UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS

E-Readiness Status and Academic Performance in Technical Training Institutions in Kenya

Case of Diploma in Information Technology

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DECLARATION

I hereby declare that this project, as presented in this report, is my original work and has not been presented for any other university award.

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ABSTRACT

Many technical training institutions are currently investing in information and communication technology so that they can improve ICT infrastructure and indirectly, the e-readiness status. By attaining high levels of e-readiness status, it is a conventionally accepted perception that the overall academic performance of the institutions will improve. However, despite these efforts, the academic performance of some institutions has been poor raising concern over the actual effectiveness of the ICT projects undertaken.

This project therefore aimed at exploring the *correlation* (if any) that exists between *e-readiness status* and *academic performance* of technical training institutions in Kenya with a special focus on Diploma in Information Technology course.

The project involved three major activities:

(i) Developing an e-readiness assessment model appropriate for technical training institutions.

(ii) Carrying out a diagnostic e-readiness assessment of the sample institutions.

(iii) Establishing correlation between *e-readiness status* and *academic performance* for the sample institutions.

The project methodology involved carrying out both quantitative and qualitative research to obtain the e-readiness data while the national examination results for the last four years were obtained from the respective registrars of the sample technical training institutions selected. The *e-readiness* indexes were then compared with the *examination* results.

The preliminary results obtained were then analyzed through the use of statistical techniques to establish whether any relationship exists between the *two variables*. The results obtained indicated a *positive correlation*.

The positive correlation obtained implied that by raising the e-readiness status of an institution, the academic performance would ultimately increase. There is therefore need for technical training institutions to be made e-ready so as to improve academic performance.

ROBERT IRUNGU MWANGI

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List of Abbreviations

APEC	Asian Pacific Economic Cooperation
CSPP	Computer System Policy Project
CID	Centre for International Development
CIDCM	Center for international Development and Conflict Management
ICT	Information Communication Technology
ISP	Internet Service Providers
IT	Information Technology
KENET	Kenya Education Network
LAN	Local Area Network
Mbps	Megabit per second
NRI	Networked readiness index
PBX	Private Branch Exchange
PC	Personal Computer
TTI	Technical Training Institute
UPS	Uninterrupted Power Supply
WAN	Wide Area Network
NEPAD	New Partnership for African Development
ERSWEC	Economic Recovery Strategy on Wealth and Employment Creation

CHAPTER 1

INTRODUCTION

The National ICT strategy for Education and Training (2006) identifies digital equipment, network infrastructure, technical support, digital content development, research and development, capacity building and integration of ICTs in education as some of the strategic pillars for ICT implementation in technical training institutions. This amounts to making technical training institutions to be e-ready. As such the achievement of high degree of e-readiness status has been placed as one of the top priorities of technical training institutions in Kenya. By attaining high levels of e-readiness status, it is a conventionally accepted perception that the overall academic performance of the institutions in national examinations will certainly be better. A great deal of time, money and effort has therefore been used in purchasing equipment and holding seminars and workshops towards the attainment of this goal.

In the light of these developments, there is therefore a need to have an assessment of the impact of e-readiness status on the academic performance so that as the principals of these institutions devote financial resources, time and effort, they do so with certainty and with confidence of achieving better results in virtually all areas. This will further assist these managers in creating strategies and action plans that will ultimately lead to accelerated development of the institutions.

This project therefore involved carrying out an e-readiness assessment of the institutions and the comparing the e-readiness results with the academic performance results with a view to establish any correlation that may exist between the two variables. Critical recommendations based on the results obtained are made at the end of the study.

1.1 DEFINITION OF E-READINESS

There are a variety of definitions of e-readiness as formulated by different organizations dealing with e-readiness assessment across the global. I look at a few of these definitions.

(i) The CSPP (2000) defines an e-ready community as one that has high-speed access in a competitive market; with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes; user privacy and

online security; and government policies which are favorable to promoting connectedness and use of the Network.

(ii) The CID (2000), the most acclaimed institution in e-readiness research defines an e-ready society is one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, many organizations online, ICTs used in everyday life, ICTs taught in schools), and the government (e-government); strong telecommunications competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investment.

(iii) The APEC (2000) defines e-readiness with respect to e-commerce preparedness, free trade, self-regulation industry, ease of exports, and compliance with international standards and trade agreements.

(iv) World Economic Forum Consultation Report on E-Readiness (2003) defines e-readiness as the ability of the ICT networks to effectively adapt to the social and economic advancement.

For the purposes of this project, the definition of **e-readiness** is be presumed to be *a measure of the degree to which an institution is ready or prepared to obtain the benefits which arise from information and communication technologies.*

1.2 RESEARCH PROBLEM AND CONTEXT

1.2.1 PROBLEM STATEMENT

Technical training institutions in Kenya have over the last four years been undergoing major developments in order to make them e-ready. This has involved large sums of financial resources, time and effort. However, despite these efforts, the academic performance of some institutions has been poor raising concern over the actual effectiveness of the ICT projects undertaken.

The purpose of this project was therefore to find out the effects of e-readiness status on academic performance in technical training institutions. The study focused specifically on Diploma in Information Technology, a course offered by many of these technical training institutions and examined by a common body, The Kenya National Examinations Council. The study aimed at answering one major question "*Is there positive correlation between e-readiness status and academic performance?*"

1.2.2 DEFINITION OF PROJECT HYPOTHESIS

Null Hypothesis H_0: *There exists no correlation between e-readiness status and academic performance.*

Alternative Hypothesis H_1: *There exists a positive correlation between e-readiness status and academic performance*

1.2.3 PROJECT OBJECTIVES

(i) To develop an e-readiness assessment model appropriate for technical training institutions in Kenya.

(ii) To carry out a diagnostic e-readiness assessment of sample technical training institutions.

(iii) To determine the *correlation* between e-readiness status and the academic performance in the institutions, for the specified course.

(iv) To develop a *regression model* that could be used to predict the academic performance of any institution given the e-readiness status.

(v) Determine the *correlation coefficient*, **r**, a measure of the *strength of the relationship* between the two variables.

(vi) To evaluate the *coefficient of determination*, the percentage of variation in academic performance due to e-readiness status.

(vii) To present the project findings to the principals of the institutions under investigation.

1.2.4 PROJECT JUSTIFICATION

There are various reasons for undertaking this research project.

(i) First, there is not a single study that has ever being carried out in technical training institutions in Kenya to determine the effects of e-readiness status on academic performance.

(ii) There is need to have a regression model that may be used to predict *academic performance* given *e-readiness status*. This is important especially when a given institution has performed poorly in national examinations.

(iii) Taking stock of the current e-readiness status while carrying out the project will greatly assist the management of these institutions formulate strategies that may help them to improve on certain critical areas.

(iv) Based on the amount of money being invested in ICT projects, there is need to have tangible evidence that the investment is producing positive impacts in the institutions' core functions.

CHAPTER 2

LITERATURE REVIEW

2.1 ORIGIN OF THE CONCEPT OF E-READINESS

The rapid rate of Internet penetration throughout the world and the dramatic advances in the use of information technology in business and industry, has occasioned a growing interest and literature on e-readiness not only in developed countries but also in developing countries as well. The concept of e-readiness was developed as a result of the need to provide a unified framework to evaluate the breadth and depth of the digital divide at macro level between more and less developed countries during the later part of the 1990s. This was followed by the emergence of various e-readiness assessment tools which were developed by different companies, organizations or groups with each group claiming its tool to offer better results. The Computer Systems Policy Project - a public policy advocacy group that comprises of the United States information technology companies, was the first to use the concept of e-readiness when it developed in 1998 an e-readiness assessment tool known as the "Readiness Guide for Living in the Networked World". From this first model by CSPP, other models have evolved as discussed later in this chapter.

2.2 E-READINESS ATTRIBUTES

(a) NETWORK ACCESS

The minimum necessary condition for e-readiness is access to adequate *network infrastructure*. Without access to global communications networks, no organization can participate in the Networked World. Access is determined by a combination of the *availability* and *affordability* of the network itself, as well as of the *hardware* and *software* needed for network interface. The *quality* and *speed* of the network are also important in determining how the network is used.

(i) Network Infrastructure

This refers to the physical hardware used to interconnect computers and users. Infrastructure includes the transmission media, telephone lines, routers, repeaters, and other devices that control transmission paths.

The infrastructure provides the necessary backbone that connects institutions to the global Internet. Sound network infrastructure is important for realization of quality services. Infrastructure development consumes large amounts of financial resources in ICT projects and it is important that management attention be directed to this component right from project initiation.

(ii) Internet Availability

Internet availability is partly affected by the Internet Service Providers that are providing the service. The range of services offered, the number of dial-up lines and the transmission capacity all influence an ISP's usefulness. The availability of leased lines is particularly important in making the Internet available to the institutions.

(iii) Internet Affordability

The prices which institutions pay for Internet access are in most cases determined by a combination of fees for basic telephony and ISP services. In organizations where the sum of ISP and telephony fees is prohibitively high, a disincentive to network usage exists, and access is curtailed. Pricing packages can be structured in ways that are conducive to Internet usage – per minute or hourly pricing (unlike flat rate pricing). The provision of tiered pricing packages can improve the affordability for many subscribers by allowing them to purchase only what they need.

(iv) Network Speed and Quality

The available bandwidth determines the number of users and types of online activities the network can support. Bandwidth-intensive activities, such as large file transfers or video streaming, may be unavailable to organizations with constrained access to the network. The quality of the network, including servers, also determines its usage. High numbers of network faults, poor connections, dropped connections and packet loss can render any network useless or operationally sub-optimal, thus discouraging use of and investment in new technologies.

(v) Hardware and Software

According to CID (2000), a vibrant market with numerous hardware and software options can encourage more specialized usage of the network, including ICT solutions that are tailored to organizational needs. More widespread retail and wholesale distribution channels for both

hardware and software increase opportunities to use the network within the organizations. The prices of hardware and software are particularly important if most of the organizations are to become ICT compliant.

(vi) Service and Support

A strong customer service orientation is important in determining the success of network deployment. Long waiting periods for installation and repair and a lack of support services by institutional ICT personnel, pose major obstacles to e-readiness. The quality and number of technical support professionals are essential in maintaining the network and providing service.

(b) NETWORKED LEARNING

(i) Access to Information and Communication Technologies

Institutes must integrate ICT tools into their learning processes if they are to be part of the Networked World. Programs that give students access to information and communication technologies in the classroom provide an important step to improving e-readiness. According to CID (2000), an organization's e-readiness in terms of access can be broken down into six broad areas: number of computers, physical access to the technology, types of computers, diffusion of the network, access to and organization of electronic content, and quality and speed of connectivity in the school.

(ii) Enhancing Education with ICTs

While putting ICTs into technical training institutions is an important step to e-readiness, the technologies need to be properly harnessed to improve the learning process.

Lectures must be trained to use the Internet and computers as tools for the students' benefit.

(iii) Developing the ICT Workforce

It is essential that there exist opportunities within the institutions to offer ICT workers essential skills such as software programming, hardware engineering and World Wide Web design. These opportunities are fundamental to creating a sustainable ICT industry and support the integration of ICTs into the institutions.

(c) NETWORKED SOCIETY

According to CID (2000), e-readiness depends upon the community's incorporation of information and communication technologies into the fabric of its activities in order to maximize the gains of joining in the Networked World. According to CID (2000), ICTs in society at large can have a profound effect upon people's professional and personal lives by providing easier access to information, more efficient ways to communicate and powerful organizational tools. According to CID (2000), in order to understand how a community is using ICTs, it is important to assess not only how many members of the community have access to the technologies, but also how they are using them.

(i) People and organizations online

According to CID (2000), one of the hardest indicators to track is the actual number of online users, particularly in the developing world, where multiple users share many electronic mail accounts and other online tools, there are few reliable indicators that accurately map how many people are online. The exponential growth in online usage also makes tracking current use difficult. This is nevertheless an important indicator. According to CID (2000), as more people access the Internet regularly and networks of users grow, there is greater demand and opportunity for online interaction, as well as better meshing with the Networked World at-large. As more organizations gain an online presence, it becomes more likely that the community will use information and communication technologies to augment or carry out its activities and needs.

(ii) Locally Relevant Content

Community members find the Internet medium more useful and relevant to their own lives when online content reflects their own interests and needs. Locally relevant content is a major driver of growth of Internet usage. Interactions such as chat rooms, online interest groups, special interest software, bulletin boards, listservs and websites all drive the community to use ICTs more widely in their lives. Similarly, online content is more relevant when it is available in local languages.

(iii) Information and Communication Technologies in Everyday Life

According to CID (2000), communities participate more directly in the Networked World when information devices, such as radios, faxes, televisions, telephones, pagers and

computers are culturally accepted and widely incorporated into daily life. It is important to examine both penetration of ICT devices into a community and their applications. In communities where either income levels or the network infrastructure cannot support high levels of individual access, public shared facilities provide a needed alternative. Such venues may include telecenters, cyber cafés and community information centers. Strategies for drawing people in to use these facilities are essential.

(iv) Information and Communication Technologies in the Workplace

According to CID (2000), the more that business and government offices are already using information and communication technologies, the better prepared they are to participate in the global networked economy. CID (2000) further notes that in order to realize important efficiency gains from ICTs, businesses and governments need to not only make technologies available to their employees, but also effectively incorporate them into their core processes.

(d) NETWORK POLICY, SECURITY AND ICT STRATEGY

(i) Network security

The terms Network Security and Information Security are often used interchangeably. Network Security is generally taken as providing network protection against unauthorized people. Information Security, however, explicitly focuses on protecting data resources from malware attack or simple mistakes by people within an organization.

(ii) ICT Privacy issues

Privacy is the ability of an individual or group to seclude themselves or information about themselves and thereby reveal themselves selectively. The boundaries and content of what is considered private differ among cultures and individuals, but share basic common themes. Institutions need to keep certain information/data private and it is therefore important that necessary policies are instituted for the betterment of all stakeholders.

(iii) ICT Copyright issues

Copyright is a form of intellectual property that gives the author of an original work exclusive right for a certain time period in relation to that work, including its publication, distribution and adaptation, after which time the work is said to enter the public domain.

Copyright applies to any expressible form of an idea or information that is substantive and discrete and fixed in a medium. Some jurisdictions also recognize "moral rights" of the creator of a work, such as the right to be credited for the work.

(iv) ICT Strategy

The Information and Communication Technology (ICT) Strategy defines the technical direction and framework for institutional developments, services and risk management.
It is envisaged that this strategy will act as a guide for the development and management of ICT for a predefined period of time.

The aims of the ICT Strategy are to:

- Define the technical direction and framework for developments in the infrastructure and administrative and academic applications that involve use of information technology.
- Define the principles and standards that permit data sharing, integration and devolvement of systems that will lead to efficient and coherent working.
- Cover issues such as security and disaster recovery

2.3 DISCUSSION OF PREVIOUSLY USED E-READINESS ASSESSMENT TOOLS

Various e-readiness assessment tools have been used over the past few years. Each tool gauges how ready a society or economy is to benefit from information and communication technology. The range of tools use varying definitions for e-readiness and different methods for measurement.

For each assessment tool, the following questions are answered in this discussion: *What is the goal of the tool? What is measured? Who created the tool? How is 'e-readiness' defined? How is assessment carried out? What is produced?*
The range of available tools is broken down into different categories.

2.3.1 READY-TO-USE TOOLS -QUESTIONNAIRES

2.3.1.1 CSPP's readiness guide for living in the networked world

Who created the tool?

The Computer Systems Policy Project (CSPP) developed this tool. It was published in 1998, and is available at www.cspp.org. CSPP is a "public policy advocacy group comprised of the Chairmen and Chief Executive Officers" of US information technology companies.

What is the tool's goal?

This self-assessment tool is designed to help individuals and communities determine how prepared they are to participate in the "networked world".

What does it measure?

The guide measures the prevalence and integration of ICTs in homes, schools, businesses, heath care facilities, and government offices, with additional focus on competition among access providers, speed of access, and government policy. Measurements are divided into five categories:

1. Infrastructure;
2. Access;
3. Applications and services;
4. Economy; and
5. "Enablers" (policy, privacy, security, ubiquity).

How does it define 'e-readiness'?

An 'e-ready' community has high-speed access in a competitive market; with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are "favorable to promoting connectedness and use of the Network."

How is the assessment carried out?

The CSPP Readiness Guide provides a series of 23 questions, for community members to ask about the community itself. For each question, the users choose from a set of answers, which

represent four progressive "stages" of development. The 23 questions are divided into the five categories listed above.

What result does it produce?

The assessment produces a rating that indicates which of four progressive stages of development the community is at for each of the five categories listed above. "An overall 'score' for the community can be estimated by simply averaging the scores across the criteria."

2.3.1.2 CID's Readiness for the Networked World: A Guide for Developing Countries

Who created the tool?

The center for International Development at Harvard University developed this guide. It was published in 2000, and is available at www.readinessguide.org. It draws from the CSPP guide, described earlier.

What is the tool's goal?

"The guide systematically organizes the assessment of numerous factors that determine the Networked Readiness of a community in the developing world." This assessment is meant to serve as a basis for further analysis and planning.

What does it measure?

This guide measures 19 different variables classified as follows:

(i) Network access (Information Infrastructure, Internet Availability, Internet Affordability, Network Speed and Quality, Hardware and Software, Service and Support)

(ii) Networked learning (Schools' Access to Information and Communication Technologies, Enhancing Education with ICTs, Developing the ICT Workforce)

(iii) Networked society (People and Organizations Online, Locally Relevant Content, Information and Communication Technologies in Everyday Life, Information and Communication Technologies in the Workplace)

(iv) Networked economy (ICT Employment Opportunities, Business-to-Consumer (B2C), Electronic Commerce, Business-to-Business (B2B) Electronic Commerce, E-Government)

(v) Network policy (Telecommunications Regulation, ICT Trade Policy)

How does it define 'e-readiness'?

An 'e-ready' society is one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, many organizations online, ICTs used in everyday life, ICTs taught in schools), and the government (e-government); strong telecommunications competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investment.

How is the assessment carried out?

The guide provides a grid (See appendix B) with descriptions of four stages of advancement in each of 19 categories (placed into five groups). Communities estimate their current stage of development in each category. No prescription is given on how that estimate should be made.

What results does it produce?

The guide rates the 'stage' a community is in for each of the 19 categories, and descriptions are given of what is required to be in a particular stage. "The Guide does not offer prescriptions for improved Readiness."

2.3.1.3 APEC's E-Commerce Readiness Assessment

Who created the tool?

The Asian Pacific Economic Co-operation (APEC) Electronic Commerce Steering Group developed this guide. It was published in 2000, and is available at http://www.ecommerce.gov/apec

What is the tool's goal?

"To help governments develop their own focused policies, adapted to their specific environment, for healthy development of e-commerce."

What does it measure?

Six categories are measured for "readiness for e-commerce:"

1. Basic infrastructure and technology (speed, pricing, access, market competition, industry standards, foreign investments),
2. Access to network services (bandwidth, industry diversity, export controls, credit card regulation),
3. Use of the Internet (use in business, government, homes),
4. Promotion and facilitation (industry led standards),
5. Skills and human resources (ICT education, workforce), and
6. Positioning for the digital economy (taxes and tariffs, industry self-regulation, government regulations, consumer trust).

How does it define 'e-readiness'?

A country that is 'ready' for e-commerce has free trade, ease of exports, and compliance with international standards and trade agreements.

How is the assessment carried out?

Participants are asked 100 multiple-choice questions grouped into six categories listed above. The possible answers indicate progressive levels of e-readiness for a country. No overall scoring occurs.

What result does it produce?

The product of the assessment is the answer to the 100 questions. Countries are supposed to work areas with less than optimal answers, since they are "impediments…to the deployment of e-commerce."

2.3.2 THIRD PARTY SURVEYS AND REPORTS

2.3.2.1 McConnell International's Risk E-Business: Seizing the Opportunity of Global E-Readiness

Who created the tool?

McConnell International prepared this report in collaboration with World Information Technology and Services Alliance (WITSA), and it was released in August 2000. It is available at http://www.mcconnellinternational.com/

What is the tool's goal?

To assess a national economy's e-readiness, or "capacity to participate in the global digital economy."

What does it measure?

The report measures five areas:

1. Connectivity (infrastructure, access and pricing),
2. E-leadership (government policies and regulations),
3. Information security (intellectual property, privacy, electronic signatures),
4. Human capital (ICT education, available skilled workforce), and
5. E-business climate (competition, political and financial stability, foreign investment, financial infrastructure).

How does it define 'e-readiness'?

An 'e-ready' country has extensive usage of computers in schools, businesses, government and homes; affordable reliable access in a competitive market; free trade; skilled workforces and training schools; a culture of creativity; government-business partnerships; transparency and stability in government and an evenly enforced legal system; secure networks and personal privacy; and regulations allowing digital signatures and encryption.

How is the assessment carried out?

For each country and each category, the report performs a "dynamic evaluation of the relevance and accuracy of available quantitative data with an understanding of myriad cultural, institutional, and historical factors." These general ratings and their narratives can be used as a starting point for further planning.

What result does it produce?

Countries are rated in the five categories listed above on a scale of one to three ('blue,' 'amber,' 'red'), and extensive analysis and recommendations are given.

2.3.2.3 CIDCM's Negotiating the Net Model

Who created the tool?

The Leland Initiative Telematics for Africa project at the Center for international Development and Conflict Management (CIDCM) at the University of Maryland developed this tool and was published in 2001.

What is the tool's goal?

To help advance the diffusion of ICTs in developing countries, especially Africa, by helping decision-makers improve the processes of negotiating through which ICTs are diffused by governments, NGOs and the private sector.

What does it measure?

The framework measures four categories of information for each country:

1. Background and history – structural context (economy, education levels, existing infrastructure), political structure and culture (type of government, policy making style), cultural norms (religion, etc).
2. Key players in Internet development – responsibilities and objectives of relevant players in government, local and foreign businesses, universities, NGOs, international financial institutions, research groups.
3. Internet development and ICT policy over time – access, regulation, competition.
4. Negotiations between players in developing the country's Internet – each aspect of Internet development and ICT policy is categorized into one of four stages (pre-commercial, commercial, competitive, and consolidated). 'Negotiation' between players is the focus of the framework – the rest is supporting information.

How does it define 'e-readiness'?

An 'e-ready' society has an ISP market that has passed through three phases of development: (1) pre-commercial (access limited to a pioneer community), (2) commercial (access is sold

to consumers), and (3) competitive (the ISP market has multiple competing actors). The negotiations between actors should be transparent, conclusive, speedy and inclusive of the major players in public, private and NGO sectors.

How is the assessment carried out?

The assessment is conducted through interviews with key actors in the relevant institutions and draws upon a range of background statistics and information as outlined above.

What result does it produce?

A detailed narrative describing the processes and outcomes of negotiations between key players over the phases of development, identifying major contentious issues likely to remain problematic in the future.

