<b>10</b>
				<b>BBK Total</b>	<b>82</b>

Source: (Emerging Market Economics, 2004).

### Appendix V: Number of Licensees for Communication Networks

Licence Category	Number of Licences (Cumulative)				
	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004
Vendors & Contractors	184	740	783	813	888
Technical Personnel	30	71	108	139	182
Cyber cafes/ Telephone Bureau	-	-	-	51	70
Internet Service Providers	43	66	72	76	78
Internet Exchange Point Providers	-	-	1	2	2
Paging Service Providers	14	16	12	12	2
Value Added Service Providers	-	1	1	3	17
Public Data Network Operators	1	1	1	4	6
Public Switched Network Operators	1	1	1	2	2
VSAT Hub Operators	1	1	1	2	2
Local Loop Providers	-	-	-	2	4
VSAT Terminal Licenses	36	56	75	130	336

Source: (Communications Commission of Kenya 2004).

## **Appendix VI: List of Acronyms**

<b>ADSL</b>	Asymmetric Digital Subscriber Line
<b>ATM</b>	Automated teller machine
<b>BBK</b>	Barclays Bank of Kenya
<b>CBA</b>	Commercial Bank of Africa
<b>CBK</b>	Central Bank of Kenya
<b>CCK</b>	Communications Commission of Kenya
<b>DSL</b>	Digital Subscriber Line
<b>EDI</b>	Electronic Data Interchange
<b>EFT</b>	Electronic Funds Transfer
<b>GEO</b>	Geosynchronous Earth Orbit
<b>GMPCS</b>	Global Mobile Personal Communications via Satellite
<b>GSM</b>	Global System for Mobile
<b>HTML</b>	Hypertext Markup Language
<b>HTTP</b>	Hypertext Transfer Protocol
<b>ICT</b>	Information Communication Technology
<b>ISDN</b>	Integrated Digital Services Network
<b>KCB</b>	Kenya Commercial Bank
<b>LAN</b>	Local Area Network
<b>NPS</b>	National Payments System
<b>PC</b>	Personal Computer
<b>PDA</b>	Personal Digital Assistant
<b>RAM</b>	Random Access Memory
<b>SMS</b>	Short Message Service
<b>SNA</b>	System Network Architecture
<b>SWAP</b>	Shared Wireless Access Protocol
<b>SWIFT</b>	Society for Worldwide Interbank Financial Telecommunication
<b>TCP/IP</b>	Transmission Control Protocol/ Internet Protocol
<b>TESPOK</b>	Telecommunications Service Providers of Kenya
<b>VOD</b>	Voice on Demand
<b>VOIP</b>	Voice over Internet Protocol
<b>VSAT</b>	Very Small Aperture Terminal



<b>WAN</b>	Wide Area Network
<b>WAP</b>	Wireless Application Protocol
<b>WWW</b>	World Wide Web
<b>XML</b>	Extensible Markup Language

## **Appendix VII: Glossary of Terms**

### **ADSL and DSL**

Asymmetric Digital Subscriber Line (ADSL) provides asymmetric transmission of data, with 265 Kbits/s upstream, depending on line length and line. Digital Subscriber Line (DSL) is a set of digital communication protocols designed to enable high-speed data communication over copper telephone lines, (Lawrence *et al.*, 2002).

### **Analog Signals**

Telephone services support voice signals, known as analog signals. Analog signals have the name analog because they are analogous to speech signals in the sense of being measured relative to electronic current, (Panko, 2001).

### **Bandwidth**

This is the transmission capacity of a computer channel or communications line, (Panko, 2001).

### **Bluetooth**

This is a computing and telecommunications industry specification that describes how mobile phones, computers and PDAs (Personal Digital Assistants) can easily interconnect with each other and with home and business phones and computers using a short-range wireless connection, (Lawrence *et al.*, 2002).

### **Broadband Technology**

This refers to those methods with connectivity speeds exceeding 128 kilobits per second. They allow for online applications such as streaming audio and video and software distribution to be offered over the Internet, (Rayport and Jaworski, 2001).

## **Business Model**

A company's business model deals with whether the revenue-cost-profit economics of its strategy demonstrate the viability of the enterprise as a whole, (Thompson and Strickland, 2001).

## **Competitive Advantage**

This is the significant advantage or edge that a company has over its competitors. Such advantages allow the organisation to add more value than its competitors in the same market. Examples of advantages are attracting customers, prices, product range, manufacturing quality and service levels, (Lynch, 2000).

## **Earth Station and Antenna**

These terms are often used interchangeably in the satellite industry. However, technically, an antenna is part of an Earth Station. An Earth Station may be composed of many antennas, (Intelsat, 2002).