2.4 OVERVIEW OF E-READINESS AT GLOBAL LEVEL

Many countries and organizations across the world have realized the enormous potential Information and Communication Technology plays in accelerating their development. As such, these countries and organizations have found it important to take stock of the state of the e-readiness by appraising the status of the underlying infrastructure, human resources, policies and investment climate at regular interval. For example, the Economic Intelligence Unit, business arm of The Economic Group, publisher of *The Economist* newspaper, has published an annual e-readiness ranking of the world's largest economies since 2000.

The e-readiness rankings by this body are a weighted collection of nearly 100 quantitative and qualitative criteria, organized into six distinct categories measuring the various components of a country's social, political, economic and of course technological development.

The underlying principal behind the rankings is that digital business is crucial to national economy and for digital transactions to be widely adopted and efficient, they have to thrive in a holistically supportive environment (Economic Group 2005).

2.5 OVERVIEW OF E-READINESS IN AFRICA

In Africa, e-readiness initiatives are being driven by the World Economic Forum and the e Africa Commission ICT Task Team responsible for developing NEPAD ICT program and implementing its projects. The World Economic Forum-NEPAD E-readiness Policy Programme has the goal of helping African countries to develop e-readiness policies and to remove or reduce the policy obstacles that limit the use of ICTs throughout the region. According to Bridges.org (2003), some of the activities that have so far been undertaken by the World Economic Forum-NEPAD E-readiness Policy Programme.

- Establishing collaboration with the e-Africa Commission;
- Identifying key actors and mechanisms to engage them;
- Collecting information on basic e-readiness in African countries;
- Creating a framework for examining the issues, and proposing country; groupings according to e- readiness levels.

According to Bridges.org (2003), key findings about e-readiness in Africa undertaken by the World Economic Forum- NEPAD E-readiness Policy Programme show that there is unanimous agreement among Africa's leaders and pan-African structures on the benefits that ICT could bring and the impact it could have on a wide range of development issues.

2.6 OVERVIEW OF E-READINESS BY KENET

KENET, an organization providing Internet connection to public and private universities in Kenya recently carried out a study whose objective was to assess the level of preparedness of Higher Education (HE) institutions in Kenya to use Information and Communication Technologies in teaching, learning, research, and management.

The study included 17 universities, eight middle-level colleges (including polytechnics), and five research institutions that are members of the body. The assessment was conducted using a diagnostic tool derived from the Center for International Development at Harvard University. The study concluded that the higher education community, especially the university community in Kenya, was *ready to use ICT for learning, teaching, research and management* but observed that the institutional leadership did not yet consider ICT a strategic priority for their institutions. The study noted that the institutions were allocating low

operational budgets to ICT, were not investing adequately in campus networks and they were not giving attention to the use of ICT to enhance education and research (KENET, 2007).

This was the first e-readiness assessment to be carried out in educational institutions in Kenya. The study made several recommendations one of which was to carry a similar assessment in other institutions not covered by the study such as teachers' training institutions.

2.7 NATIONAL ICT STRATEGY FOR EDUCATION AND TRAINING

The Ministry of education, sector partners and stakeholders have developed the National ICT Strategy for Education and Training (2006) aimed at guiding the education sector in the adoption of ICTs across all levels of education and training. The strategy was developed by taking into consideration the policy environment captured in the National ICT Policy of 2006. The strategy was been developed in line with the E-Government Strategy of 2004 and the wider Economic Recovery Strategy Paper for Wealth and Employment Creation (ERSWEC). The strategy identifies the following strategic pillars for education sector ICT implementation:

- Establishment of a policy framework
- Digital equipment
- Connectivity and network infrastructure
- Technical support
- Harnessing emerging technologies
- Digital content development
- Integration of ICTs in education
- Training (capacity building including professional development)
- Research and development
- Partnerships and resource mobilization
- Legal and regulatory framework, and
- Monitoring and evaluation.

It is in the light of this strategy that technical training institutions in Kenya have taken steps towards making the institutions e-ready.

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGN

3.1 INTRODUCTION

A methodology can be defined as a set of techniques that researchers use to carry out an enquiry by systematically gathering information to describe, explore, explain or predict a phenomenon of interest. The methodology involved in this project used of both quantitative and qualitative research. Quantitative research focuses on determining facts and the relationships among variables and seeks to describe observations through statistical analysis of data. On the other hand, qualitative research refers to a descriptive study that is aimed at collecting and analyzing in-depth narrative data that provide information about the subjective meaning of human experiences and phenomena, usually conducted in the natural setting.

The project hoped that by combining two research approaches (quantitative and qualitative), a more comprehensive study would be carried out that would give more accurate results and more valid conclusions at the end of the process.

3.2 RESEARCH DESIGN

Research design is the logical sequence that connects the empirical data to a study's initial research questions and ultimately to its conclusions. The research design consists of a plan to answer the research question or test the hypothesis. It includes the plan of how to measure the concepts of interest, determine who will participate and how they will be selected, what setting will be used, what data collection procedures will be employed, and how the data will be analyzed.

This project used a two-phased research design, the quantitative and the qualitative survey respectively.

3.3 POPULATION AND SAMPLING PROCEDURE

Sampling can be defined as the representation of subsets making up the population from which results could be generalized. How well a sample represents a population depend on the sample frame, the sample size and the specific design of the selection procedure.

SAMPLING PROCEDURE: QUANTITATIVE SURVEY OF THE RESEARCH

There is no certain rule of thumb to determine the sample size. Some researchers do, however, propose a sample size of 30% of the population. Based on this rule, the expected sample size from a population of 42 is given by:

Sample size **n** = 30% x 42 = 12.6; which means about 13 institutes.

The actual sample size for the study consisted of 10 technical training institutes out of 42 institutions. The decision to use sample rather than cover the entire population was largely influenced by lack of sufficient funds to cover the whole population. The selection criterion was based on representation by province but due to the high cost of covering Coast , Western, Nyanza and North Eastern province, four provinces were selected namely Nairobi, Rift Valley, Eastern and Central. All the institutes offer similar courses and therefore by taking a sample representative, it was presumed that this would give a fairly true picture of all the technical training institutes in the Kenya. For the sample population selected, questionnaires were developed and administered to the heads of ICT departments.

SAMPLING PROCEDURE: QUALITATIVE SURVEY OF THE RESEARCH

During the qualitative survey of the research, five people were selected for the interview from each department. The composition included two teachers and three students. The use of qualitative approach during the survey research was to enable the researcher to confirm some of the issues which were not clear from the quantitative survey and also to get a deeper insight from all the stake holders. This way, it was presumed that the researcher would be able to generate sound theoretical framework that fits a reflection of reality.

3.4 DATA COLLECTION PROCEDURE

Data collection procedure involved the use of a questionnaire for quantitative research and use of interviews for the qualitative research.

DATA COLLECTION PROCEDURE: QUANTITATIVE SURVEY OF THE RESEARCH

Data collection procedure during the quantitative survey involved the use of a short self-administered questionnaire (see Appendix D) to heads of ICTs of various institutions. The questionnaires were delivered to the respondents' institutions by the researcher. The delivery of the questionnaires was accompanied by a letter explaining the purpose of the research and requesting that the questionnaire be completed by the head of ICT.

The respondents were given up to three weeks to complete the questionnaires which would then be collected by the researcher. Before the researcher collected the completed questionnaires from the institutions, attempts were made to remind the respondents through telephone of the impending visits. This approach helped to encourage the respondents who had not completed the questionnaires to do so.

DATA COLLECTION PROCEDURE: QUALITATIVE SURVEY OF THE RESEARCH

The qualitative survey involved use of face-to-face interviews that were conducted in various institutions (See appendix E) mainly to explore the opinions of lecturers and students on issues that could not have been achieved by using the structured questionnaire. The researcher prepared the questions to be asked two months ahead of the interview and also informed the institutions of the impending visits. The respondents were also given enough time to prepare so that they could voluntarily give the required information without pressure.

The researcher prepared himself adequately prior to the interview so as to ensure that everything proceeded smoothly.

The researcher interviewed five people from the ICT departments. Each interviewee was briefed on the information concerning the goals of the study and the purpose of conducting the interviews. Each interview lasted between 30 and 45 minutes.

The choice of face-to-face interviews as the data collection method for the qualitative data was motivated by several factors.

(i) Interviews give a researcher an opportunity to motivate the interviewees so that they can respond freely and openly to questions.

(ii) Interviews allow a researcher to probe for more feedback from the interviewee.

(iii) Interviews give a researcher an opportunity to observe the interviewee's body language.

3.5 FRAMEWORK FOR E-READINESS ASSESSMENT OF TECHNICAL TRAINING INSTITUTIONS

A special framework was developed for the purpose of this project research. The framework was designed to meet the specific needs of technical training institutions although it owed much of its structure to the existing e-readiness tools developed by other bodies.

ADAPTATION OF E-READINESS ASSESSMENT MODEL

The project used an e-readiness assessment framework based on a combination of existing e-readiness models, including the CSPP[1] "Readiness Guide for Living in the Networked World", APEC[2] "E-commerce Readiness Assessment" and CID[3] "Readiness for the Networked World: A Guide for Developing Countries". These three tools consisted of a total of 37 e-readiness indicators. However, some of the indicators were not relevant to technical training institutes. For example, *ICT trade policy*, *Telecommunication Regulation*, *Networked Economy*, *Business-to-Consumer electronic commerce*, *Business–to-Business electronic commerce* and *E-government* were not relevant to technical training institutes and were therefore not adapted. Apart from eliminating some of the 37 indicators, the project introduced two new indicators and renamed some of the indicators. The two new indicators added were *ICT in libraries* and *ICT strategy*. These two indicators are significant to technical training institutes and as such had to be incorporated. This gave rise to a total of 17 indicators. Details of factors adapted/rejected are as shown in table 1.

[1] Computer System Policy Project www.cspp.org

[2] Asia Pacific Economic Cooperation Electronic Commerce Steering Group, www.commerce.gov.apec

[3] Centre for International Development, www.readinessguide.org

Table 1 : Details of factors adapted/rejected

NO.	INDICATOR	SOURCE	RELEVANCE TO TECHNICAL T.T.Is
1	▪ Network Infrastructure	CID, CSPP, APEC	This indicator was relevant to technical training institutes as a network is a necessity for connectivity and information dissemination in the institutes. It was therefore adapted.
2	▪ Internet Availability	CID	This factor was relevant to technical training institute as Internet is one the core technology used in academic research and was therefore adapted
3	▪ Internet Affordability/Price	CID, APEC	This factor was relevant to technical training institute as it determines how much bandwidth an institution can afford was therefore adapted
4	▪ Network Speed and Quality	CID, APEC	This factor was relevant to technical training institute as it determines how fast information may be retrieved on the Internet and was therefore adapted
5	▪ Network reliability	APEC	This factor was relevant to technical training institute as it determines the credibility of the network and was therefore adapted.
6	▪ Infrastructure market conditions	APEC	This factor was not relevant to technical training instates and was therefore *not* adopted.
7	▪ Interconnection and interoperability	APEC	This factor was relevant to technical training institute as it how sound the network is and was therefore adapted as *Network Access*
8	▪ Access to necessary services	APEC	This factor was relevant to technical training institute as it determines services provided and was therefore adapted but renamed as *Service and support.*
9	▪ Current level and type of use of the Internet	APEC	This factor was relevant to technical training institute as it determines Internet usage and was therefore adapted
10	▪ Access to ICTs	APEC	This factor was relevant to technical training institute as it determined students and lecturers access to ICT and was therefore adapted
11	▪ ICT Hardware and Software	CID, APEC	This factor was relevant to technical training institute as it forms the core of ICT and was therefore adapted
12	▪ Enhancing Education with ICTs	CID	This factor was relevant to technical training institute it determines ICT adoption in training and was therefore adapted
13	▪ Security for ICT equipment and software.	APEC	This factor was relevant to technical training institute as it determines security of ICT resources and was therefore adopted
14	▪ ICT privacy issues	APEC	This factor was relevant to technical training institute as it relates to confidentiality of information in institutes and was therefore adapted
15	▪ ICT Service and	CID	This factor was relevant to technical training

	Support		institute and was therefore adopted
16	▪ ICTs in libraries.	New	This was a new factor introduced that determines the level of automation in libraries.
17	▪ People and Organizations Online	CID	This factor was relevant to technical training institute as it determines the adoption of ICT and was therefore adopted
18	▪ ICT copyright issues	CID, APEC	This factor was relevant to technical training institute as it determines legality of software; patent and was therefore adopted
19	▪ ICT strategy	New	This factor was relevant to technical training institute as it determines current and future projections and was therefore adopted
20	▪ Relevant software	CID	This factor was relevant to technical training institute and was therefore adapted
21	▪ Locally Relevant content	CID	This factor was relevant to technical training institute as it determines relevance of information held in institutes' websites and was therefore adapted
22	▪ Schools' Access to ICTs	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
23	▪ Developing ICT workforce	CID	This factor was relevant to technical training institute as it relates to production of skilled ICT staff and was therefore adopted
24	▪ ICTs in everyday life	CID	This factor was relevant to technical training institute as it related to ICT adoption and was therefore adapted
25	▪ ICTs in workplace	CID	This factor was relevant to technical training institute as it related to ICT adoption and was therefore adapted
26	▪ ICT employment opportunities	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
27	▪ Business-to-Consumer electronic commerce	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
28	▪ Business–to-Business electronic commerce	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
29	▪ E-government	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
30	▪ Telecommunication regulation	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
31	▪ ICT Trade policy	CID	This factor was not relevant to technical training instates and was therefore *not* adopted.
32	Promotion and facilitation activities	APEC	This factor was not relevant to technical training instates and was therefore *not* adopted.
33	Skills and human resources	APEC	This factor was relevant to technical training institute and was therefore adapted and combined with *Developing ICT workforce* from CID.
34	Legal framework	APEC	This factor was not relevant to technical training instates and was therefore *not* adopted.

35	Electronic authentication	APEC	This factor was not relevant to technical training instates and was therefore *not* adopted.
36	Security and Encryption	APEC	This factor was relevant to technical training instates and was therefore adopted and renamed as *Security for ICT equipment and software.*
37	Copyright	APEC	This factor was relevant to technical training instates and was therefore adopted but renamed as ICT copyright issues.

The 17 ICT indicators were grouped under four categories as follows:

(i) Network Access (Network infrastructure, Internet availability, Internet affordability, Network speed and quality, ICT hardware and software, ICT service and support).

(ii) Networked learning (Access to ICTs, Enhancing education with ICTs, Developing ICT workforce, ICTs in libraries)

(iii) Networked society (People and organizations online, Locally relevant content, ICTs in the workplace).

(iv) Network Security and ICT strategy (Security for ICT equipment and software, ICT privacy issues, ICT copyright issues, ICT strategy)

The grouping of indicators was based on relevance. For example all factors based on the network: i.e. its infrastructure, its availability, quality and speed are all related to one thing and were therefore grouped together as *Network access* for easier analysis.

The resulting model arising from these indicators is as shown in figure 1.

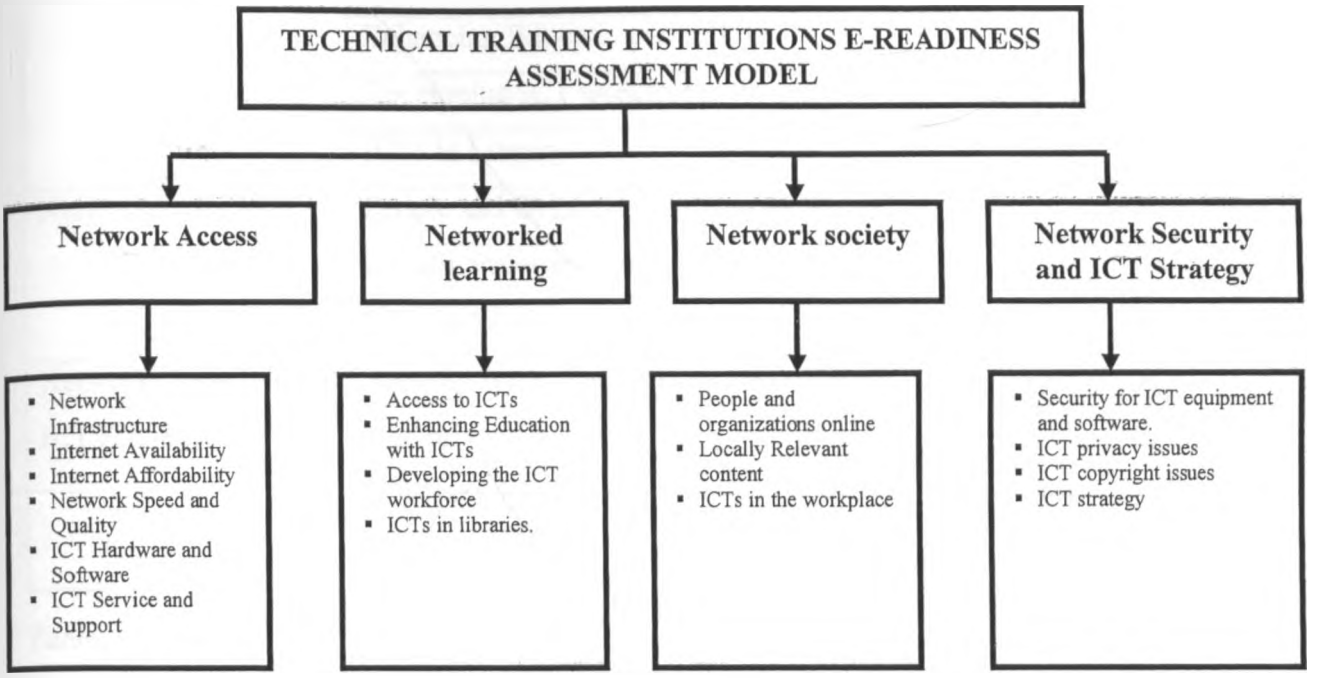

Figure 1: Structure of technical training institutions e-readiness assessment model (Adopted from Bulgarian E-readiness Assessment Model)

3.6 DEVELOPMENT OF RESEARCH QUESTIONNAIRES

The development of the research questionnaire was based on the e-readiness assessment model designed for technical training institution shown in figure1.

Questions were designed from the four main broad categories of indicators and each sub-indicator had at least two or more questions designed so as to capture the relevant data from the institutions. The number of questions per sub-indicator depended on the amount of details that could be extracted from the sub-indicator domain.

The breakdown of the questions was as shown in the table below:

INDICATOR CATEGORY	SUB-INDICATORS	NUMBER OF QUESTIONS
Network access	Network Infrastructure	5
	Internet Availability	12
	Network Speed and Quality	2
	ICT hardware and software	11
	ICT service and Support	3

Networked learning	Access to ICTs	14
	Enhancing Education with ICTs	6
	Developing ICT workforce	6
	ICTs in Library	13
Networked Society	People and Organizations Online	5
	Locally Relevant Content	7
	ICTs in Workplace	11
Network Security and ICT Strategy	Security for ICT equipment and software	13
	ICT privacy issues	5
	ICT copyright issues	6
	ICT strategy	12

Table 2: Framework of the questions

3.7 FORMULA USED FOR COMPUTING E-READINESS

Once data was collected on each of the 17 indicators across the 4 different categories, each indicator was given a score based on scale of 1 to 4 with 1 representing the state of unpreparedness while 4 represented full e-readiness status. The score was arrived at by comparing the indicator data against a set of predetermined factors (see appendix A) defining the characteristics of each stage of ICT development.

The following formula was used in computing overall e-readiness index for a given institute.

$$E\text{-}readiness_i = \Sigma_{j=1,n}\, e_{ij} / n$$

where

E-readiness: the overall e-readiness value

$_i$: institute

$_j$: each of the 17 indicators

e_{ij} : individual score for each indicator on a scale of 1 to 4

n: total number of measures (17)

CHAPTER 4

RESULTS

The data collected during the research was divided into two sections. The first section presented the e-readiness results of each institution while the second section presented the academic performance results. A summary of the results was presented at the end of each section.

4.1 E-READINESS RESULTS OF VARIOUS INSTITUTES

4.1.1 STATUS OF KINYANJUI TECHNICAL TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 104 -Number of telephone extensions: 12 -Number of external fixed lines connected to PBX: 2 -Mobile lines connected to PBX: 1 - Structured cabling installed in offices, library and computer labs	**Stage 2** (A teledensity of about 2 mainlines per 100 people)
Internet Availability	-Access to Internet through wireless leased line. -Capacity of the line: 512kbps -Distance between ISP and institute: within 40km. -Intranet present -No wireless LAN segments. -Size of LAN: 120 computers	**Stage 1.8** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- Total annual ISP charge: Ksh 528,000. -Total annual cost of fixed line: 120,000	**Stage 1.4** (Rates for local telephone calls are high enough to discourage extensive Internet use)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: 512kbps - PCs connected to the Internet are all Pentium IVs.	**Stage 2** Leased lines available with transfer speeds of up to 1MB.
ICT Hardware and Software	-Value of ICT hardware: 2.5m -No. of ICT applications: 1 MIS system. - Currently the institute has 120 desktop computers, 1 communication server, and 1 MIS server. MIS system caters for financial, academic, and timetabling.	**Stage 1.6** Some hardware and software solutions available locally.

	- Institute has 7 printers, 2 laptops. 1 printer connected to LAN.	
Service and Support	- There are 5 ICT professionals, 2 hardware technicians and 1 network administrator. MIS system maintained through contract agreement with supplier i.e. Spreading Wings Company Ltd.	**Stage 2.1** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 3: Kinyanjui T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- 1 mail, 1 application server available.120 connected to Internet. 3 computer labs with 30 computers per lab. Computers available to students from 8.00 am to 6.00 pm Monday to Friday and 9.00am to 1.00pm of Saturdays. Academic staff from ICT have 8 computers reserved for them. Students do not have an institutional e-mail. Students to computer ration: **5: 1**	**Stage 2.1** Computer labs open during the day and closed after school. A LAN present interlinking PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 7%. Only ICT staff uses the productivity software tools. ICT not integrated into the curriculum.	**Stage 1.4** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- No training programs currently exist for training ICT workforce mainly due to lack of funds. However, occasionally, the Computer for Schools, an NGO organizes training workshops for ICT technicians and lecturers.	**Stage 1** Training opportunities for programming, maintenance, support, web design etc non-existent.
ICTs in libraries	- Library not automated. However it has 7 computers connected to Internet to supplement few books available. No budget for automation and ICT operations. Highest qualification for librarian: diploma.	**Stage 1.6** Library not automated but there is Internet installed

Table 4: Kinyanjui T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail and search for materials major usage of the Internet. - No Kenyan registered domain name. Currently no corporate e-mail system, arrangements are in place to install it by the end of august 2010.	**Stage 1.5** Less than 0.5% of the population has used Internet facility.
Locally relevant content	- No web based services. However, the institutes website is currently being developed and is expected to contain locally relevant materials	**Stage 1.1** No web site exists providing information on the institute.
ICTs in workplace	-PBX, cyber café's and networked applications present. -11 employees linked to networked applications.	**Stage 2.2**

Table 5: Kinyanjui T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated every 14 days. - No firewall installed. No protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room. Data backup on weekly bases. No off-site data backup.	**Stage 1.6** Although, there is licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Currently not available although the institutes overall institute's strategic plan has sections dealing with ICT.	**Stage 1.5** There is no ICT strategic policy

Table 6: Kinyanjui network security and ICT strategy indicators

4.1.2 STATUS OF KABETE TECHNICAL TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	- 12 telephone extensions connected digital PBX. - The institute has 4 fixed landline and two wireless lines. - Structured cabling installed in offices, library and computer lab.	**Stage 2.1** (A teledensity of less than 2 mainlines per 100 people)
Internet Availability	- Internet available through wireless leased line service. - Bandwidth 512kbps.	**Stage 1.9** (There is provision for full Internet access through leased lines by ISP, but no intranet)
Internet Affordability	- The institute spends Ksh 1,200,000 annually.	**Stage 2** (Institute able to finance because of large student population)
Network speed and Quality	- 512 Kbps provided via wireless connection. - No monitoring of packet loss. - PCs connected to the Internet are all Pentium IVs.	**Stage 2.4** Leased lines available with transfer speeds of up to 512 kbps.
ICT Hardware and Software	- Currently the institute has 130 desktop computers, 9 printers - MIS system automates finance department.	**Stage 2.2** Some hardware and software solutions available locally.
Service and Support	- There are 12 ICT professionals, 1 technician but no network administrator.	**Stage 1.7** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 7: Kabete T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- Mail, and application server available as one. -Networked computers connected to Internet. 2 computer labs. Computers available to students from 8.00 am to 6.00 pm Monday to Friday and Saturdays. -networked computers in academic staff offices. Students to computer ratio 50:1	**Stage 1.5** Computer labs open during the day and closed after school. No networked computers PIII and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 7-10%. Lectures use computers mainly for word processing, spreads, and database. ICT fully integrated into the curriculum but not used in classrooms for teaching.	**Stage 1.8** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying

		and pasting.
Developing the ICT workforce	- In-house training programs for junior ICT workforce. 4 ICT personnel are graduates of local universities. 2 employees have professional certification (MCSE).	**Stage 1.8** Training opportunities for programming, maintenance, support, web design etc non-existent.
ICTs in libraries	- Library not automated but a computer for keeping book details. No multimedia center.	**Stage 1.9** Library not automated

Table 8: Kabete T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail major usage of the Internet. - Institute has Kenyan registered domain name. However, no co-operate e-mail system available.	**Stage 1.5** Less than 0.5% of the population has used Internet facility.
Locally relevant content	- Information based website. Website hosted locally.	**Stage 2** Web site present providing information on the institute.
ICTs in workplace	-12 employees linked to PBX. However no cyber cafés and no networked applications	**Stage 1.7**

Table 9: Kabete T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers are not protected via licensed ant-virus software. - No firewall installed. No protection against Spam mail and Internet Spy ware. Labs physically secured. No electronic or radio alarm in the server room. Data backup on weekly bases. No off-site data backup.	**Stage 1** There is no licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Institute has an ICT strategic plan.	**Stage 1.8** There is no ICT strategic policy

Table 10: Kabete T.T.I network security and ICT strategy indicators

4.1.3 STATUS OF NAIROBI TECHNICAL TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	- The institute has 27 telephone extensions connected to PBX. - The institute has 2 fixed landlines and 1 wireless lines. No of employees. Teledensity ratio: - No structured cabling installed in offices and library	**Stage 2.5** (A teledensity of between 2 and 8 mainlines per 100 people)
Internet Availability	- Internet available through digital leased line at 512 kbps. - Institute has an Intranet linking 150 computers. - Institute's Website hosted by local ISP.	**Stage 2.3** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- The institute spends Ksh 960,000 annually for ISP charge.	**Stage 2.7** (Rates for local telephone calls are high enough to discourage extensive Internet use)
Network speed and Quality	- 512 kbps provided via wireless connection. No monitoring of packet loss on the Internet.	**Stage 2.6** Leased lines available with transfer speeds of up to 512 kbps.
ICT Hardware and Software	- Currently the institute has 140 desktop computers, 2 application servers and 13 printers. Out of these 70 computers and 3 printers are connected to the Intranet. Value of hardware in inventory Ksh 8,000,000. Total cost of software in the last financial year Ksh 100,000.	**Stage 2.6** Some hardware and software solutions available locally.
Service and Support	- There are 7 ICT professionals, 1 hardware technicians and 0 network administrator. MIS system maintained through contract agreement with supplier i.e. Spreading Wings Company Ltd.	**Stage 2.3** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 11: Nairobi T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- Institute has no 0 mail, 0 web and 1 application server. 70 computers connected to Internet. 2 computer labs with 40 computers per lab. Computers available to students from 8.00 am to 6.00 pm Monday to Friday.	**Stage 2.6** Computer labs open during the day and closed after school. No networked computers PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 20-40%. Lecturers mainly use word processing, spreadsheets and database systems. Lecturers communicate to students via e-mail. ICT not integrated into the curriculum.	**Stage 2.6** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- Training of junior ICT workforce mainly through external consultants. Institute has 7 ICT graduates from local universities. Total training budget for last year 2 million.	**Stage 2.2** There is limited Training opportunities for junior staff through external consultants.
ICTs in libraries	- Library fully automated. Issue desk function automated. Highest qualification for librarian: Diploma.	**Stage 2.7** Library automated

Table 12: Nairobi T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- Organization uses Internet mainly for communication and searching training materials. E-mail and search for materials major usage of the Internet. - Institute has a Kenyan registered domain name and co-operate e-mail system. 20 employees have individual corporate e-mail addresses.	**Stage 1.8** Less than 0.5% of the population has used Internet facility.
Locally relevant content	- Institute maintains information based website. The website is hosted in Kenya. Institute advertises its courses in the web site.	**Stage 2.7** Web site present providing information on the institute.
ICTs in workplace	-PBX, cyber café's and networked applications present. -8 employees linked to networked applications.	**Stage 2.4**

Table 13: Nairobi T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated every 365 days. - No firewall installed. No protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Computer lab safeguarded against physical theft. There is a radio alarm in the server room. Data backup on daily bases. No off-site data backup.	**Stage 2.8** There is licensed anti-virus software, however, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently no policy to regulate this issue but draft available.	**Stage 1.8** There is aggressive sensitization amongst staff.
ICT copyright issues	- Currently no policy to regulate this issue but institute had installed authentic software in its systems.	**Stage 1.7** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Institute has an ICT strategic policy aligned to overall corporate strategic plan by 25-50%. Main focus of the ICT strategic plan is to support administrative services, research, teaching and learning. In overall, ICT has brought efficiency and effectiveness.	**Stage 2.5** There is no ICT strategic policy

Table 14: Nairobi T.T.I network security and ICT strategy

4.1.4 STATUS OF MACHAKOS TECHNICAL TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	- 1 active telephone extension to digital PBX: 11 - The institute has 2 fixed landline and 0wireless lines. - Structured cabling installed in offices, library and computer labs.	**Stage1.8** (A teledensity of less than 2 mainlines per 100 people)
Internet Availability	- Internet available leased line at 256kbps. -90 computers in the LAN all connected to Internet.	**Stage 2** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- The institute spends Ksh 9,000 per month. This adds up to Ksh 500,000 annually.	**Stage 2.3** Institute has large number of students
Network speed and Quality	- 256 Kbps provided via copper leased line.	**Stage 1.7** Speed up to 1MB

ICT Hardware and Software	- Currently the institute has 90 desktop computers, 0 communication server, and 1 application server. - Institute has 6 printers, 2 laptops. 1 printer connected to LAN.	**Stage 1.9** Some hardware and software solutions available locally.
Service and Support	- There are 4 ICT professionals, 1 hardware technicians and 0 network administrator.	**Stage 1.8** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 15: Machakos T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- 0 mail, 0 web server available. 70 connected to Internet. 2 computer labs with 14 computers per lab. Computers available to students after lessons from Monday to Friday. No access on Saturdays. Students do not have an institutional e-mail.	**Stage 1.9**
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 60-80%. Only word processing, spreadsheets and DBMS used frequently. ICT not fully integrated into the curriculum.	**Stage 1.7**
Developing the ICT workforce	- No training programs currently exist for training ICT workforce.	**Stage 1.6**
ICTs in libraries	- Issue desk library service fully automated. Annual budget of Ksh 100,000 for automation and ICT operations.	**Stage 1.6** Library automated

Table 16: Machakos T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail and search for materials major usage of the Internet. - No Kenyan registered domain name. Currently no co-operate e-mail system.	**Stage 1.2** Less than 0.5% of the population has used Internet facility.
Locally relevant content	- No web based services. However, the institutes website is currently being developed and is expected to contain locally relevant materials	**Stage 1** No Web site present.
ICTs in workplace	- No PBX. However no cyber cafés and no networked applications	**Stage 1.4** ICT use only in offices

Table 17: Machakos T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated on weekly bases. - No firewall installed. No protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room. Data backup on weekly bases. No off-site data backup.	**Stage 1.2** There is licensed anti-virus software, however, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Currently not available although the institutes overall institute's strategic plan has sections dealing with ICT.	**Stage 1.2** There is no ICT strategic policy

Table 18: Machakos T.T.I network security and ICT strategy indicators

4.1.5 STATUS OF MASAI TECHNICAL TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 104 -Number of telephone extensions: 6 -Number of external fixed lines connected to PBX: 1 -Mobile lines connected to PBX: 0 - Simple LAN installed computer lab with 40 computers	**Stage 1.4** (A teledensity of less than 2 mainlines per 100 people)
Internet Availability	-Access to Internet through wireless leased line. -Capacity of the line: 64kbps -Distance between ISP and institute: over 100 km. -No Intranet present - -Size of LAN: 40 computers	**Stage 1** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- Total annual ISP charge: Ksh 500,000. -Total annual cost of fixed line: 120,000	**Stage 1.4** (Rates for local telephone calls are high enough to

		discourage extensive Internet use)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: 64kbps	**Stage 1.5** Leased lines available with transfer speeds of up to 1GB.
ICT Hardware and Software	-Value of ICT hardware: 750,00 -No. MIS system. - Currently the institute has 40 desktop computers all PIVs, 4 printers	**Stage 1.8** Some hardware and software solutions available locally.
Service and Support	- There are 4 ICT professionals, 1 hardware technicians and 1 network administrator.	**Stage 1.4** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 19: Masai T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	Computers available to students from 8.00 am to 5.00 pm Monday to Friday. Academic staff from ICT have 1 computers reserved for them. Students do not have an institutional e-mail. Students to computer ration: **10: 1**	**Stage 1.3** Computer labs open during the day and closed after school. A LAN present interlinking PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills:3%. Only ICT staff uses the productivity software tools. ICT not integrated into the curriculum.	**Stage 1** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- No training programs currently exist for training ICT workforce mainly due to lack of funds.	**Stage 1.2** Training opportunities for programming, maintenance, support, web design etc non-existent.
ICTs in libraries	- Library not automated. However plans at advanced stage to construct modern library.	**Stage 1.3** Library not automated but there is Internet installed

Table 20: Masai T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- No Kenyan registered domain name. Currently no co-operate e-mail system.	**Stage 1.2** Less than 0.5% of the population has used Internet facility.
Locally relevant content	- No web based services. However, the institutes website is currently being developed and is expected to contain locally relevant materials	**Stage 1.1** No web site exists providing information on the institute.
ICTs in workplace	Computer use by employees limited to principals and deputy principals offices. -11 employees linked to networked applications.	**Stage 1.1**

Table 21: Masai T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	-Guard employed to monitor labs. - No firewall installed. No protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft.	**Stage 1.2** Although, there is licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Draft ICT policy available. To be launched by September 2010.	**Stage 1.1** Draft ICT strategic policy available.

Table 22: Masai network security and ICT strategy indicators

4.1.6 STATUS OF KIAMBU INST. OF SCI. & TECHNOLOGY

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 130, student population: 900 -Number of telephone extensions: 16 -Number of external fixed lines connected to PBX: 1 -Mobile lines connected to PBX: 2 - Structured cabling installed in offices, library and computer labs	**Stage 2.4** (A teledensity of more than 2 mainlines per 100 people)
Internet Availability	-Access to Internet through wireless leased line. -Capacity of the line: 512kbps -Intranet present -No wireless LAN segments. -Size of LAN: 124 computers	**Stage 2.2** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- Total annual ISP charge: Ksh 1,000,000. -Total annual cost of fixed line: 500,000	**Stage 2.3** (Large student population)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: 512kbps - PCs connected to the Internet are all Pentium IVs.	**Stage 2** Leased lines available with transfer speeds of up to 1GB.
ICT Hardware and Software	-Value of ICT hardware: 4m -No. of ICT applications: 1 MIS system. - Currently the institute has140 desktop computers, 1 communication server, 1 MIS server and 1 e-mail server. MIS system caters for financial, academic, and timetabling.- Institute has 10 printers, 4 laptops. 3 printer connected to LAN.	**Stage 2.5** Some hardware and software solutions available locally.
Service and Support	- There are 12 ICT professionals, 1 hardware technicians and 1 network administrator. MIS system maintained through contract agreement with supplier	**Stage 1.8** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 23: KIST network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- 1 mail, 1 web server available and 1 MIS server. 120connected to Internet. 3 computer labs with 40	**Stage 2.1** Computer labs open during the day and

	computers per lab. Computers available to students from 8.00 am to 6.00 pm Monday to Friday	closed after school. A LAN present interlinking PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 10%. Only ICT staff uses the productivity software tools.	**Stage 1.8** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- No training programs currently exist for training ICT workforce. However, since institution is to be transformed to university, training opportunities to be availed.	**Stage 1** Training opportunities for programming, maintenance, support, web design etc non-existent.
ICTs in libraries	- Library fully automated.	**Stage 2.2** Library automated and there is Internet installed

Table 24: KIST networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail and search for materials major usage of the Internet. - Kenyan registered domain name. Currently there is co-operate e-mail system.	**Stage 1.8** e-mail accounts available to students and staff.
Locally relevant content	- Web services available. Has information on courses offered in the institute and departmental profiles.	**Stage 1.7** Web site exists providing information about the institute.
ICTs in workplace	-PBX, cyber café's and networked applications present. -22 employees linked to networked applications.	**Stage 2.3**

Table 25: KIST network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated every 14 days. - No firewall installed. No	**Stage 1.6** Although, there is licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room

	protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room. Data backup on weekly bases. No off-site data backup.	
ICT privacy issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Institutes has comprehensive ICT policy.	**Stage 1.9** There is an ICT strategic policy

Table 26: KIST network security and ICT strategy indicators

4.1.7 STATUS OF THIKA TECH. TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 147, 1540 students -Number of telephone extensions: 18 -Number of external fixed lines connected to PBX: 2 -Mobile lines connected to PBX: 2 - Structured cabling installed in offices, library and computer labs	**Stage 2.6** (A teledensity of morethan 2 mainlines per 100 people)
Internet Availability	-Access to Internet through wireless leased line. -Capacity of the line: 1GB -Distance between ISP and institute: within 60km. -Intranet present -No wireless LAN segments. -Size of LAN: 160 computers	**Stage 2.8** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- Total annual ISP charge: Ksh1000, 000. -Total annual cost of fixed line: 500,000	**Stage 1.4** (large student population makes funds available)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: 1 GB - PCs connected to the Internet are all Pentium IVs.	**Stage 2.4** Leased lines available with transfer speeds of up to 1 GB
ICT Hardware and Software	-Value of ICT hardware: 5m -No. of ICT applications: 1 MIS system, 1 e-mail and	**Stage 2.8** Some hardware and

	1 web server.- Currently the institute has 160 desktop computers. - Institute has 10 printers, 4 laptops. 1 printer connected to LAN.	software solutions available locally.
Service and Support	- There are 9 ICT professionals, 2 hardware technicians and 1 network administrator. MIS system maintained through contract agreement with supplier.	**Stage 2.6** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 27: THIKA T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- 1 mail, 1 email, 1 web server. 160 connected to Internet. 4 computer labs with 40 computers per lab. Computers available to students from 8.00 am to 6.00 pm Monday to Friday and 9.00am to 1.00pm of Saturdays.	**Stage 2.3** Computer labs open during the day and closed after school. A LAN present interlinking PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 10%. Only ICT staff uses the productivity software tools. ICT not integrated into the curriculum.	**Stage 1.8** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- No training programs currently exist for training ICT workforce mainly due to lack of funds. However institutions arranges for in-house training of its staff to make them computer literate.	**Stage 2** Training opportunities for programming, maintenance, support, web design etc non-existent.
ICTs in libraries	- Library fully automated with provision for browsing to get additional materials.	**Stage 2.6** Library fully automated and there is Internet installed

Table 28: THIKA T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail and search for materials major usage of the Internet. - Kenyan registered domain name. There is co-operate e-mail system.	**Stage 1.9** More than 50% of the population has used Internet facility.
Locally relevant content	- web services available with information of courses offered in the institute.	**Stage 2.8** No web site exists providing information on the institute.
ICTs in workplace	-PBX, cyber café's and networked applications present. -20 employees linked to networked applications.	**Stage 2.2**

Table 29: THIKA T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated every 14 days. - No firewall installed. No protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room. Data backup on weekly bases. No off-site data backup.	**Stage 2.5** Although, there is licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- There is policy to regulate this issue.	**Stage 1.9** There is policy to regulate this issue.
ICT copyright issues	- There is attempt to discourage software piracy.	**Stage 1.5** There is attempt to discourage software piracy
Strategic policy on ICT	- Institute has a comprehensive ICT policy.	**Stage 2.3** Institute has a comprehensive ICT policy.

Table 30: THIKA network security and ICT strategy indicators

4.1.8 STATUS OF NYERI TECH. TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 130, student population: 1560 -Number of telephone extensions: 16 -Number of external fixed lines connected to PBX: 1 -Mobile lines connected to PBX: 1 - Structured cabling installed in offices, library and computer labs	**Stage 2.2** (A teledensity of more than 2 mainlines per 100 people)
Internet Availability	-Access to Internet through wireless leased line. -Capacity of the line: 512kbps -Distance between ISP and institute: within 180km. -Intranet present -Size of LAN: 170 computers	**Stage 2** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- Total annual ISP charge: Ksh 1,200,000. -Total annual cost of fixed line: 500,000	**Stage 2.2** (High student population makes funds available)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: 512kbps - PCs connected to the Internet are all Pentium IVs.	**Stage 2** Leased lines available with transfer speeds of up to 1GB.
ICT Hardware and Software	-Value of ICT hardware 6 m. -No. of ICT applications: 1 MIS system, 1 web and 1 e-mail. - Currently the institute has 160 desktop computers. - Institute has 8 printers, 4 laptops. 3 printer connected to LAN.	**Stage 2.4** Some hardware and software solutions available locally.
Service and Support	- There are 11 ICT professionals, 2 hardware technicians. MIS system maintained through contract agreement with supplier i.e. Spreading Wings Company Ltd.	**Stage 2.1** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 31: NYERI T.T.I network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- 1 mail, 1 application server available. 160 connected to Internet. 4 computer labs with 40 computers per lab.	**Stage 2.4** Computer labs open during the day and

	Computers available to students from 8.00 am to 5.00 pm Monday to Friday. 10 computers reserved for staff. Students do not have an institutional e-mail. Students to computer ration: **10: 1**	closed after school. A LAN present interlinking PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills:20%. Only ICT staff uses the productivity software tools. ICT not integrated into the curriculum.	**Stage 1.4** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- In-house training program for ICT staff currently exist for making all staff ICT compliant.	**Stage 1.9** Training opportunities for programming, maintenance, support, web design etc
ICTs in libraries	- Library fully automated with Internet connected.	**Stage 2.3** Library fully automated and there is Internet installed

Table 32: NYERI T.T.I networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail and search for materials major usage of the Internet. - Kenyan registered domain name.	**Stage 1.5** More than 50% of the population has used Internet facility.
Locally relevant content	- web has information about institute courses and provision for online application.	**Stage 2.4** No web site exists providing information on the institute.
ICTs in workplace	-PBX, cyber café's and networked applications present. -25employees linked to networked applications.	**Stage 2.2**

Table 33: NYERI T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated every 14 days. - firewall installed for protection against Spam mail	**Stage 1.6** There is firewalls, off-site data bad up and radio alarm in server room.

	and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room. Data backup on weekly bases.	
ICT privacy issues	- There is policy to regulate this issue.	**Stage 1.8** There is policy to regulate this issue.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Institute has a comprehensive ICT policy.	**Stage 2.2** Institute has a comprehensive ICT policy

Table 34: NYERI network security and ICT strategy indicators

4.1.9 STATUS OF MICHUKI TECHNICAL TRAINING INSTITUTE

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 90 -Number of telephone extensions: 3 -Number of external fixed lines connected to PBX: 1 -Mobile lines connected to PBX: 0 - No structured cabling installed in offices, library and computer labs	**Stage 1** (A teledensity of less than 2 mainlines per 100 people)
Internet Availability	-No Internet available	**Stage 1** (No Internet available)
Internet Affordability	- Total annual ISP charge: Ksh 500,000 but not yet installed. -Total annual cost of fixed line: 250,000	**Stage 1** (Rates for local telephone calls are high enough to discourage extensive Internet use)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: None - PCs connected to the Internet: None	**Stage 1** Leased lines available with transfer speeds of up to 64 kbps.
ICT Hardware and Software	-Institute has 40 computers, 2 printers	**Stage 1.1** Some hardware and software solutions available locally.
Service and Support	- There are 5 ICT professionals, 1 hardware technicians	**Stage 1** Technician repairs all machines.

Table 35: MICHUKI T.T.I network access indicators

b) **NETWORKED LEARNING INDICATORS**

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	- No Internet service available, computers used only in finance department and principal's secretary.	**Stage 1** -Limited use.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 5%. Only ICT staff uses the productivity software tools. ICT not integrated into the curriculum.	**Stage 1** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- No training programs currently exist for training ICT workforce mainly due to lack of funds	**Stage 1** No training programs currently exist
ICTs in libraries	- Library not automated	**Stage 1** Library not automated

Table 36: MICHUKI T.T.I networked learning indicators

c) **NETWORK SOCIETY INDICATORS**

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- No E-mail system. - No Kenyan registered domain name.	**Stage 1** Less than 0.5% of the population has used Internet facility.
Locally relevant content	- No web based services.	**Stage 1** No web site exists providing information on the institute.
ICTs in workplace	-3 employees use computers.	**Stage 1** -Usage limited to office.