## **E-commerce**

According to Rayport and Jaworski (2001), E-commerce can be defined as technology-mediated exchanges between parties (individuals, organizations, or both) as well as the electronically based intra or inter-organizational activities that facilitate such exchanges.

## **E-banking**

This encompasses all the different ways of transacting banking business electronically whereby; clients can access their banks without having to be physically present at a bank branch, (Deutsche Bundesbank, 2000).

## **Information and Communications Technologies (ICT)**

These technologies include computers, telecommunication and audio-visual systems, that enable the collection, processing, transportation and delivery of information and communication services to users, (Ministry of Information & Communication, 2004).

## **Integrated Digital Services Network (ISDN)**

Digital communication lines handle voice, graphics, data and combined voice and images .The combination of these services on a single digital service is known as an ISDN, (Panko, 2001).

## **Internet Gateway and Backbone Operator**

This is an operator who has been licensed to construct and maintain Internet gateway and backbone facilities for purposes of providing connectivity to Internet Service Providers, both locally and internationally, ([www.cck.go.ke](http://www.cck.go.ke)).

## **LAN & WAN**

LAN stands for Local Area Network and WAN stands for Wide Area Network, (Panko, 2001).

## **Legacy Systems**

These are the existing company databases which often have been developed in third generation languages such as COBOL or back-end systems such as EDI, (Lawrence *et al.*, 2002).

## **Local Loop Operator (LLO)**

A local loop operator is one who has been licensed to provide end-users with total telecommunication solutions. This includes the provision of both data and voice services,

and also the ability to choose the least cost routing. Local loop operator may therefore connect to a mobile, fixed or data network operator, ([www.cck.go.ke](http://www.cck.go.ke)).

### **Network Infrastructure**

This is the basic, underlying group of electronic devices and connecting circuitry designed as a system to share information. This infrastructure includes all the various communications systems and networks now in use, such as the telephone, cable television, broadcast radio and television, computer, satellite, and wireless telephone, (Rayport and Jaworski, 2001).

### **Online and Internet Banking**

These are the different forms of PC banking. Online banking is conducted within closed networks and requires the client to obtain special software provided by his/her bank. Internet banking permits the client to conduct transactions from any terminal with Internet access, (Deutsche Bundesbank, 2000).

### **Protocols**

These are a standardised set of rules that define how computers communicate with each other, (Kalakota, 2000).

### **Public Data Network Operator (PDNO)**

A Public Data Network Operator is one who has been licensed to provide both switched and dedicated fixed point-to-point data connectivity for all forms of data, ([www.cck.go.ke](http://www.cck.go.ke)).

### **Satellite Footprint**

This is the geographic area that the satellite can transmit to, or receive from, (Intelsat, 2002).

## **SNA**

This stands for System Network Architecture and may be used instead of TCP/IP, (Panko, 2001).

## **Sniffer**

A sniffer is a device that is capable of eavesdropping on telecommunications traffic, capturing passwords and data in transit, (Basel Committee on Banking Supervision, 2003b).

## **Spoofing**

This is impersonating a legitimate client through use of his/her account number, password, personal identification number (PIN) and or email address, (Basel Committee on Banking Supervision, 2003b).

## **Strategy**

A company's strategy consists of the combination of competitive moves and business approaches that managers employ to please clients, compete successfully, and achieve organizational objectives, (Thompson and Strickland, 2001).

## **SWIFT**

This stands for Society for Worldwide Interbank Financial Telecommunication, (Central Bank of Kenya, 2004a).

## **TCP/IP**

This stands for Transmission Control Protocol/ Internet Protocol – a set of commands and communications protocols used by the Internet to connect dissimilar systems and control the flow of information, (Lawrence *et. al.*, 2002).

## **UNCITRAL**

This stands for United Nations Commission on International Trade Law. ([www.un.org](http://www.un.org)).

## **Very Small Aperture Terminal (VSAT)**

This is a broadcasting system whereby a satellite uses a small dish to broadcast the signal to many receivers in a region. Usually, receivers have small antennas, (Panko, 2001).

## **Wireless Application Protocol (WAP)**

WAP is an open global standard for communication between mobile handsets, pagers, personal digital assistants, other wireless terminals and the Internet or other computer applications. WAP-based technology enables the design of advanced, interactive and real-time mobile services such as mobile banking or Internet based news services, which can be used in digital mobile phones or other mobile devices, ([www.thuraya.com](http://www.thuraya.com)).

## **World Wide Web (WWW)**

This is a graphical hypertext environment that operates within the Internet, (Lawrence *et al.*, 2002).