Table 37: MICHUIKI T.T.I network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room.	**Stage 1.1** Although, there is licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- Currently not available although the institutes overall institute's strategic plan has sections dealing with ICT.	**Stage 1** There is no ICT strategic policy

Table 38: MICHUKI network security and ICT strategy indicators

4.1.10 STATUS OF MURANGA COLLEGE OF TECHNOLOGY

a) NETWORK ACCESS INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Network Infrastructure	-Number of employees (both academic and non-academic): 145, student population 800. -Number of telephone extensions: 16 -Number of external fixed lines connected to PBX: 2 -Mobile lines connected to PBX: 1 - Structured cabling installed in offices, library and computer labs	**Stage 2.4** (A teledensity of more than 2 mainlines per 100 people)
Internet Availability	-Access to Internet through wireless leased line. -Capacity of the line: 512kbps -Distance between ISP and institute: within 40km. -Intranet present -No wireless LAN segments. -Size of LAN: 120 computers	**Stage 2** (There is provision for full Internet access through leased lines by ISP)
Internet Affordability	- Total annual ISP charge: Ksh 1000,000. -Total annual cost of fixed line: 500,000	**Stage 2.1** (Student population high enough to high)
Network speed and Quality	-Maximum Internet access speed (if organization could afford): 2Mb/s-8Mb/s -Current speed: 512kbps	**Stage 2.3** Leased lines available with transfer speeds of up

	- PCs connected to the Internet are all Pentium IVs.	to 1 GB.
ICT Hardware and Software	-Value of ICT hardware: 5m -No. of ICT applications: 1 MIS system. - Currently the institute has 130 desktop computers, 1 communication server, and 1 MIS server and 1 web server, -Institute has 10 printers, 4 laptops. 3 printer connected to LAN.	**Stage 2.6** Some hardware and software solutions available locally.
Service and Support	- There are 8 ICT professionals, 1 hardware technicians and 1 network administrator. MIS system maintained through contract agreement with supplier	**Stage 2.2** Takes about one week for reported problems to be resolved. Some ICT maintenance and technical services available.

Table 39: MURANGA C.T network access indicators

b) NETWORKED LEARNING INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Access to ICT	1 mail, 1 application server available AND 1 WEB SERVER. 120 connected to Internet. 3 computer labs with 40 computers per lab. Computers available to students from 8.00 am to 5.00 pm Monday to Friday. Student to computer ration: 8: 1	**Stage 2.4** Computer labs open during the day and closed after school. A LAN present interlinking PIVs and above.
Enhancing Education with ICT	- Percentage of academic staff with ICT skills: 10%. Only ICT staff uses the productivity software tools. ICT not integrated into the curriculum.	**Stage 1.8** Most teachers use computers in a very limited fashion. (Basic understanding of o/s, file manipulation, copying and pasting.
Developing the ICT workforce	- No training programs currently exist for training ICT workforce although there are efforts to make all lecturers ICT compliant and subject them to external exam.	**Stage 1.2** Training opportunities for programming, maintenance, support, web design etc non-existent.
ICTs in libraries	- Library was at the time of collecting data being automated.	**Stage 1.5** Library being automated and Internet installed

Table 40: MURANGA C.T networked learning indicators

c) NETWORK SOCIETY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
People and organizations online	- E-mail and search for materials major usage of the Internet. - Kenyan registered domain name.	**Stage 1.5** More than 40% of the population has used Internet facility.
Locally relevant content	- web based services available with information on courses available in the institute. However, on provision for online application.	**Stage 1.9** web site exists providing information on the institute.
ICTs in workplace	-PBX, cyber café's and networked applications present. -23 employees linked to networked applications.	**Stage 2** Communication via network in place.

Table 41: MURANGA C.T network society indicators

d) NETWORK SECURITY AND ICT STRATEGY INDICATORS

INDICATOR	STATUS	E-READINESS STAGE (RNW)
Security for ICT equipment and software	- Networked computers protected via licensed ant-virus software. This is updated every 14 days. - No firewall installed. No protection against Spam mail and Internet Spy ware. Fire fighting equipments have been installed in all the rooms. Metallic doors to safeguard against physical theft. No electronic or radio alarm in the server room. Data backup on weekly bases.	**Stage 1.6** Although, there is licensed anti-virus software, there are no firewalls, no off-site data back up and no radio alarm in server room
ICT privacy issues	- Currently a policy to regulate this issue.	**Stage 2** Currently a policy to regulate this issue.
ICT copyright issues	- Currently no policy to regulate this issue.	**Stage 1** There is no privacy law. Bill has been proposed but not yet passed into law.
Strategic policy on ICT	- There is a comprehensive institute's ICT policy.	**Stage 1.8** There is a comprehensive institute's ICT policy.

Table 42: MURANGA C.T network security and ICT strategy indicators

4.1.11 SUMMARY OF E-READINESS STATUS FOR VARIOUS INSTITUTIONS

INSTITUTE	E-READINESS STAGE
KINYANJUI	1.6
KABETE	1.69
NAIROBI	2.4
MACHAKOS	1.51
MASAI	1.24
KIST	1.86
THIKA	2.3
NYERI	2.00
MURANGA	1.9
MICHUKI	1.01
MURANGA C.T	1.9

Table 43: Summary of e-readiness status for various institutes.

4.2 ACADEMIC RESULTS OF VARIOUS INSTITUTES

Academic results from various institutes were obtained from the offices of the registrars of the respective institutes through the assistance of the heads of departments of ICTs.

All the institutes apart from Nairobi T.T.I provided summarized results while Nairobi T.T.I provided copies of raw data from the Kenya National Examinations Council.

The results were keyed-in in a spreadsheet program for analysis purposes. Key information from the data included:

(i) Year the examination was done;

(ii) Class;

(iii) Total number of candidates for a particular sitting;

(iv) Number of male candidates for a particular sitting;

(v) Number of female candidates for a particular sitting;

(vi) Number of male candidates who passed in a particular sitting;

(vii) Number of female candidates who passed in a particular sitting;

(viii) Number of male candidates who failed in a particular sitting;

(ix) Number of female candidates who failed in a particular sitting;

(x) Percentage pass for all candidates in a particular sitting;

(xi) Average pass for the four years considered.

Details of the results for each institution are as shown in the following tables.

4.2.1 ACADEMIC RESULTS OF KINYANJUI T.T.I

ANALYSIS OF RESULTS FOR KINYANJUI TECHNICAL TRAINING INSTITUTE									
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008									
YEAR	CLASS	M	F	TOTAL	PASS		FAIL		% PASS
					M	F	M	F	
Nov-08	MODULE I	9	1	**10**	8	1	1	0	**90**
	MODULE II	7	4	**11**	3	2	6	0	**45**
	MODULE III	1	0	**1**	0	0	1	0	**0**
Jul-08	MODULE I	4	4	**8**	3	2	1	2	**63**
	MODULE II	5	7	**12**	2	2	3	5	**33**
	MODULE III	1	1	**2**	0	0	1	1	**0**
Nov-07	MODULE I	6	4	**10**	5	3	1	1	**80**
	MODULE II	2	1	**3**	1	0	1	1	**33**
	MODULE III	1	1	**2**	0	1	1	0	**50**
Jul-07	MODULE I	8	3	**11**	6	3	2	0	**82**
	MODULE II	2	9	**11**	0	0	2	9	**0**
	MODULE III	7	5	**12**	4	4	3	1	**67**
Nov-06	MODULE I	5	4	**9**	5	3	0	1	**89**
Jul-06	MODULE I	1	4	**5**	1	2	0	2	**60**
	MODULE II	9	7	**16**	7	6	2	1	**81**
	MODULE III	3	1	**4**	2	1	1	0	**75**
Jul-05	MODULE I	2	6	**8**	2	5	0	1	**88**
	MODULE II	8	7	**15**	2	2	6	5	**27**
	MODULE III	0	2	**2**	1	1	0	0	**100**
AVERAGE RESULTS FOR FOUR YEARS									**56**

Table 44: Average academic results for various Kinyanjui T.T.I

4.2.2 ACADEMIC RESULTS OF KABETE T.T.I

ANALYSIS OF RESULTS FOR KABETE TECHNICAL TRAINING INSTITUTE									
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008									
YEAR	CLASS	M	F	TOTAL	TOTAL PASS		FAIL		% PASS
					M	F	M	F	
Nov-08	MODULE II	10	6	**16**	4	2	6	4	38
Nov-08	MODULE III	7	4	**11**	5	3	1	2	73
Jul-08	MODULE I	21	18	**39**	14	8	9	6	56
Jul-08	MODULE II	12	12	**24**	4	2	9	6	25
Nov-07	MODULE II	11	13	**24**	3	6	8	7	38
Nov-07	MODULE III	1	1	**2**	1	1	1		100
Jul-07	MODULE I	13	15	**28**	13	14	0	1	96
Jul-07	MODULE II	13	9	**22**	4	2	2		27
Jul-07	MODULE III	17	19	**36**	11	14	4	6	69

Nov-06	MODULE I	17	18	**35**	11	14	2	1	71
Nov-06	MODULE III	1	0	**1**	1	0	0	0	100
Jul-06	MODULE II	22	23	**45**	18	20	4	5	84
Jul-06	MODULE III	4	3	**7**	3	3	1	0	86
AVERAGE RESULTS FOR FOUR YEARS									**66**

Table 45: Average academic results for various Kabete T.T.I

4.2.3 ACADEMIC RESULTS OF NAIROBI T.T.I

ANALYSIS OF RESULTS FOR NAIROBI TECHNICAL TRAINING INSTITUTE
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008

YEAR	CLASS	M	F	TOTAL	TOTAL PASS		FAIL		% PASS
					M	F	M	F	
Nov-08	MODULE I	21	25	**46**	21	25	0	0	100
Nov-08	MODULE II	4	2	**6**	2	0	2	2	33
Nov-08	MODULE III	3	3	**6**	0	0	0	0	0
Jul-08	MODULE I	20	24	**44**	20	24	0	0	100
Jul-08	MODULE II	27	25	**52**	22	16	11	9	73
Jul-08	MODULE II	5	8	**13**	5	8	0	0	100
Nov-07	MODULE I	15	19	**34**	15	18	0	1	97
Jul-07	MODULE I	21	23	**44**	21	23	0	0	100
Nov-06	MODULE I	11	9	**20**	11	5	0	4	80
Jul-06	MODULE I	20	19	**39**	20	19	0	0	100
AVERAGE RESULTS FOR FOUR YEARS									**78**

Table 46: Average academic results for various Nairobi T.T.I

4.2.4 ACADEMIC RESULTS OF MACHAKOS T.T.I

ANALYSIS OF RESULTS FOR MACHAKOS TECHNICAL TRAINING INSTITUTE
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008

YEAR	CLASS	M	F	TOTAL	TOTAL PASS		FAIL		% PASS
					M	F	M	F	
Jul-08	MODULE I	7	25	**32**	7	25	0	0	100
Jul-08	MODULE II	12	11	**23**	7	3	5	8	43
Jul-08	MODULE III	6	5	**11**	6	4	0	1	91
Jul-07	MODULE I	27	14	**41**	26	12	0	0	93
Jul-07	MODULE II	16	14	**30**	3	0	13	14	10
Jul-07	MODULE III	8	6	**14**	4	6	2	0	71
Jul-06	MODULE I	17	17	**34**	15	15	2	2	88
Jul-06	MODULE II	11	16	**27**	8	7	3	9	56
Jul-06	MODULE III	0	1	**1**	0	0	0	1	0
Jul-05	MODULE I	7	8	**15**	5	5	2	3	67
Jul-05	MODULE II	4	6	**10**	4	3	0	3	70
AVERAGE RESULTS FOR FOUR YEARS									**63**

Table 47: Average academic results for various Machakos T.T.I

4.2.5 ACADEMIC RESULTS OF MASAI T.T.I

ANALYSIS OF RESULTS FOR MASAI TECHNICAL TRAINING INSTITUTE									
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008									
YEAR	CLASS	M	F	TOTAL	PASS		FAIL		% PASS
					M	F	M	F	
Nov-08	MODULE I	12	4	**16**	6	2	6	2	**50**
	MODULE II	7	4	**11**	3	2	6	0	**45**
	MODULE III	4	1	**5**	2	1	1	0	**60**
Jul-08	MODULE I	6	4	**10**	3	2	3	2	**50**
	MODULE II	5	7	**12**	2	2	3	5	**33**
Nov-07	MODULE I	6	4	**10**	4	2	2	2	**60**
	MODULE II	10	6	**16**	5	6	5	0	**69**
	MODULE III	6	5	**11**	3	3	3	2	**55**
Jul-07	MODULE I	8	3	**11**	6	3	2	0	**82**
	MODULE II	2	9	**11**	0	0	2	9	**0**
	MODULE III	6	4	**10**	3	4	3	0	**70**
Nov-06	MODULE I	5	4	**9**	5	3	0	1	**89**
Jul-06	MODULE I	3	4	**7**	2	2	1	2	**57**
	MODULE III	9	8	**17**	3	3	6	5	**35**
AVERAGE RESULTS FOR FOUR YEARS									**54**

Table 48: Average academic results for various Masai T.T.I

4.2.6 ACADEMIC RESULTS OF KIST

ANALYSIS OF RESULTS FOR KIAMBU INST. OF SCI. AND TECHNOLOGY							
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008							
YEAR	CLASS	M	F	TOTAL	PASS	FAIL	% PASS
Nov-08	MODULE I	26	10	**36**	34	2	94
Jul-08	MODULE I	18	19	**37**	35	2	95
Jul-08	MODULE II	11	14	**25**	11	14	44
Jul-08	MODULE III	3	6	**9**	7	2	78
Nov-07	MODULE II	12	6	**18**	5	13	28
Jul-07	MODULE I	12	14	**26**	26	1	100
Jul-07	MODULE II	6	12	**18**	6	12	33
Jul-07	MODULE III	13	12	**25**	21	4	84
Jul-06	MODULE II	9	13	**22**	20	2	91
Jul-06	MODULE III	10	10	**20**	15	5	75
AVERAGE RESULTS FOR FOUR YEARS							**72**

Table 49: Average academic results for various Kiambu Inst. of Sci. and Technology

4.2.7 ACADEMIC RESULTS OF THIKA T.T.I

ANALYSIS OF RESULTS FOR THIKA TECHNICAL TRAINING INSTITUTE									
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008									
YEAR	CLASS	M	F	TOTAL	PASS		FAIL		% PASS
					M	F	M	F	
Nov-08	MODULE I	18	13	**31**	12	8	6	5	**65**
	MODULE II	20	14	**34**	7	5	13	9	**35**
	MODULE III	23	19	**42**	16	13	7	6	**69**
Jul-08	MODULE I	25	15	**40**	23	11	2	4	**85**
	MODULE II	16	11	**27**	8	5	8	6	**48**
	MODULE III	19	14	**33**	16	12	3	2	**85**
Nov-07	MODULE I	18	16	**34**	17	16	1	0	**97**
	MODULE II	22	20	**42**	7	6	15	14	**31**
	MODULE III	20	15	**35**	19	12	1	3	**89**
Jul-07	MODULE I	23	18	**41**	22	16	1	2	**93**
	MODULE II	17	11	**28**	7	4	10	7	**39**
	MODULE III	22	16	**38**	19	12	3	4	**82**
Nov-06	MODULE I	26	14	**40**	24	12	2	2	**90**
Jul-06	MODULE I	20	16	**36**	18	16	2	0	**94**
	MODULE II	19	18	**37**	5	9	14	9	**38**
	MODULE III	23	11	**34**	15	12	8	-1	**79**
AVERAGE RESULTS FOR FOUR YEARS									**70**

Table 50: average academic results for various Thika Technical Training Institute

4.2.8 ACADEMIC RESULTS OF NYERI T.T.I

ANALYSIS OF RESULTS FOR NYERI TECHNICAL TRAINING INSTITUTE									
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008									
YEAR	CLASS	M	F	TOTAL	PASS		FAIL		% PASS
					M	F	M	F	
Nov-08	MODULE I	33	20	**53**	30	19	3	1	**92**
	MODULE II	28	25	**53**	19	14	9	11	**62**
	MODULE III	27	24	**51**	25	20	2	4	**88**
Jul-08	MODULE I	33	25	**58**	30	25	3	0	**95**
	MODULE II	24	29	**53**	16	12	8	17	**53**
	MODULE III	26	24	**50**	20	16	6	8	**72**
Nov-07	MODULE I	27	20	**47**	25	20	2	0	**96**
	MODULE II	28	16	**44**	15	10	13	6	**57**
	MODULE III	27	13	**40**	24	12	3	1	**90**
Jul-07	MODULE I	30	16	**46**	30	14	0	2	**96**
	MODULE II	32	22	**54**	17	13	15	9	**56**
	MODULE III	22	16	**38**	18	13	4	3	**82**
Nov-06	MODULE I	20	21	**41**	20	20	0	1	**98**
Jul-06	MODULE I	30	23	**53**	28	23	2	0	**96**
	MODULE II	33	25	**58**	20	13	13	12	**57**
	MODULE III	29	31	**60**	26	24	3	7	**83**
Jul-05	MODULE I	30	27	**57**	29	25	1	2	**95**
	MODULE II	28	16	**44**	20	12	8	4	**73**
AVERAGE RESULTS FOR FOUR YEARS									**80**

Table 51: average academic results for various Nyeri Technical Training Institute

4.2.9 ACADEMIC RESULTS OF MICHUKI T.T.I

ANALYSIS OF RESULTS FOR MICHUKI T. TRAINING INSTITUTE							
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008							
YEAR	CLASS	M	F	TOTAL	PASS	FAIL	% PASS
Nov-08	MODULE I	16	12	**28**	16	12	57
Jul-08	MODULE I	14	10	**24**	17	7	71
Jul-08	MODULE II	13	14	**27**	9	18	33
AVERAGE RESULTS FOR TWO YEARS							**54**

Table 52: average academic results for various Michuki Technical Training Institute

4.2.10 ACADEMIC RESULTS OF MURANGA COLL. OF TECH.

ANALYSIS OF RESULTS FOR MURANGA COLLEGE OF TECHNOLOGY							
COURSE: DIPLOMA IN INFORMATION TECHNOLOGY PERIOD 2005 - 2008							
YEAR	CLASS	M	F	TOTAL	PASS	FAIL	% PASS
Nov-08	MODULE I	24	16	**40**	32	8	80
Jul-08	MODULE I	18	19	**37**	28	9	76
Jul-08	MODULE II	13	11	**24**	8	16	33
Jul-08	MODULE III	10	12	**22**	16	6	73
Jul-07	MODULE I	26	18	**44**	36	8	82
AVERAGE RESULTS FOR TWO YEARS							**69**

Table 53: average academic results for various Muranga College of Technology

4.2.11 SUMMARY OF EXAMINATION RESULTS FOR VARIOUS INSTITUTES

INSTITUTE	PERCENTAGE PASS
KINYANJUI	**56**
KABETE	**66**
NAIROBI	**78**
MACHAKOS	**63**
MASAI	**54**
KIST	**72**
THIKA	**70**
NYERI	**80**
MICHUKI	**58**
MURANGA	**69**

Table 54: Summary of academic results for various institutes.

CHAPTER 5

ANALYSIS OF RESULTS

5.1 ANALYSIS OF E-READINESS RESULTS FOR EACH INSITUTION

5.1.1 KINYANJUI TECHNICAL INSTITUTE

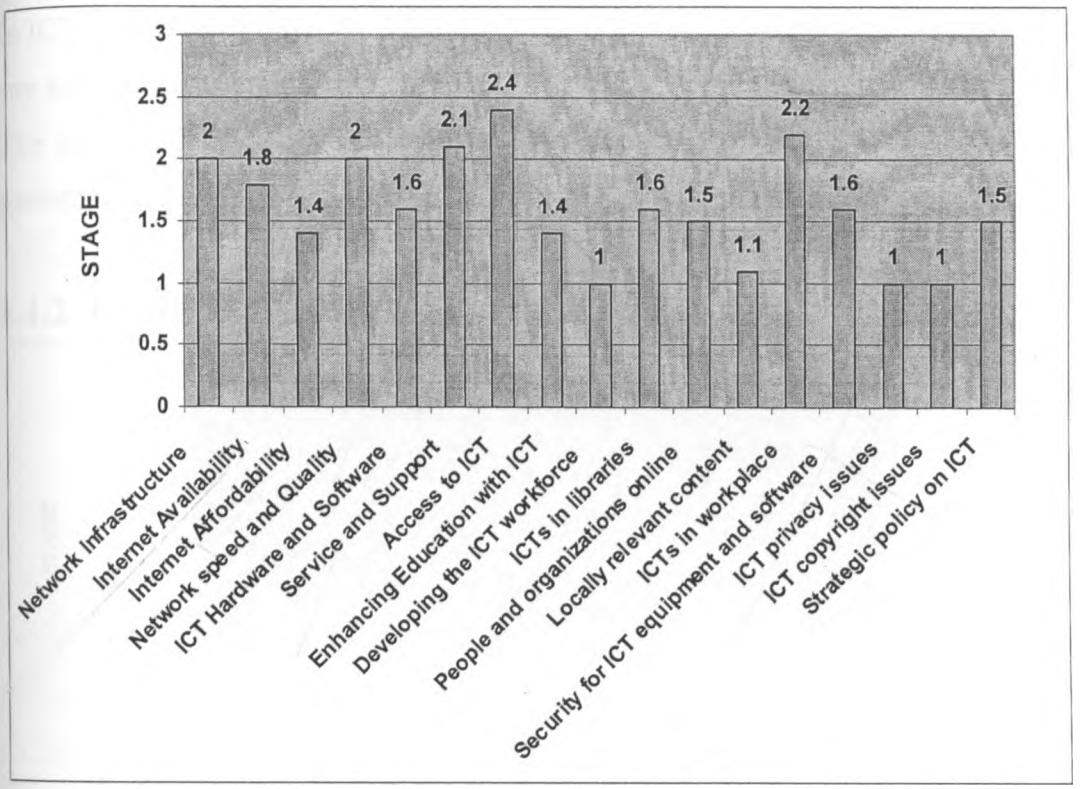

Figure 2: Staging of all e-readiness indicators for Kinyanjui T.T.I

The results for Kinyanjui T.T.I show that this institute is far from exploiting the full benefits of networked environment. With an average overall stage of 1.60, it means the management of this institution has a lot do in order to make it e-ready.

Indicator of 2.1 for network access arises from the fact that the institute full exploits the available Internet resources by time tabling all students to access ICT resources at various times during the week. However in virtually all other indicators, the results leave a lot to be desired.

Indicators at stage 1 mean the institute has done virtually nothing towards meeting acceptable standards. This includes the following areas:

(i) Developing the ICT workforce;

(ii) ICT privacy issues;

(iii) ICT copyright issues.

Failure to develop ICT workforce may partly be attributed to lack of funds due to low student enrolment. With a student population of about 500, it means the income realized through fees collection may not be adequate. However because this institute is government sponsored, it should be able to seek assistance through relevant ministry.

In ICT privacy and copyright issues the score is at stage 1 meaning the institute has not made any effort towards curbing this menace.

The institute is rated seventh in overall e-readiness status, and ninth in overall academic performance.

5.1.2 KABETE TECHNICAL INSTITUTE

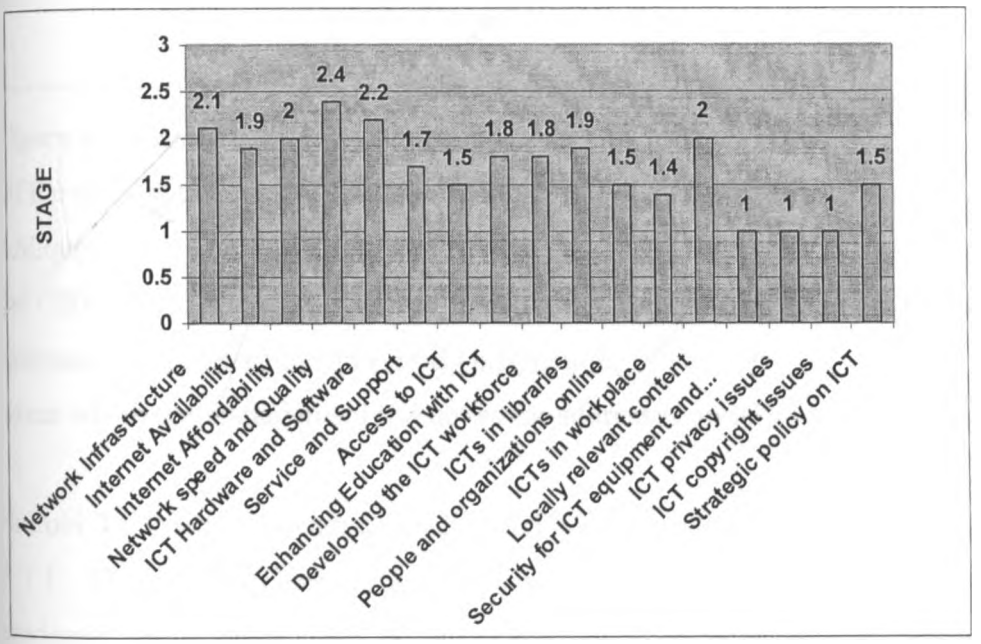

Figure 3: Staging of all e-readiness indicators for Kabete T.T.I

Kabete T.T.I situated in the city is also far from realizing the ideal e-readiness status. At an average of 1.69, the institute does not have adequate network infrastructure and ICT hardware and software. The institute has performed poorly in network security and ICT strategy indicators. With a population of 1700, and only 90 computers, it means the student do not get adequate facilities to ICT.

The institute was rated sixth in e-readiness status as well as in academic performance.

5.1.3 NAIROBI TECHNICAL INSTITUTE

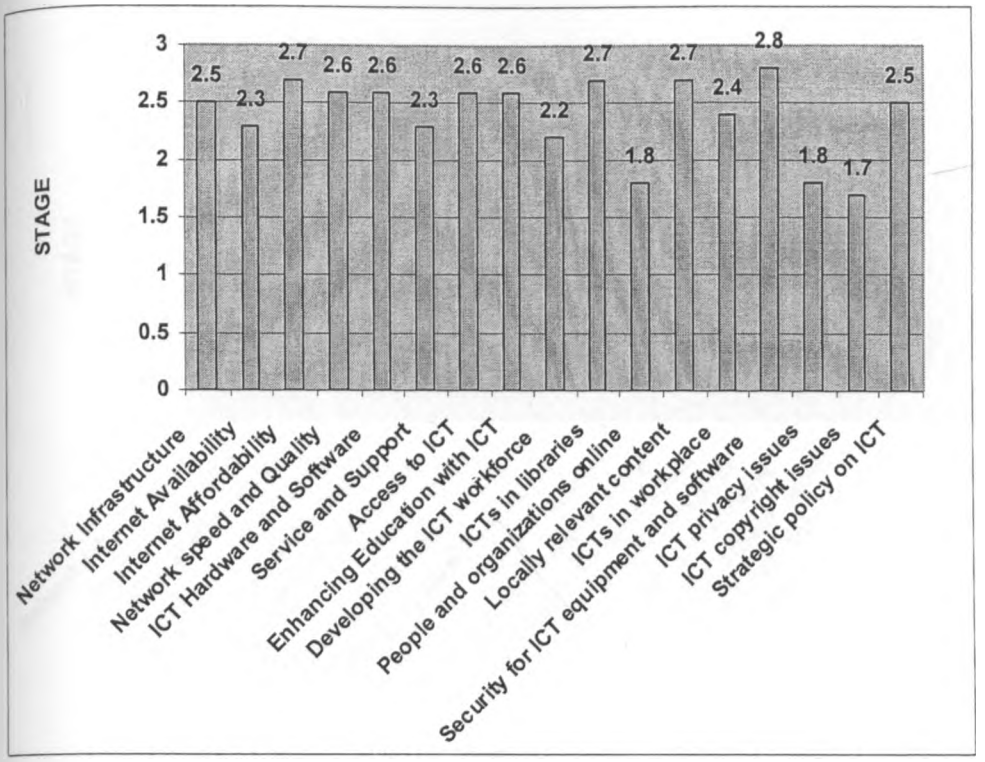

Figure 4: Staging of all e-readiness indicators for Nairobi T.T.I

Of the ten institutes under research, Nairobi T. T.T. led with an average rating of 2.5.

Although the stage is still low compared to stage the ideal e-readiness status of stage 4 (as per the CID e-readiness tool), the institutes has taken quite deal of effort to address most of the parameters that determine an e-ready origination.

Areas which the management has not so far address is on ICT privacy and copyright issues.

Nairobi T.T.I led in e-readiness status and was second in academic performance after Nyeri T.T.I.. The results clearly shows there a positive link between e-readiness status and academic performance. This is the ideal scenario expected as the institutions invest large sums of money in ICT with ultimate goal of improving overall performance. Taken alone, the institution may be said to be fully adopting ICT in its delivery services and hence good results in its academic performance.

5.1.4 MACHAKOS TECHNICAL TRAINING INSTITUTE

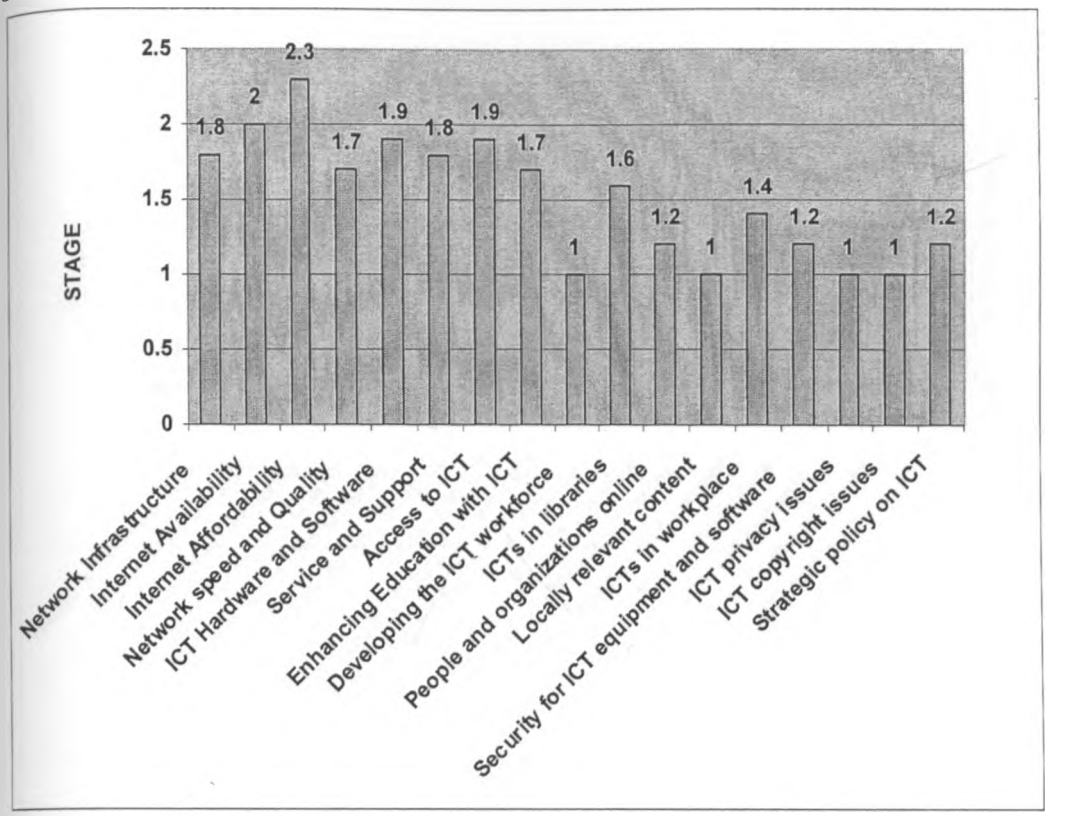

Figure 5: Staging of all e-readiness indicators for Machakos T.T.I

Machakos T.T.I situated in eastern province scored an overall rating of 1.51. The institute purchases a bandwidth (128kbps) but does not have a sound network infrastructure and hence a low rating of 1.8 in this sub-indicator. A significant move the institute has done is the automation of its library issue desk services and hence the rating at 1.6.

Machakos T.T.I was rated eighth in terms of e-readiness status and seventh in terms of academic performance.

5.1.5 MASAI TECHNICAL TRAINING INSTITUTE

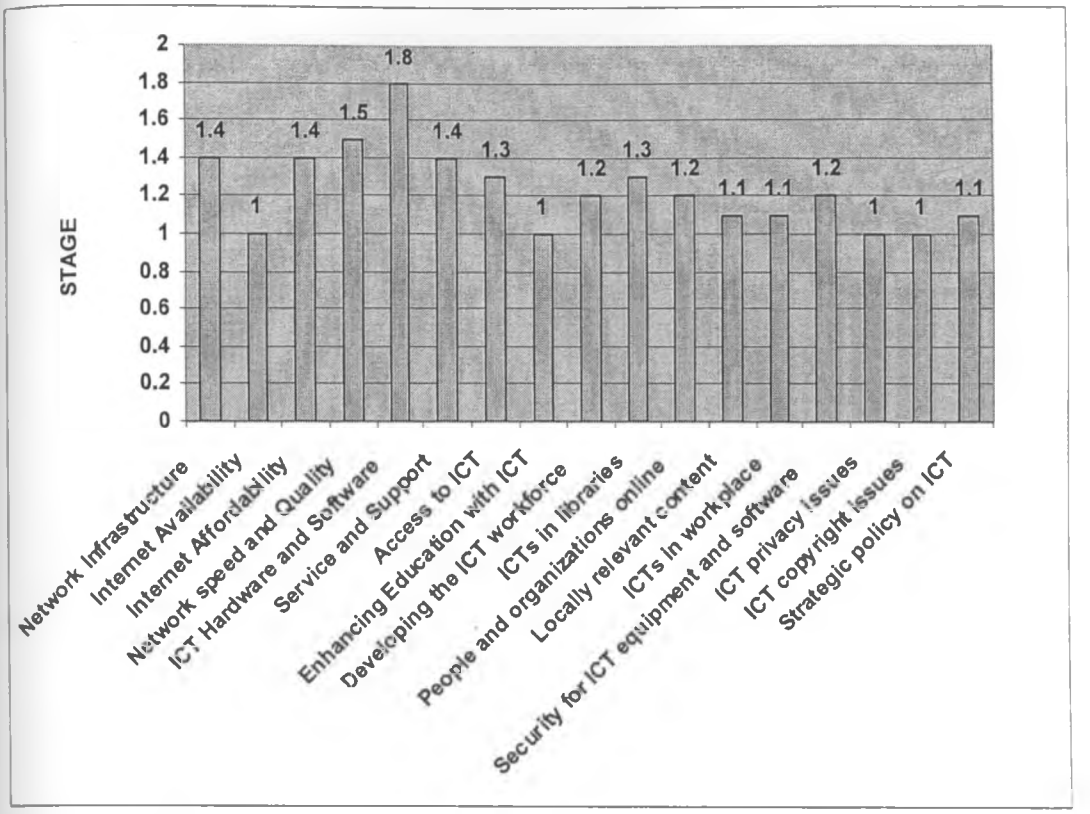

Figure 6: Staging of all e-readiness indicators for Masai T.T.I

Masai T.T. I had an overall e-readiness status of 1.24. The institute performed poorly in the following area:

(i) Internet availability;

(ii) Enhancing education with ICT;

(iii) ICT privacy issues;

(iv) ICT copyright issues

In all these indicators the institute scored a minimal value of 1. This means the management of the institute has a lot to do so as increase the e-readiness status to appreciable levels. It is expected with the introduction of performance contract which has ICT compliance as one of the indicators; the institution will ultimately improve its ICT infrastructure and install the necessary services.

The institute was rated ninth in terms of e-readiness status and tenth in terms of academic performance.

5.1.6 KIAMBU INSTITUTE OF SCIENCE AND TECHNOLOGY

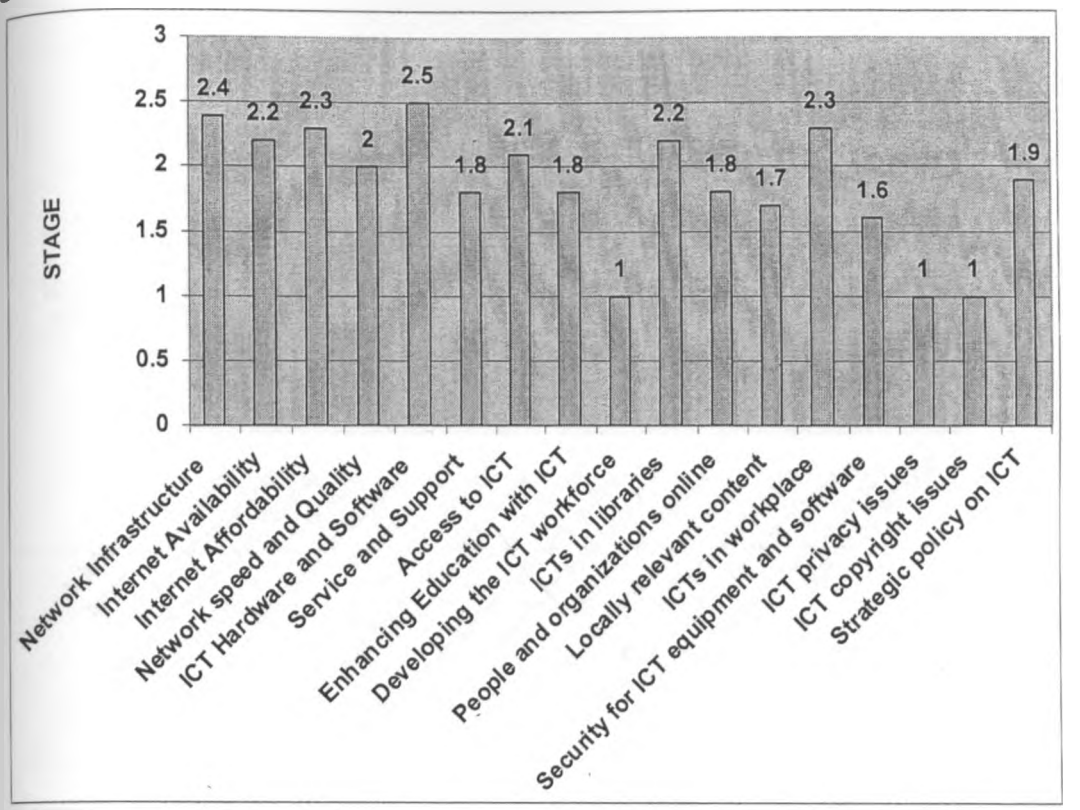

Figure 7: Staging of all e-readiness indicators for KIST

Kiambu institute of science and technology faired well in network access indicators with an average of 2.25. This is attributed to the fact that that the institute has bought a large number of computers (160) all with licensed software. In addition the institute has a sound network linking major departmental offices.

The institute has an IMS system which serves the finance, registrar, dean and senior administers offices.

Areas the institute needs to address include:

(i) developing ICT workforce

(ii) ICT privacy issues

(iii) ICT copy right issues

The institute was rated fourth in terms of e-readiness status and third in terms of academic performance.

5.1.7 THIKA TECHNICAL TRAINING INSTITUTE

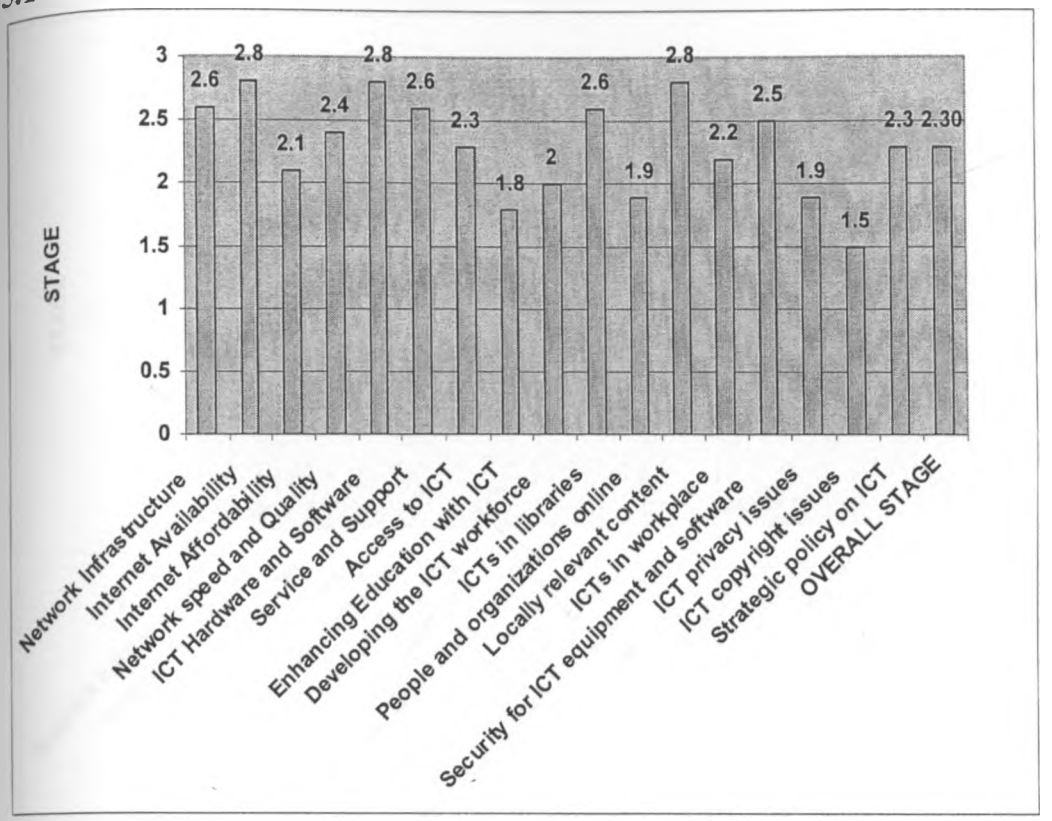

Figure 8: Staging of all e-readiness indicators for Thika T.T.I

This institute is in central province, with a student population of 1500.

The institute scored an average of 2.3 in e-readiness meaning the management has done a great deal of effort in providing the necessary facilities towards exploiting the benefits ICT. Significant areas as far as ICT is concerned include automation of admissions, finance and library series.

The institute provides Internet services to all students and in addition computer labs are adequately equipped. These two factors made the institute scored a staggering 2.8 in Internet availability and ICT hardware and software factors.

The institute was rated second in e-readiness status and fourth in academic performance.

5.1.8 NYERI TECHNICAL TRAINING INSTITUTE

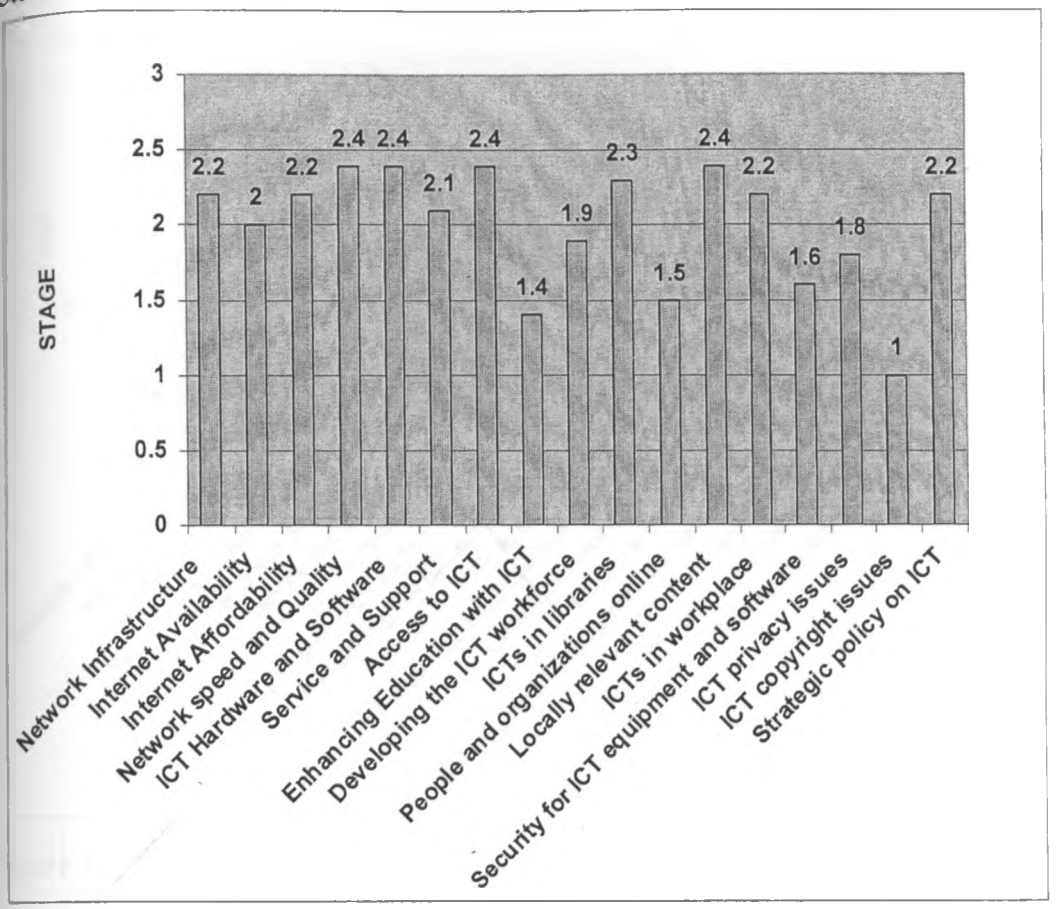

Figure 9: Staging of all e-readiness indicators for Nyeri T.T.I

This institute scored an overage stage of 2.0. This means there is great deal of effort required towards providing necessarily ICT enrolment.

The institute has sound network and three computer labs each equipped with 50 computers each. This made the institute score 2.4 on the indices matrix. Areas the institute needs to address include putting measures towards elimination of on pirated software.

The institute was rated third in e-readiness status and first in academic performance.

5.1.9 MICHUKI TECHNICAL TRAINING INSTITUTE

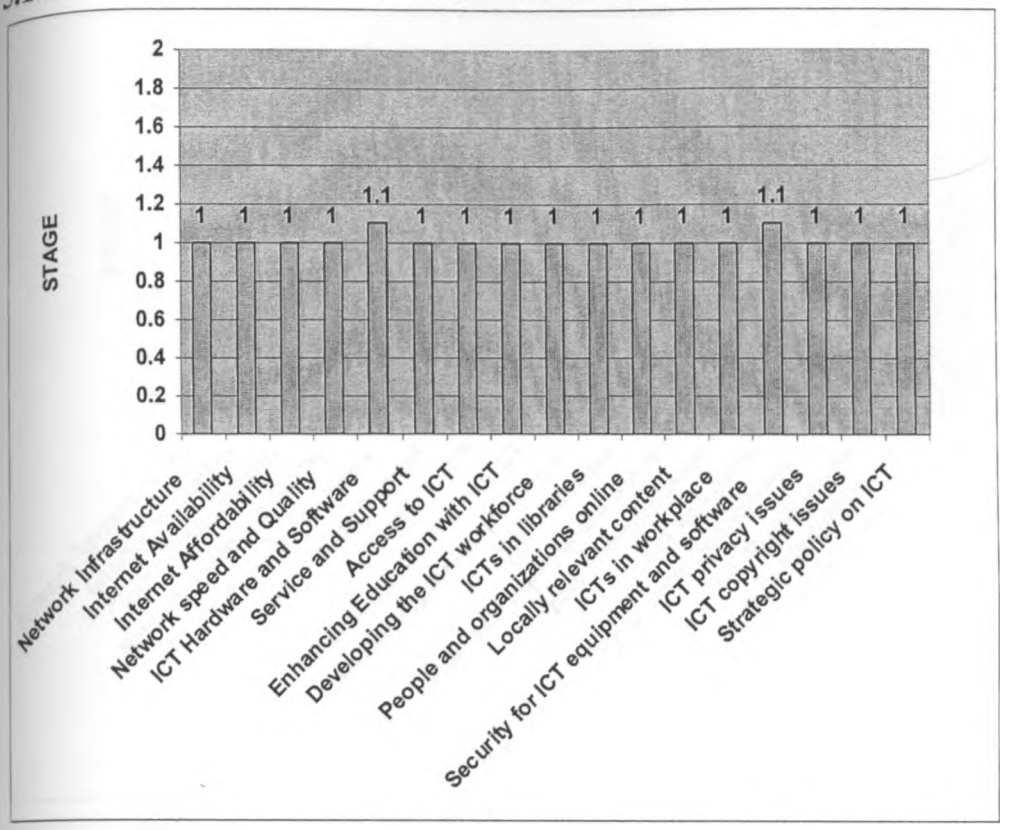

Figure 10: Staging of all e-readiness indicators for Michuki T.T.I

This institute scored extremely value in terms of e-redness. At stage 1.01, the institute needs to buy necessary hardware and software and install a sound network so that it can be able to realize full benefits of ICT.

At the time of collecting the data, plans were underway to purchase a number of computers and install a network.

Poor road network seemed to have affected the institute negatively but with the completion of all-weather road near the institute, the institute is expected to open up and catch up with the rest of the institutes.

The institute was rated tenth in terms of e-readiness and eighth in terms of academic performance.

5.1.10 MURANGA TECHNICAL TRAINING INSTITUTE

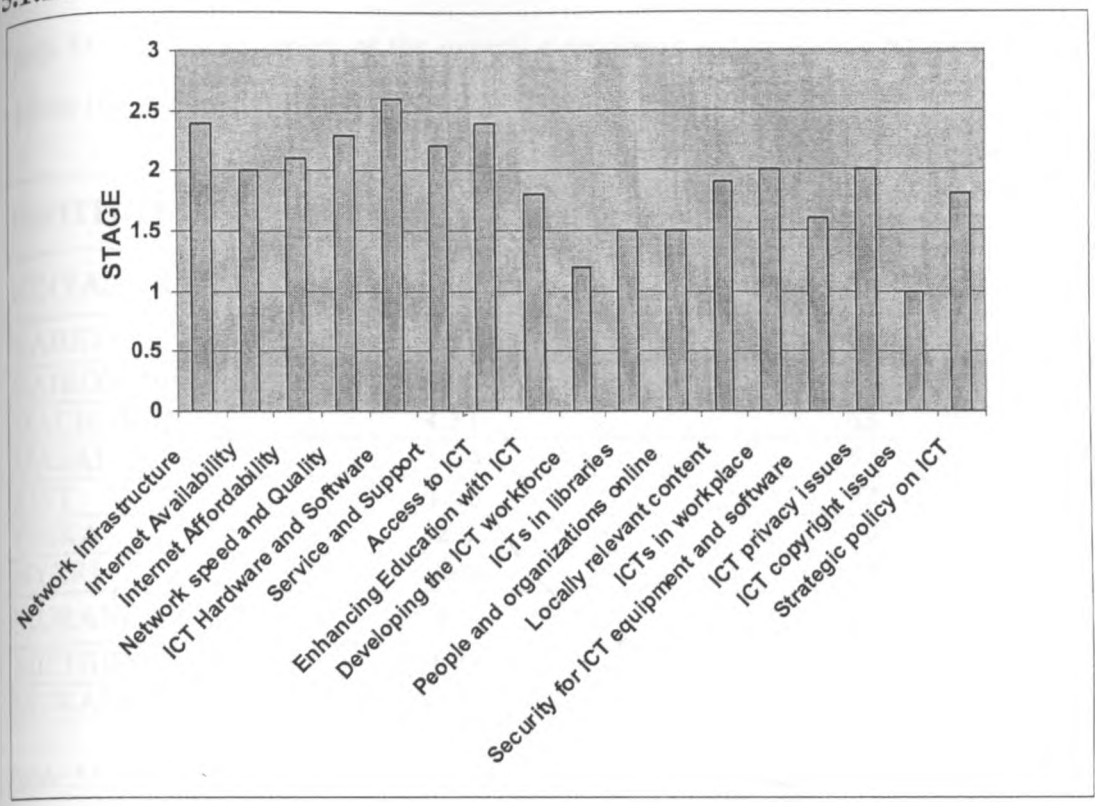

Figure 11: Staging of all e-readiness indicators for Muranga C.T

This institute scored an average of 1.9 in e-readiness status. The institute has a sound network and has installed an MIS system to cater for account, library, and timetabling.

The institute has a large number of computers distributed in several departments

Areas the institute needs to address include:

(i) developing of ICT workforce.- currently no college based scholarships are available to enhance capacity building among its staff;

(ii) ICT copyright issues- software piracy is still rampant and not effort has been put in place to disk average the vice.

The institute was rated fourth in terms of e-readiness status and fifth in terms of academic performance.

5.2 DETERMINATION OF CORRELATION

Table 55 shows a summary of the *overall e-readiness* and *academic performance* results for various institutions.

INSTITUTE	E-READINESS STAGE	PERCENTAGE ACADEMIC PERFORMANCE
KINYANJUI	1.6	56
KABETE	1.69	66
NAIROBI	2.4	78
MACHAKOS	1.51	63
MASAI	1.24	54
KIST	1.86	72
THIKA	2.3	70
NYERI	2.00	80
MURANGA	1.9	69
MICHUKI	1.01	58
MURANGA C.T	1.9	69

Table 55: E-readiness and academic results for various institutes

These results were analyzed through the use of statistical techniques and statistical packages in order to establish the correlation between the two variables.

Figure 3 shows a scatter chart produced through the use of SPSS statistical package by plotting the e-readiness status against the academic performance for all the sample institutions.

Through the use of the software, a best fit line is drawn through the scatter chart which represents the *regression line*.

5.2.1 E-READINESS VERSUS ACADEMIC PERFORMANCE GRAPHICAL PRESENTATION

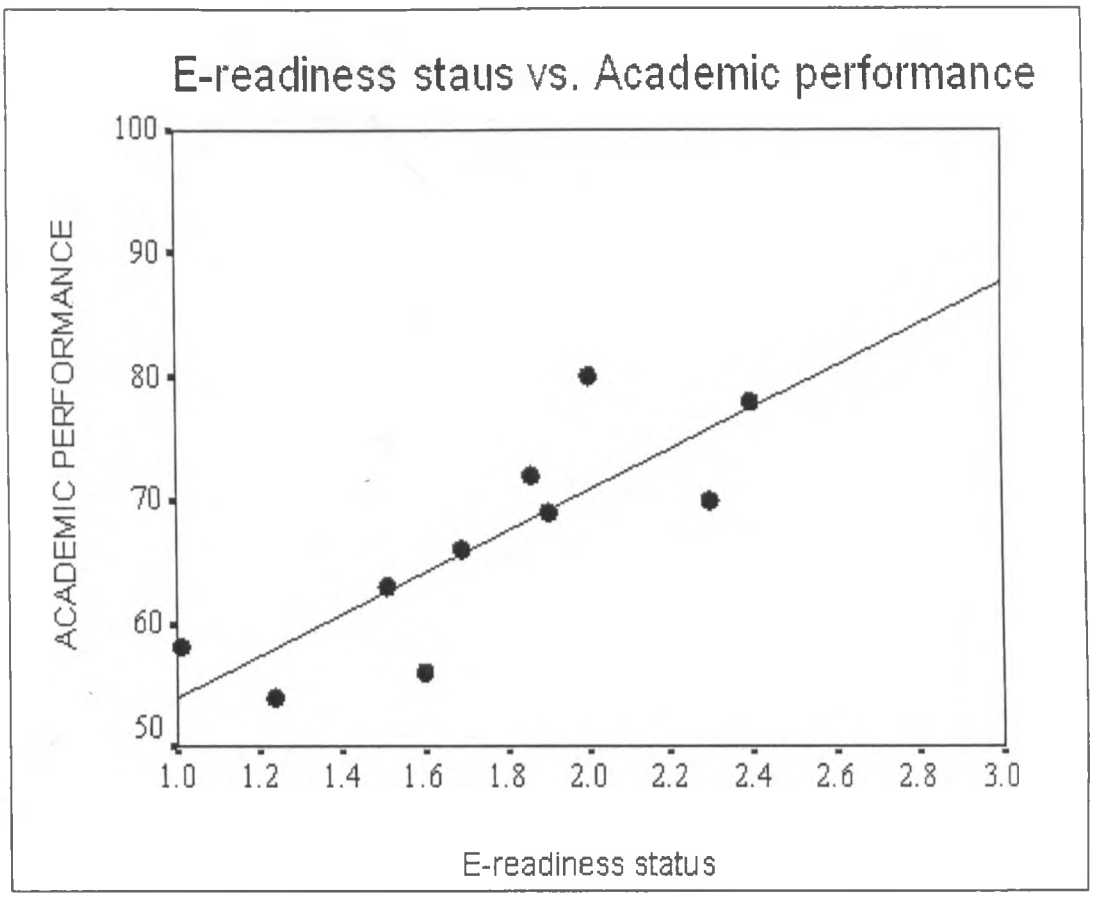

Figure 12: E-readiness status against academic performance.

5.2.2 DETERMINATION OF THE REGRESSION MODEL

FORMULA FOR DETERMINING REGRESSION MODEL: -LEAST SQUARES METHOD

Consider a scatter diagram of a set of bivariate data. Of all the regression lines that could be drawn to represent the data, the least squares regression line of y on x is that line for which the sum of squares of the vertical deviations of all the points from the line is least.

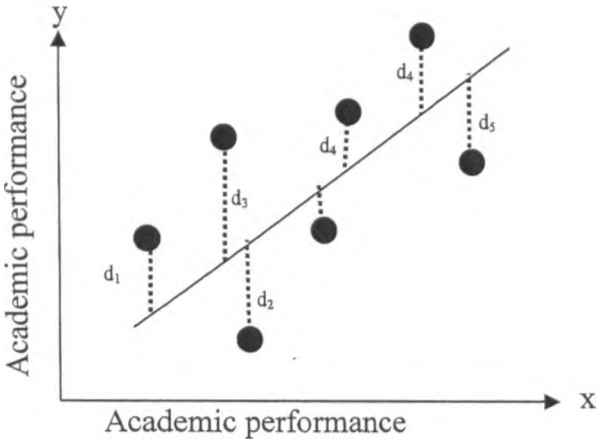

Figure 13: Scatter diagram

The line shown in figure 1 is the least squares line of y on x.

$d_1, d_2, \ldots\ldots d_n$ are the numerical differences between each plotted value and the regression line. If the least squares regression line of y on x is given by $\mathbf{y = a + bx}$, then:

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 + (\sum x)^2} \qquad a = \frac{\sum y}{n} \quad - b\frac{\sum x}{n}$$

From the graphical results, it is possible to generate the equation of a straight line through the points that can be used to describe the relationship between the two variables.

Assuming the regression model is of the form $\mathbf{y = a + bx}$ where **y** represents the percentage academic performance and **x** represents e-readiness status, **a** and **b** can be determined through statistical techniques.

TABULATION OF VARIOUS PARAMETERS

x	y	xy	x^2	y^2
1.6	56	89.6	2.56	3136
1.69	66	111.54	2.8561	4356
2.4	78	187.2	5.76	6084
1.51	63	95.13	2.2801	3969
1.24	54	66.96	1.5376	2916
1.86	72	133.92	3.4596	5184
2.3	70	161	5.29	4900
2	80	160	4	6400
1.01	58	58.58	1.0201	3364
1.9	69	131.1	3.61	4761
17.51	**666**	**1195.03**	**32.3735**	**45070**

From the above table,

$\sum x = 17.51$

$\sum y = 666$

$\sum xy = 1195.03$

$\sum x^2 = 32.3735$

$\sum y^2 = 45970$

Thus;

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} = \frac{11950.3 - 11661.66}{323.735 - 306.6001}$$

$$= \mathbf{16.84515}$$

$$a = \frac{\sum y}{n} - b\frac{\sum x}{n} = \frac{666}{10} - \frac{16.84515 \times 17.51}{10}$$

$$= 66.6 - 29.49586$$

$$= \mathbf{37.1041}$$

Therefore the linear regression model for the two variables is given by:

$$\mathbf{y = 37.1041 + 16.84515\ x}$$

This implies that given an e-readiness status of an institution, the academic performance can be determined from this equation. These results show there is a correlation between academic performance and e-readiness status and therefore justifies investments in ICT by the institutions so as to obtain better academic results.

5.2.3 DETERMINATION OF CORRELATION COEFFICIENT

A measure of strength of the correlation between the two variables is desirable. This is achieved through a *correlation coefficient* normally represented by the symbol **r**. This is a numeral that lies between -1 and +1. That is: -1 <= r <= +1

A value of r = 0 signifies that there is *no correlation* present, while the further away from 0 (towards -1 or +1) r is, the stronger the correlation.
From statistics, the formula for **r** is given by:

$$\text{Correlation Coefficient, } r = \frac{n\sum xy - n\sum x\sum y}{\sqrt{n\sum x^2 - (\sum x)^2}\sqrt{n\sum y^2 - (\sum y)^2}}$$

$$= \frac{10 \times 1195.03 - 17.51 \times 666}{\sqrt{10 \times 32.3735 - (17.51)2}\ \sqrt{10 \times 45070 - (666)}}$$

$$= \frac{11950.3 - 1166.66}{\sqrt{323.735 - 306.600}\ \sqrt{450700 - 443556}}$$

$$= \frac{288.64}{\sqrt{17.135}\sqrt{7144}}$$

$$= \frac{288.64}{4.13944 \times 84.52219}$$

$$= \mathbf{0.82}$$

A value of r = 0.82 is closer to 1 implying *strong correlation* between the two variables. Also the fact that the value of r is positive implies a *positive correlation*. This means an increase in the value of one variable tends to be associated with an increase in the value of the other valuable. This implies an increase in *e-readiness status* will ultimately lead to an increase in *academic performance*. This makes the null hypothesis $\mathbf{H_0}$ to be rejected and the alternative hypothesis $\mathbf{H_1}$ to be approved.

5.2.4 THE COEFFICIENT OF DETERMINATION

In statistics, the **coefficient of determination**, r^2 is used in the context of statistical models whose main purpose is the prediction of future outcomes on the basis of other related information. It is the **proportion of variability** in a data set that is accounted for by the statistical model. It provides a measure of how well future outcomes are likely to be predicted by the model.

Coefficient of determination, $\mathbf{r^2}$ is given by:

$$\mathbf{r^2} = \frac{\text{explained variation in all items}}{\text{total variation in all items}}$$

Since $-1 < r < +1$, it follows that $0 < r^2 < 1$

From the above analysis, $r = 0.82$

Therefore *coefficient of determination,* $r^2 = 0.82 \times 0.82$

$= \mathbf{0.6724}$

This means that only **67.24%** of the variation in academic performance is due to e-readiness status. The percentage of the variation in academic performance due to other factors (other than e-readiness status) is **32.76%**

5.2.5 MINIMAL PERFORMANCE FOR AN INSTITUTION AT STAGE 1 OF E-READINESS STATUS

In terms of e-readiness status, **stage 1** represents the minimal state of unpreparedness an institution can be and so the expected percentage academic performance at this stage is computed as follows:

$y = 34.1041 + 16.84515\ x.$

substituting for the value of $x = 1$, we get

$y = 37.1041 + 16.84515 \times 1$

$= \mathbf{53.94925}$

This implies that an institution that has no ICT facilities at all will be expected to achieve at least **53.95 %** in terms of academic performance.

5.2.6 MAXIMUM ACADEMIC PERFORMANCE FOR AN INSTITUTION AT STAGE 4 OF E-READINESS STATUS

In terms of e-readiness status, **stage 4** represents the maximum state of preparedness an institution can have and so the expected percentage academic performance at this stage is:

$y = 34.1041 + 16.84515\ x.$

Substituting for the value of $x = 4$, we get

$$y = 37.1041 + 16.84515 \times 4$$

$$= \mathbf{104.4847}$$

This value is certainly higher than the expected value of 100 by **4.4847**

5.2.7 PERCENTAGE ERROR IN ACADEMIC PERFORMANCE ESTIMATION

Base on the maximum e-readiness status of stage 4, the percentage error in academic performance estimation may be computed as follows:

$$\text{Percentage error} = \frac{\text{Estimated Percentage} - \text{Actual Percentage}}{\text{Actual Percentage}}$$

$$= \frac{104.4847 - 100 \times 100}{100}$$

$$= \mathbf{0.044847 \text{ or } 4.4847\ \%}$$

CHAPTER 6

DISCUSSION OF RESULTS

This research project set out to explore the correlation between e-readiness status and academic performance of technical training institutions. The e-readiness status was obtained by carrying out a diagnostic e-readiness assessment of the institutions through a model adapted from various e-readiness tools but customized to the meet specific needs of technical training institutions. The e-readiness results produced a series of indices for the institutions on a scale of 1 to 4 with 1 representing a state of unpreparedness while 4 representing full readiness status.

The results of academic performance were obtained directly from the institutions through the offices of their respective registrars.

By plotting the e-readiness status versus academic performance and obtaining the best straight line through the points, a direct link between the e-readiness status and academic performance of the institutions was established.

The regression model established can be used to determine the academic performance of any institution given the e-readiness status. For example, Kenya Science Campus, an institution with an e-readiness status of **3** generated the following results.

$y = 37.1041 + 16.84515\ x$, substituting the value of $x = 3$ gives,

$y = 37.1041 + 16.84515 \times 3$

= 87.64 %.

Actual academic results obtained from the institution gave an average percentage pass of **82%** representing a percentage error of 7 %. This is within the allowable limits.

6.1 STRENGTH OF THE CORRELATION

Statistical analysis gave a *coefficient of determination* of **0.82**. This value indicates a measure of the strength of correlation between the two variables with a value of **0** indicating no correlation while a value of **1** indicates perfect correlation. The difference of **0.18** may account for a variety of factors such as different management, different lecturers teaching the courses and different entry points for individual students.

In virtually all the institutes under investigation, the actual use of ICT facilities was far below the expectation and this could probably have accounted for lack of a perfect correlation (r = 1) between the e-readiness status and the academic performance.
For instance, most of the institutions continued to use old teaching methodologies of writing on blackboards despite having laptops and LCD projectors already acquired. Of the institutes surveyed, few institutions exploited the interactive learning environment offered by ICT facilities so as to make the lessons lively and thereby stimulate the learning process.

For instance, in Kinyanjui T.T.I, it was observed that the institute had acquired two powerful and expensive servers to the tune of Ksh 500,000. However, despite the potential offered by these systems, the institute was using these facilities merely for MIS system and for browsing purposes. The institute did not have a website, did not have academic materials posted on the network nor provision for online discussions, all of which could promote learning and ultimately improve the academic performance of the institute.

In Machakos T.T.I, it was observed that although the institute had hosted a website, the web's content was merely for advertisement purposes. There was no provision for online registration or posting of academic materials.
In Kabete T.T.I, lecturers used old copies of schemes of work. No attempt had been made to put the schemes of work into electronic form for easier modification and subsequent re-use in future.

In Nairobi T.T.I, it was observed that despite the institute having a sound website, students examination results were still being sent through the traditional mail system. There was no provision for posting the results on the institute's website nor provision for online course registration.

In some institutions, despite the presence of Internet facilities in the institutes, the students still relied on commercial cyber cafés in nearby areas. This could be attributed to the low access speeds offered by the institutes' Internet services. Low access speeds may be due to the high cost of Internet making the institutions unable to purchase adequate bandwidth.

It was also observed that the number of ICT staff in all the institutes was below the expected number based on the Teachers Service Commission's Curriculum Based Establishment. This could also have affected the level of utilization of ICT facilities. In general, the results

showed that although an institute could be having a high e-readiness status, the level of technology adoption was still low.

CHAPTER 7

CONCLUSION

From the project results, it is clear that there is a *positive correlation* between e-readiness status and academic performance in technical training institutions for the particular course under study. These results imply that institutions should strive to improve their e-readiness status so that they can ultimately improve their academic performance in ICT related areas.

Thus the results disapproved the null hypothesis, $\mathbf{H_0}$, which stated that "*there exists no correlation between e-readiness and academic performance*". The null hypothesis was therefore rejected and the alternative hypothesis, $\mathbf{H_1}$, approved.

7.1 FURTHER WORK

Once the relationship between the independent and dependant variable has been established, the next step is to explain that relationship in systematic and explicit way – in the form of a theory.

The way forward will be to conduct several researches in other institutions and present the results in a wider forum for scrutiny and eventually come up with a theory linking the two variables.

CHAPTER 8

RECOMMENDATIONS

The recommendations arising from the project can be looked at from two broad perspectives:

(i) Recommendations arising from the impact of e-readiness status on academic performance;

(ii) Recommendations arising from the diagnostic e-readiness assessment.

8.1 RECOMMENDATIONS ARISING FROM THE IMPACT OF E-READINESS STATUS ON ACADEMIC PERFORMANCE

The project observed that there was a *positive correlation* between *e-readiness status* and *academic performance* in technical training institutes for the particular course under study. Consequently, the management of technical institutions should strive to see that these institutions are e-ready. These would certainly lead to *improved* academic performance as the project results have demonstrated.

8.2 RECOMMENDATIONS ARISING FROM E-READINESS STATUS

The National ICT Strategy for Education and Training (2006) outlines the following as some of the strategic pillars for ICT implementation:

- Digital equipment
- Connectivity and network infrastructure
- Technical support
- Harnessing emerging technologies
- Digital content development
- Integration of ICTs in education
- Training (capacity building including professional development)
- Research and development

Based on the results of the e-readiness assessment, there was a clear gap in technical training institutions between the current status of e-readiness and what is expected both by the

ministry and by the ideal e-ready parameters. Accordingly, certain issues need to be addressed by principals of technical institutions if full e-readiness status is to be realized in the near future and thereby make these institutions realize the benefits of ICT adoption. These issues and recommendations thereafter are based on the four major categories of indicators used in the e-readiness assessment framework formulated and the National ICT Strategy for Education and Training (2006).

8.2.1 NETWORK ACCESS CRITICAL ISSUES

(i) Inadequate Internet bandwidth:

One of the critical issues was that institutes do not purchase adequate Internet bandwidth for their populace. The study established that most of the institutes purchased less than 1Mb/s Internet bandwidth for the entire population. This may partly be due to the high cost of Internet bandwidth in Kenya but the cost is expected to come down once the laying of fibre optic cable project currently undertaken by the ministry of information and communication is completed.

Recommendation:

The institutes should increase the total Internet bandwidth so as to guarantee fast access and discourage both students and teachers from seeking Internet services from commercial cyber cafés near these institutes.

(ii) Low number of networked computers/Digital equipment

On average, the number of networked computers for each institution is about 60. This number if very low compared to entire students and teachers' population of more than 1000.

Recommendation:

More computers should be purchased so as to increase the ratio networked PCs to students. *N-computing* technology should be adopted so as to reduce costs of the equipment. The capital required may be raised from the students' fees and by writing project proposals to relevant ministry seeking for funding.

(iii) Poor ICT service and support:

The quality of network service in all the institutes was rather wanting. The institutes' networks are characterized by frequent breakdowns and long recovery time partly due to lack of qualified technicians.

Recommendation:

The institutes should hire and retain highly skilled technical staff.

8.2.2 NETWORKED LEARNING CRITICAL ISSUES

(i) Provision of digital content: None of the institutes had leaning materials posted on websites.

Recommendation:

The institutes should ensure that all learning materials are posted on the institutes' web servers for students to access online and thereby accelerating the learning process.

(ii) Library resources:

Most libraries in T.T.Is were observed to be using purely manual systems. This means a lot of time is wasted while going through various book catalogues thus creating a high degree of dissatisfaction amongst the students and lecturers.

Recommendation:

The institutes should automate all the library activities and ensure that where applicable the resources are available over the Internet for on-line access. Institutions could make use of open source library automation systems.

8.2.3 NETWORKED SOCIETY CRITICAL ISSUES

(i) Lack of interactive institutional websites:

The study found that of the few institutes that had hosted websites, the contents of the websites were purely informational.

Recommendation:

The institutes should setup interactive websites that are driven by Internet-enabled academic and administrative information systems, especially the core business systems (student, finance and library information systems).

8.2.4 NETWORK SECURITY AND ICT STRATEGY CRITICAL ISSUES

(i) Use of licensed anti-virus software:

Most of the institutes were found to be using pirated anti-virus software. Apart from the fact that this is illegal, this paused challenges when seeking for updates through the Internet thereby threatening the safety of programs and data for the institutes.

Recommendation:

The institutes should purchase licensed anti-virus software so that they can get regular updates via the Internet.

(ii) Lack of regular power supply for ICT equipment:

The study observed that the institutes had neither standby generators in case of power blackout.

Recommendation:

The institutes should install standby generators so as to ensure smooth delivery of services.

(iii) Lack of a disaster recovery plan:

The lack of a disaster recovery plan is an indicator of low state of readiness to use ICT to support mission-critical operations of the institutions (e.g., student information systems). This pause great dander as the institutes can loose crucial data in the event a disaster occurs.

Recommendation:

The study recommends the implementation of a disaster recovery plan by all institutes.

(iv) Lack of integrated management information systems.

In 70% of the institutes surveyed, there is absence of integrated management information systems installed to ensure sound overall management.

Recommendation:

The institutes should acquire, implement and sustain integrated management information systems. These systems should be implemented and supported by qualified information systems professionals.

(v) Lack of ICT policy:

Apart from Nairobi T.T.I, all the other institutes did not have an ICT policy in place which is aligned to the overall institutes' strategic policy. This is not a very health situation as it makes ICT be accorded low status in terms of the institutes' resource allocation

Recommendation:

The institutes should develop and implement an ICT policy that is aligned to the overall strategic plan.

8.2.5 INTEGRATION OF ICT IN EDUCATION

It was observed that although most institutions had LCD projectors and laptops, most of them were not using these facilities when training. Most of the institutions relied on traditional blackboards.

Recommendation:

Full integration of ICT in training rather than relying on traditional teaching techniques. The management of technical training institutions should come out with strategies that will ensure adoption of ICT in:

- Teaching
- Libraries for research by both students and lecturers.
- Preparation of schemes of work and lesson notes by lecturers.
- Management of the institutes.

8.2.6 HARNESING EMERGING TECHNOLOGIES

While there is a wide range of innovations in ICT to support effective and quality delivery of education services and curricula, there is a considerable technology lag in technical training institutions. Most institutions still use nearly obsolete systems and are consequently unable to exploit the educational potential of the emerging technologies.

Every institute should establish an innovation and technology centre that would facilitate mechanisms that would encourage the institute to keep abreast and harness emerging technologies to enhance the process of teaching, learning and acquisition of knowledge and skills in tandem with the modern world.

The centre would also come up with mechanisms to encourage the institution to keep abreast and to harness emerging technologies to improve effective and quality delivery of education services and curricula by promoting the establishment of centres of excellence, education exhibitions and science congress.

8.2.7 RESEARCH AND DEVELOPMENT

There is no technical training institute which has established a research centre to address key challenges that stand in the way of adoption and use of ICT in the institutes. Further there is need for technical training institutions to engage in software development that can serve local market.

As such the institutes should establish research centres to:

- Facilitate research and development of ICTs in the institutes.
- To facilitate dissemination of research and development outcomes.

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APPENDIX A

GRID FOR STAGING E-READINESS INDICES FOR TECHNICAL TRAINING INSTITUTIONS

NETWORK ACCESS

FACTOR	Network Infrastructure	Internet Availability	Internet Affordability	Network Speed and Quality	Hardware and Software	Service and Support
STAGE 1	Access to telecommunications infrastructure is very poor. (Roughly: There are very few shared facilities for telecommunications access. Telephone penetration is very low, with a teledensity of less than 2 mainlines per 100 people. Mobile wireless penetration is below 0.5% of the population. No cable services are available.)	There are no Internet Service Providers (ISPs) offering local dial-up access. There is no public Internet access. Businesses are unable to lease dedicated lines from the local telephone operator, or there is a multi-year wait to do so.	Most users are charged long distance or international rates for dial-up access. ISP rates are so high that few individuals can afford Internet access.	Fewer than half of all domestic telephone calls are successful. For voice telephony, sound quality is often not acceptable for regular conversation. More than 100 faults are reported per year for each 100 telephone mainlines. No services beyond limited electronic mail capabilities are supported by the local telecommunications infrastructure. Large businesses which want access must link their networks directly to infrastructure backbone outside their community.	There are no distribution/sales points for ICT hardware/software within the community. ICT hardware and software are too expensive for all but large businesses and a small minority of citizens and small and medium-sized businesses.	Telephone mainlines take at least four years to be installed from the time their orders are placed. It takes over six months for reported mainline problems to be resolved, if ever. Very few or no software developers, programmers or computer technicians are present in the community.
STAGE 2	A small minority in the community has good access to the telecommunications network, but most of community does not. (Roughly: Teledensity is between 2 and 8 mainlines per 100 people. Mobile wireless penetration is between 0.5% and 3%. Cable penetration is below 5% of all households in the community.)	A limited number of Internet Service Providers offers local dial-up access. There are more than 1,000,000 inhabitants per local ISP. Some providers offer only e-mail services. There are limited opportunities for public Internet access. Users often have difficulty establishing a dial-up connection to a local ISP. There is no competition in commercial leased line provision. Businesses may only lease lines from a single telephone operator.	Rates for local telephone calls are high enough to discourage extensive Internet use via local ISPs, even among most who can afford Internet access. Local access solutions exist, but rates for ISP services are high enough to discourage extensive Internet use. The lack of competition in the provision of commercial leased lines is reflected in prohibitively or very high leasing fees.	50-70% of domestic telephone calls are successful. Dropped connections are frequent and extremely disruptive. For voice telephony, sound quality is acceptable for regular conversation. Between 50 and 100 faults are reported per year for each 100 mainlines. The telecommunications infrastructure in most areas of the community supports dial-up modem transfer speeds of 9.6 Kbps or less. Some areas may support speeds of 14.4 Kbps. Large businesses and ISPs can link their networks to a local infrastructure backbone, but backbone capacity is frequently inadequate to support user demands. Packet loss is significant and regularly disruptive for any online activities.	Some off-the-shelf hardware and software solutions are available locally, but there are none or very few in the native language of the community. Basic hardware and software are affordable for some citizens and small and medium-sized businesses.	Mainlines take at least six months for installation. It takes over one month for reported mainline problems to be resolved. Providers pay no explicit attention to customer service. A small community of software developers, web designers, network administrators and other technical personnel exists.

STAGE 3	A sizeable portion of the community has good access to telephone services. Growth in mobile wireless telephony is accelerating. (Roughly: Teledensity is between 8 and 40 mainlines per 100 people. Mobile wireless penetration is between 3% and 14%. Between 5 and 10% of households in the community subscribe to cable services.)	There are between 500,000 and 1,000,000 inhabitants per local ISP. ISPs provide full Internet access. Subscribers may have some options between various Internet service packages. There are some opportunities for public Internet access. It is normally possible for users to establish a dial-up connection to a local ISP, except during peak hours. One or two private providers leased lines to businesses.	Telephone charges for Internet access reflect emerging competition in the telecoms market, yet they are high enough to discourage extensive use by some users. Internet access is priced within reach of the majority of citizens. Competition in leased line provision for businesses has been introduced, and prices are falling but are still high.	70-90% of domestic telephone calls are successful. Connections are dropped with noticeable frequency and are somewhat disruptive. Fewer than 50 faults are reported per year for each 100 mainlines. Users have access to dial-up modem transfer speeds of up to 28.8 Kbps. Leased lines with transfer speeds of up to 64 Kbps are widely available for businesses and ISPs. Limited higher-speed lines are available in some areas. Backbone facilities serving the community are usually sufficient, although regular peak demand periods result in slower network response times. Packet loss by the network may occur but is not generally disruptive.	Most ICT products are sourced from abroad, but there is a strong and growing localization industry to adapt products to local needs. Some software appropriate to local needs and languages is available. A variety of hardware and software solutions are available and affordable to most small and medium-sized businesses, as well as many individuals.	Mainlines take at least one month to be installed. It takes over one week for reported mainline problems to be resolved. There is a growing customer service ethic among service and support providers, although it is not a priority for most. Some ICT maintenance and technical support services are available. A nascent software industry is present in the community, and there is a growing number of hardware technicians, web designers and network administrators.
STAGE 4	-There is widespread access to telecommunications and network services. (Roughly: There is high teledensity of 40 mainlines or more per 100 people. Penetration of mobile wireless telephony is high and growing, with at least 14% of the community subscribing. Cable penetration is high, at 10% of households or higher.)	There are more than two local ISPs per 1,000,000 inhabitants. Higher bandwidth solutions such as DSL (digital subscriber line) and cable modem access are available. Most customers can tailor services to meet different demands for speed, service, security, quality and cost. ISPs provide web hosting services to their subscribers. There are adequate opportunities for public Internet access for those without access at home, school or work. Users are able to establish a dial-up connection to a local ISP on a reliable basis. Multiple private providers leased lines to businesses. Wireless solutions may be available in addition to fixed line solutions.	Prices for telephone usage are set competitively and are affordable for nearly all citizens. Flat rate pricing may be in effect for local telephone calls. Prices for Internet access are set competitively and are affordable for nearly all citizens. Flat rate pricing may be available. Free ISP services may be available, particularly in communities with time-metered pricing of local phone calls. Higher bandwidth solutions such as DSL services and cable modem access are priced competitively, which may include tiered pricing based on speed of access or usage-based pricing based on total volume. "Always-on" connections are available without time-metered pricing. Pricing for leased business lines is set in a competitive environment featuring multiple vendors.	Dropped connections are fairly infrequent and not a major disruption. Over 90% of domestic telephone calls placed are successful. Fewer than 10 faults are reported per year for each 100 mainlines. There is widespread access to dial-up modem transfer speeds up to 56 Kbps, with some access to high speed solutions such as DSL, cable modems and wireless media. High speed services of 1.5 Mbps are common, with higher speeds available in some areas. Adequate backbone capacity exists to support community needs without Significant transmission delays except during infrequent periods of high demand. Packet loss by the network is below 10%.	A vibrant marketplace exists for software and hardware with a competitive retail and wholesale market for these products. Hardware and software appropriate to local needs and languages are widely available and affordable.	Mainline installation is usually completed within a few days. Service providers can be contacted in a number of ways (e-mail, telephone, mail). Reported problems are usually resolved within 48 hours. Online help is available and may allow for immediate resolution. Customer service is considered a source of competitive advantage for the service provider. ICT maintenance and technical support are widely available. A competitive and sophisticated web design market exists, incorporating the latest development technology.

NETWORKED LEARNING

	Schools' Access to ICTs	Enhancing Education with ICTs	Developing the ICT Workforce
STAGE 1	There are no computers in schools.	Computers are not used by any teachers or students	Training opportunities for programming, maintenance, support, Web design and other ICT professions are virtually non-existent.
STAGE 2	Where there are ICTs in schools, it is primarily at the university level, and there are generally fewer than five computers in a school or faculty. Access to the computer(s) is limited to computer teachers and/or administrators Computers tend to be older generation models, such as stand-alone 486 PCs or the equivalent. Where there are multiple computers installed, they are not networked. Use of the computer(s) is limited to electronic documents that are available on the hard drive or diskettes. There may be connectivity for store-and-forward e-mail.	Only a few teachers use computers in a very limited fashion. Teachers' basic computer literacy involves skills such as use of the keyboard and mouse, a basic understanding of the computer's operating system, manipulation of files, and cutting and pasting. Computers are mainly used at the university level.	There are limited opportunities for training in ICT skills development.
STAGE 3	Computers can be found at the university level as well as in primary and secondary schools. Up to 10 to 15 computers can be found in laboratories for classroom group work, with about four students per computer. Computer labs are generally only open for computer studies during the day and closed after school, or may be open to teachers for class preparation but closed to students Computers tend to be older generation models, such as 486 PCs or higher, and they may be networked with a file and mail server. There may be an internal Local Area Network (LAN) in place. If there are multiple computer labs, they may be connected through the school network. Where there are stand-alone PCs, they may have a limited CD-ROM library. The networked lab achieves connectivity through a dial-up connection to the Internet, which supports limited World Wide Web access.	Teachers and students use computers to support traditional work and study. Teachers who use computers are generally proficient with word processing applications and may access information offline from CD-ROMs. They may employ computers in some basic drill-and-practice lessons. In some cases, teachers access and organize information from the World Wide Web in their work, share information using e-mail, and create information in electronic format to share with others both inside and outside the school.	Technical classes and programs on ICT-related subjects are available from a variety of public and private centers. Some limited online access to training is available. Some employers offer training in the use of information and communication technologies to their employees.
STAGE 4	Most schools at all educational levels have access to computers There may be a number of computer labs in each school, and computers may be found in the classroom. In some cases, students and teachers may have individual laptop computers. Computer labs are open to students and reserved for subject matter classes to use, and are open after school hours. The lab may be open to the community and other schools after school and on weekends There may be an internal Web server on the school network — computers as well as other devices are connected to the network. Classrooms may be wired and connected to the school's Wide Area Network (WAN). Clusters of schools may be connected to a regional WAN to share electronic resources. A national school network may be in place. Connectivity may be obtained through a leased line or wireless connection with at least 64 to 128 Kbps of dedicated access.	Information and communication technologies are fully integrated into the curricula, are used in the classroom and are essential to the learning process. The curricula may feature collaborative, project-based learning activities that enable students to use the Internet and advanced software skills to work with other students and teachers in their school, outside their community and internationally. Teachers are well-trained in methods for incorporating computers and ICTs into their instruction and curricula.	There are many technical schools with specialized curricula in information and communication technologies and computer science. There are a variety of training opportunities relating to information and communication technologies available through vendor certification programs, employers, educational institutions, private training centers and distance learning courses. Online resources and courses are widely available for the development of technical skills.

NETWORKED SOCIETY

	People and Organizations Online	Locally Relevant Content	ICTs in Everyday Life	ICTs in the Workplace
STAGE 1	Most of the population has never heard of the Internet Less than 0.05% of the population has used the Internet at any time during the past three months. No business entity in the community has a registered Internet domain name.	No websites exist providing information on local topics. Few or no websites are available in local languages or a dominant Web language spoken locally.	Members of the community do not normally employ information and communication technologies in their daily lives. Most social communication is paper based and/or oral.	Employees have limited access to telephones. A small minority of business and government offices have at most a few computers, none of which are networked. Most business communication takes place in person or by mail. A small number of businesses use telephone and fax.
STAGE 2	Much of the population has never heard of the Internet and most people do not know anyone who has ever used it. Less than 0.5% of the population has used the Internet recently, and few are regular users. Some local businesses and institutions have registered domain names. There are fewer than two of these domains per 1000 inhabitants There is no advertising in traditional media frontline companies or resources.	Few websites covering local topics exist, and most of them are created and hosted outside the community. Some websites are available in local languages or a dominant Web language spoken locally. There is little use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs.	Information and communication technologies (telephones, fax machines, pagers, computers) are used to a limited degree by some members of the community. Public telephones are available in some parts of the community and are used regularly b y many community members. Personal computers with e-mail capability are made publicly available by some businesses, but most users are from outside the community (e.g. tourists and visiting businesspeople).	Organizations achieve sporadic efficiency gains through limited deployment of ICT systems in their internal workings. Some employees have access to telephones. Few offices have computers that are networked for internal file sharing and basic enterprise applications. In offices where there are computers, only some employees use them for their work, though not for electronic communications.
STAGE 3	Most of the population has heard of the Internet, although few have used it. Less than 10% of the population uses the Internet regularly. The overwhelming majority of Internet users are males between the ages of 10 and 35 The number of registered domains locally is at least 2 per 1000 people. Advertising in traditional media for online companies or resources is infrequent.	Some local websites are available, though most carry static content and are updated infrequently. Websites carry diverse types of information relevant to different groups within the community. Many websites are available in local languages or a dominant Web language spoken locally. There is some use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs There are opportunities for Web-related training, although they may be expensive and accessible only in certain areas.	Public telephones may be found in most parts of the community and are heavily used. Some members of the community have Internet access at home. Growing numbers of community members use telecenters, cybercafes and other businesses that offer computer use and online services to the public for a fee.	Organizations achieve some efficiency gains through some degree of deployment of ICT systems in their internal workings. Many computers in business offices are internally networked for data processing, management reporting, and other enterprise applications. Some employees conduct research and business transactions over the Web, though most often they use a shared workstation to do so. Some employees use e-mail for internal communications. 7
STAGE 4	Most of the population is interested in using the Internet and knows others who do. At least 10% of the population accesses the Internet with some regularity. Males between the ages of 10 and 35 no longer represent the overwhelming majority of Internet users. The number of registered local domains is at least 20 per 1,000 population Advertising in traditional media for online companies or resources is fairly common.	Many websites provide dynamic information on local topics and are updated at least several times per week. Local content is generated by citizens at all levels of society, including websites and online bulletin-board systems, Usenet groups, newsletters, and/or listservs. A significant amount of information is available through websites in local languages or a dominant Web language spoken locally. Many affordable opportunities exist for Web-related training. Many members of the community use information and communication technologies (wireless phones, digital assistants, pagers, personal computers) to assist in their personal lives.	Many members of the community use information and communication technologies for household commerce (online shopping, banking, investing) and for a variety of social and commercial interactions with other people (including bartering, consumer-to consumer trade, online chat). Citizens without access through home, school or work use a variety of public and private Internet access options, including online cafes and community centers.	Organizations achieve major efficiency gains through widespread deployment of ICT systems in their internal processes. Computers in offices are fully networked. Different office locations are connected to each other through external networks. These networks may extend nationally or internationally. Most employees have Internet access from their own workstations. Most employees have their own e-mail accounts for internal and external communications. Workers commonly list their e-mail and website addresses on their business cards.

NETWORK SECURITY AND ICT STRATEGY

	SECURITY FOR ICT EQUIPMENT	ICT PRIVACY ISSUES	ICT COPYRIGHT ISSUES	ICT STRATEGY
STAGE 1	10% of always-on connections have firewalls. Sensitive business and personal e-mail never encrypted. Virus software updated annually.	75% of public and private sector websites post privacy policies. 10% of people feel they understand how to protect their privacy when online.	Institution not aware of Treaties on Copyright and Related Rights. 100% Photocopying of books	Policy makers and business leaders are familiar with key connectedness policy issues such as privacy, telecommunications competition, taxation, authentication, intellectual property, security, and online criminal activity.
STAGE 2	50% of always-on connections have firewalls. Sensitive business and personal e-mail sometimes encrypted. Virus software updated monthly.	25% of public and private sector websites meet the privacy guidelines of BBBOnline or TRUSTe. 25% of people feel they understand how to protect their privacy when online.	Institution aware of treaties on but 75% of population	Policy makers and business leaders are working to ensure that new policies are in place to encourage and support the emergence of connectedness. Policy makers and business leaders are working to eliminate barriers to connectedness, such as requirements for physical signatures.
STAGE 3	100% of always-on connections have firewalls. Sensitive business and personal e-mail always encrypted Virus software updated weekly. Digital signature or equivalent authentication technology used by 50% of users.	50% of public and private sector websites meet the privacy guidelines of BBBOnline or TRUSTe. 75% of people feel they understand how to protect their privacy when online.	Institution aware of WIPO Treaties on Copyright and Related Rights 25% still photocopy books and journals	Regular assessments of connectedness are made as well as the effect policies are having on connectedness.
STAGE 4	Organizations and individual users use tools to protect online security and are prepared to make themselves "well" again when security is breached.	Users are enabled to easily protect their privacy through a combination of technology tools and best practices. Public and private sector organizations make it easy for users to understand how information is collected and used.	Institution implements WIPO Treaties on Copyright and Related Rights No photocopying of books and related copyrighted materials.	Policies related to privacy, telecommunications competition, taxation, authentication, intellectual property, and criminal conduct for disrupting networks are clearly established and are favorable to promoting connectedness and use of the Network.

APPENDIX B

CSPP GRID FOR STAGING E-READINESS INDICES

1. THE NETWORK (INFRASTRUCTURE)

FACTOR/ STAGE	SPEED & AVAILABILITY		COMPETITION	
	Residential	**Commercial**	**Wired/Fixed Wireless**	**Mobile Wireless**
STAGE 1	-56k dial-up available to 100% of homes. -Only analog mobile wireless services offered.	-56k dial-up available to 100% of businesses. -Only analog mobile wireless services offered.	-1 high-speed data provider for residential and business markets. - Installation takes 2 weeks.	-1 mobile voice/data wireless provider. -Monthly contracts available on per-minute basis.
STAGE 2	-DSL/Cable or fixed wireless equivalent available to 20% of homes. - Mobile digital wireless data service covers 30% of the community at 12kbps.	-High-speed (DSL/Cable or dedicated T1+) access available to 40% of businesses. -Mobile digital wireless data service covers 30% of the community at 12kbps.	-2 residential high-speed data providers servicing more than 50% of the community. -3 high-speed data providers for the business market. - Installation takes less than 2 weeks.	-3 mobile voice/ data wireless providers. -Mobile wireless long distance flat rates available on per-minute basis
STAGE 3	-DSL/Cable or fixed wireless equivalent available to 80% of homes. -Mobile digital wireless data services covers 50% of the community	-High-speed access available to 80% of businesses -Mobile digital wireless data service covers 50% of the community at 56kbps	-3 residential high-speed data providers servicing more than 75% of the community -5 high-speed providers for the business market -Installation takes 1 week	-5 mobile voice/data wireless providers. -Mobile wireless data flat rate available on per-minute basis
STAGE 4	-Every home has access to high-speed connections and people can access the Network wirelessly from anywhere in the community.	-Every business has access to high-speed connections and employees can access the Network wirelessly from anywhere in the community	-High-speed data services for the residential and business markets are highly competitive for price, innovation, and quality of service	-Mobile wireless services are highly competitive for price, innovation, and quality of service.

2. NETWORKED PLACES (ACCESS)

FACTOR/ STAGE	Business	Government	K-12	Higher Ed	Health	Home
STAGE 1	-Employees dial-up for Internet access -25% of employees have email accounts.	-50% of government buildings have always-on connection. - 25% of employees have email	-10% of classrooms have always-on connection to the Internet. -25% of teachers have email accounts.	-100% of offices, libraries, and labs have always-on connection to the Internet. -25% of dorm rooms have always on connection to the Internet. -100% of students, faculty, and staff have email accounts.	-25% of providers have dial-up Internet access. -25% of providers have email accounts for external communication.	-25% of homes have a computer/ access device. -15% of homes use the Internet
STAGE 2	-30% of employees have access to an always-on connection to the Internet. -50% of employees have email accounts. -50% of mobile employees use wireless devices.	-100% of government buildings have always-on connection to the Internet. -100% of employees have email. 50% of mobile employees use wireless devices	-50% of classrooms have always-on connection to the Internet. -100% of teachers have email accounts.	-50% of dorm rooms have always on connection to the Internet.- 25% of campuses have a wireless network.	-25% of providers have always-on connection to the Internet. -50% of providers have email accounts for external communication.	-50% of homes have a computer/ access device. - 30% of homes use the Internet
STAGE 3	- 60% of employees have access to an always-on connection to the Internet. - 75% of employees have email accounts. - 100% of mobile employees use wireless devices.	- 100% of mobile employees use wireless devices. - Public terminals are available in 50% of buildings that are accessible to the public.	- 75% of classrooms have always-on connection to the Internet. 100% of students have email accounts - Public ports and terminals are available in some common areas.	-100% of dorm rooms have always on connection to the Internet. - 50% of campuses have a wireless network.	- 50% of providers have always-on connection to the Internet. - 100% of providers have email accounts for external communication.	-80% of homes have a computer/ access device. -80% of homes use the Internet.
STAGE 4	- All businesses of all sizes and in all sectors are always connected to the Network and every employee is able to access the Network when it is needed to perform their job, even when mobile.	- Governments make the Network always available to employees and become a point of Network access for the public when they are in a public building.	- All K-12 campuses are highly networked environments where the Network is available to students, faculty, and staff from anywhere on campus.	- All higher ed campuses are highly networked environments where the Network is available to students, faculty, and staff from anywhere on campus.	All health care providers have high-speed access for communication and telemedicine purposes.	- All homes are connected to the Network and enable people and devices to access the Network from multiple sites in the home.

3. NETWORKED APPLICATIONS AND SERVICES

FACTOR/ STAGE	Business	Government	K-12	Higher Ed	Health	Home
STAGE 1	-10% order goods online. 10% transact with customers online. 10% manage HR/administrative information online.	50% of agencies have informational websites. 25% of agencies manage HR/administrative information online.	100% of schools have an informational website. 25% of teachers trained to use digital content and web-based learning for instruction. 25% of classes use digital content and/or web-based learning.	-25% of campuses offer online registration. 25% of faculty trained to use digital content and web-based learning for instruction. 25% of classes use digital content and/or web-based learning.	- 10% of providers have an informational website.	25% of community based organizations have an informational website.
STAGE 2	-25% order goods online. 25% transact with customers online. 25% manage HR/administrative information online.	25% of agencies have transactional websites for citizens and suppliers. 50% of agencies share data electronically. 50% of agencies manage HR/administrative information online.	25% of schools have an interactive website including access to homework assignments and email contact with teachers and administrators. 50% of teachers trained to use digital content and web-based learning for instruction. 50% of classes use digital content and/or web-based learning.	50% of campuses offer online registration. 50% of faculty trained to use digital content and web-based learning for instruction. 50% of classes use digital content and/or web-based learning.	25% of providers have an informational website. 10% of providers store records electronically.	50% of community based organizations have an informational website.
STAGE 3	50% order goods online. 50% transact with customers online. 50% manage HR/administrative information online.	75% of agencies have transactional websites for citizens and suppliers. 75% of agencies share data electronically. 75% of agencies manage HR/administrative information online.	75% of schools have an interactive website including access to digital content and email contact with teachers and administrators. 100% of teachers trained to use digital content and web-based learning for instruction. 100% of classes use digital content and/or web-based learning.	75% of campuses offer online registration. 75% of faculty trained to use digital content and web-based learning for instruction. 100% of classes use digital content and/or web-based learning.	75% of providers have an informational website. 25% of providers have an interactive website for scheduling and basic questions. 50% of providers store records electronically.	75% of community based organizations have an informational website. A unified community portal provides access to a broad range of community information and services.
STAGE 4	Businesses incorporate the Network into every aspect of their operations, creating greater efficiencies, spurring innovation, and connecting online to everyone that is part of the business, both internally and externally.	Governments use the Network to run operations more efficiently internally and to serve constituents 24x7 externally.	Schools use the Network to connect students, teachers, and parents; improve learning using digital content; and manage administrative responsibilities more efficiently.	All aspects of higher ed are available through the Network including instruction, content and administration.	Providers interact with their patients online and perform some consultations and procedures remotely.	Community-based organizations are able to use the Network to engage people in the community and make their services available to everyone.

4. NETWORKED ECONOMY

FACTOR/ STAGE	Innovation	Workforce	Consumer
STAGE 1	Business permits and licenses take up to 3 months to secure. 25% of existing businesses have transformed their internal and external practices due to the Internet.	10% of the workforce participates in training/education programs either online or in person every 5 years. 10% of employers post job openings on online job listing services.	10% of households purchase goods or use services online.
STAGE 2	Business permits and licenses take up to 1 month to secure. 50% of existing businesses have transformed their internal and external practices due to the Internet.	25% of the workforce participates in training/education programs either online or in person every 5 years. 25% of employers post job openings on online job listing services. 5% of the workforce telecommutes at least once a week.	33% of households purchase goods or use services online.
STAGE 3	Business permits and licenses take less than 2 weeks to secure. 75% of existing businesses have transformed their internal and external practices due to the Internet.	50% of the workforce participates in training/education programs either online or in person every 5 years. 75% of employers post job openings on online job listing services. 15% of the workforce telecommutes at least once a week.	75% of households purchase goods or use services online.
STAGE 4	Starting a new business has minimal bureaucratic and economic barriers and support mechanisms are in place to assist and encourage new business development. Existing businesses are embracing new technologies and best practices.	People are continually upgrading their skills to adjust to new technologies and best practices. Online job banks are able to dynamically match employees with openings and connect to training/ education programs to identify changing workforce skill requirements. Telework becomes a standard operating procedure in most work environments.	Consumers can find information about, compare, and buy any good or service located anywhere in the world online Places (Access)

5. NETWORKED WORLD ENABLERS

FACTOR/ STAGE	Ubiquity	Security	Privacy	Policy
STAGE 1	A visitor can find high-speed access to the Network within a 20-minute drive from the center of the community on 24x7 basis.	10% of always-on connections have firewalls. Sensitive business and personal e-mail never encrypted. Virus software updated annually.	75% of public and private sector websites post privacy policies. 10% of people feel they understand how to protect their privacy when online.	Policy makers and business leaders are familiar with key connectedness policy issues such as privacy, telecommunications competition, taxation, authentication, intellectual property, security, and online criminal activity.
STAGE 2	A visitor can find high-speed access to the Network within a 10-minute drive from the center of the community on a 24x7 basis.	50% of always-on connections have firewalls. Sensitive business and personal e-mail sometimes encrypted. Virus software updated monthly.	25% of public and private sector websites meet the privacy guidelines of BBBOnline or TRUSTe. 25% of people feel they understand how to protect their privacy when online.	Policy makers and business leaders are working to ensure that new policies are in place to encourage and support the emergence of connectedness. Policy makers and business leaders are working to eliminate barriers to connectedness, such as requirements for physical signatures.
STAGE 3	A visitor can find high-speed access to the Network within a 10-minute walk from the center of the community on a 24x7 basis.	100% of always-on connections have firewalls. Sensitive business and personal e-mail always encrypted. Virus software updated weekly. Digital signature or equivalent authentication technology used by 50% of users.	50% of public and private sector websites meet the privacy guidelines of BBBOnline or TRUSTe. 75% of people feel they understand how to protect their privacy when online.	Regular assessments of connectedness are made as well as the effect policies are having on connectedness.
STAGE 4	High-speed access terminals or ports are available everywhere in the community and getting on the Network wherever you are does not require much effort.	Organizations and individual users use tools to protect online security and are prepared to make themselves "well" again when security is breached.	Users are enabled to easily protect their privacy through a combination of technology tools and best practices. Public and private sector organizations make it easy for users to understand how information is collected and used.	Policies related to privacy, telecommunications competition, taxation, authentication, intellectual property, and criminal conduct for disrupting networks are clearly established and are favorable to promoting connectedness and use of the Network.

APPENDIX C

CID GRID FOR STAGING E-READINESS INDICES

NETWORK ACCESS

FACTOR/ STAGE	INFORMATION INFRASTRUCTURE	INTERNET AVAILABILITY	INTERNET AFFORDABILITY	NETWORK SPEED AND QUALITY	HARDWARE AND SOFTWARE	SERVICE AND SUPPORT
STAGE 1	Access to telecommunications infrastructure is very poor. (Roughly: There are very few shared facilities for telecommunications access. Telephone penetration is very low, with a teledensity of less than 2 mainlines per 100 people. Mobile wireless penetration is below 0.5% of the population. No cable services are available.)	There are no Internet Service Providers (ISPs) offering local dial-up access. There is no public Internet access. Businesses are unable to lease dedicated lines from the local telephone operator, or there is a multi-year wait to do so.	Most users are charged long distance or international rates for dial-up access. ISP rates are so high that few individuals can afford Internet access.	Fewer than half of all domestic telephone calls are successful. For voice telephony, sound quality is often not acceptable for regular conversation. More than 100 faults are reported per year for each 100 telephone mainlines. No services beyond limited electronic mail capabilities are supported by the local telecommunications infrastructure. Large businesses which want access must link their networks directly to infrastructure backbone outside their community.	There are no distribution/sales points for ICT hardware/software within the community. ICT hardware and software are too expensive for all but large businesses and a small minority of citizens and small and medium-sized businesses.	Telephone mainlines take at least four years to be installed from the time their orders are placed. It takes over six months for reported mainline problems to be resolved, if ever. Very few or no software developers, programmers or computer technicians are present in the community.
STAGE 2	A small minority in the community has good access to the telecommunications network, but most of community does not. (Roughly: Teledensity is between 2 and 8 mainlines per 100 people. Mobile wireless penetration is between 0.5% and 3%. Cable penetration is below 5% of all households in the community.)	A limited number of Internet Service Providers offers local dial-up access. There are more than 1,000,000 inhabitants per local ISP. Some providers offer only e-mail services. There are limited opportunities for public Internet access. Users often have difficulty establishing a dial-up connection to a local ISP. There is no competition in commercial leased line provision. Businesses may only lease lines from a single telephone operator.	Rates for local telephone calls are high enough to discourage extensive Internet use via local ISPs, even among most who can afford Internet access. Local access solutions exist, but rates for ISP services are high enough to discourage extensive Internet use. The lack of competition in the provision of commercial leased lines is reflected in prohibitively or very high leasing fees.	50-70% of domestic telephone calls are successful. Dropped connections are frequent and extremely disruptive. For voice telephony, sound quality is acceptable for regular conversation. Between 50 and 100 faults are reported per year for each 100 mainlines. The telecommunications infrastructure in most areas of the community supports dial-up modem transfer speeds of 9.6 Kbps or less. Some areas may support speeds of 14.4 Kbps. Large businesses and ISPs can link their networks to a local infrastructure backbone, but backbone capacity is frequently inadequate to support user demands. Packet loss is significant and regularly disruptive for any online activities.	Some off-the-shelf hardware and software solutions are available locally, but there are none or very few in the native language of the community. Basic hardware and software are affordable for some citizens and small and medium-sized businesses.	Mainlines take at least six months for installation. It takes over one month for reported mainline problems to be resolved. Providers pay no explicit attention to customer service. A small community of software developers, web designers, network administrators and other technical personnel exists.

STAGE 3	A sizeable portion of the community has good access to telephone services. Growth in mobile wireless telephony is accelerating. (Roughly: Teledensity is between 8 and 40 mainlines per 100 people. Mobile wireless penetration is between 3% and 14%. Between 5 and 10% of households in the community subscribe to cable services.)	There are between 500,000 and 1,000,000 inhabitants per local ISP. ISPs provide full Internet access. Subscribers may have some options between various Internet service packages. There are some opportunities for public Internet access. It is normally possible for users to establish a dial-up connection to a local ISP, except during peak hours. One or two private providers leased lines to businesses.	Telephone charges for Internet access reflect emerging competition in the telecoms market, yet they are high enough to discourage extensive use by some users. Internet access is priced within reach of the majority of citizens. Competition in leased line provision for businesses has been introduced, and prices are falling but are still high.	70-90% of domestic telephone calls are successful. Connections are dropped with noticeable frequency and are somewhat disruptive. Fewer than 50 faults are reported per year for each 100 mainlines. Users have access to dial-up modem transfer speeds of up to 28.8 Kbps. Leased lines with transfer speeds of up to 64 Kbps are widely available for businesses and ISPs. Limited higher-speed lines are available in some areas. Backbone facilities serving the community are usually sufficient, although regular peak demand periods result in slower network response times. Packet loss by the network may occur but is not generally disruptive.	Most ICT products are sourced from abroad, but there is a strong and growing localization industry to adapt products to local needs. Some software appropriate to local needs and languages is available. A variety of hardware and software solutions are available and affordable to most small and medium-sized businesses, as well as many individuals.	Mainlines take at least one month to be installed. It takes over one week for reported mainline problems to be resolved. There is a growing customer service ethic among service and support providers, although it is not a priority for most. Some ICT maintenance and technical support services are available. A nascent software industry is present in the community, and there is a growing number of hardware technicians, web designers and network administrators.
STAGE 4	-There is widespread access to telecommunications and network services. (Roughly: There is high teledensity of 40 mainlines or more per 100 people. Penetration of mobile wireless telephony is high and growing, with at least 14% of the community subscribing. Cable penetration is high, at 10% of households or higher.)	There are more than two local ISPs per 1,000,000 inhabitants. Higher bandwidth solutions such as DSL (digital subscriber line) and cable modem access are available. Most customers can tailor services to meet different demands for speed, service, security, quality and cost. ISPs provide web hosting services to their subscribers. There are adequate opportunities for public Internet access for those without access at home, school or work. Users are able to establish a dial-up connection to a local ISP on a reliable basis. Multiple private providers leased lines to businesses. Wireless solutions may be available in addition to fixed line solutions.	Prices for telephone usage are set competitively and are affordable for nearly all citizens. Flat rate pricing may be in effect for local telephone calls. Prices for Internet access are set competitively and are affordable for nearly all citizens. Flat rate pricing may be available. Free ISP services may be available, particularly in communities with time-metered pricing of local phone calls. Higher bandwidth solutions such as DSL services and cable modem access are priced competitively, which may include tiered pricing based on speed of access or usage-based pricing based on total volume. "Always-on" connections are available without time-metered pricing. Pricing for leased business lines is set in a competitive environment featuring multiple vendors.	Dropped connections are fairly infrequent and not a major disruption. Over 90% of domestic telephone calls placed are successful. Fewer than 10 faults are reported per year for each 100 mainlines. There is widespread access to dial-up modem transfer speeds up to 56 Kbps, with some access to high speed solutions such as DSL, cable modems and wireless media. High speed services of 1.5 Mbps are common, with higher speeds available in some areas. Adequate backbone capacity exists to support community needs without significant transmission delays except during infrequent periods of high demand. Packet loss by the network is below 10%.	A vibrant marketplace exists for software and hardware with a competitive retail and wholesale market for these products. Hardware and software appropriate to local needs and languages are widely available and affordable.	Mainline installation is usually completed within a few days. Service providers can be contacted in a number of ways (e-mail, telephone, mail). Reported problems are usually resolved within 48 hours. Online help is available and may allow for immediate resolution. Customer service is considered a source of competitive advantage for the service provider. ICT maintenance and technical support are widely available. A competitive and sophisticated web design market exists, incorporating the latest development technology.

NETWORKED LEARNING

	SCHOOLS' ACCESS TO ICTS	ENHANCING EDUCATION WITH ICTS	DEVELOPING THE ICT WORKFORCE
STAGE 1	There are no computers in schools.	Computers are not used by any teachers or students.	Training opportunities for programming, maintenance, support, Web design and other ICT professions are virtually non-existent.
STAGE 2	Where there are ICTs in schools, it is primarily at the university level, and there are generally fewer than five computers in a school or faculty. Access to the computer(s) is limited to computer teachers and/or administrators. Computers tend to be older generation models, such as stand-alone 486 PCs or the equivalent. Where there are multiple computers installed, they are not networked. Use of the computer(s) is limited to electronic documents that are available on the hard drive or diskettes. There may be connectivity for store-and-forward e-mail.	Only a few teachers use computers in a very limited fashion. Teachers' basic computer literacy involves skills such as use of the keyboard and mouse, a basic understanding of the computer's operating system, manipulation of files, and cutting and pasting. Computers are mainly used at the university level.	There are limited opportunities for training in ICT skills development.
STAGE 3	Computers can be found at the university level as well as in primary and secondary schools. Up to 10 to 15 computers can be found in laboratories for classroom group work, with about four students per computer. Computer labs are generally only open for computer studies during the day and closed after school, or may be open to teachers for class preparation but closed to students. Computers tend to be older generation models, such as 486 PCs or higher, and they may be networked with a file and mail server. There may be an internal Local Area Network (LAN) in place. If there are multiple computer labs, they may be connected through the school network. Where there are stand-alone PCs, they may have a limited CD-ROM library. The networked lab achieves connectivity through a dial-up connection to the Internet, which supports limited World Wide Web access.	Teachers and students use computers to support traditional work and study. Teachers who use computers are generally proficient with word processing applications and may access information offline from CD-ROMs. They may employ computers in some basic drill-and-practice lessons. In some cases, teachers access and organize information from the World Wide Web in their work, share information using e-mail, and create information in electronic format to share with others both inside and outside the school.	Technical classes and programs on ICT-related subjects are available from a variety of public and private centers. Some limited online access to training is available. Some employers offer training in the use of information and communication technologies to their employees.
STAGE 4	Most schools at all educational levels have access to computers. There may be a number of computer labs in each school, and computers may be found in the classroom. In some cases, students and teachers may have individual laptop computers. Computer labs are open to students and reserved for subject matter classes to use, and are open after school hours. The lab may be open to the community and other schools after school and on weekends. There may be an internal Web server on the school network — computers as well as other devices are connected to the network. Classrooms may be wired and connected to the school's Wide Area Network (WAN). Clusters of schools may be connected to a regional WAN to share electronic resources. A national school network may be in place. Connectivity may be obtained through a leased line or wireless connection with at least 64 to 128 Kbps of dedicated access.	Information and communication technologies are fully integrated into the curricula, are used in the classroom and are essential to the learning process. The curricula may feature collaborative, project-based learning activities that enable students to use the Internet and advanced software skills to work with other students and teachers in their school, outside their community and internationally. Teachers are well-trained in methods for incorporating computers and ICTs into their instruction and curricula.	There are many technical schools with specialized curricula in information and communication technologies and computer science. There are a variety of training opportunities relating to information and communication technologies available through vendor certification programs, employers, educational institutions, private training centers and distance learning courses. Online resources and courses are widely available for the development of technical skills.

NETWORKED SOCIETY

	People and Organizations Online	Locally Relevant Content	ICTs in Everyday Life	ICTs in the Workplace
STAGE 1	Most of the population has never heard of the Internet. Less than 0.05% of the population has used the Internet at any time during the past three months. No business entity in the community has a registered Internet domain name.	No websites exist providing information on local topics. Few or no websites are available in local languages or a dominant Web language spoken locally.	Members of the community do not normally employ information and communication technologies in their daily lives. Most social communication is paper based and/or oral.	Employees have limited access to telephones. A small minority of business and government offices have at most a few computers, none of which are networked. Most business communication takes place in person or by mail. A small number of businesses use telephone and fax.
STAGE 2	Much of the population has never heard of the Internet, and most people do not know anyone who has ever used it. Less than 0.5% of the population has used the Internet recently, and few are regular users. Some local businesses and institutions have registered domain names. There are fewer than two of these domains per 1000 inhabitants. There is no advertising in traditional media for online companies or resources.	Few websites covering local topics exist, and most of them are created and hosted outside the community. Some websites are available in local languages or a dominant Web language spoken locally. There is little use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs.	Information and communication technologies (telephones, fax machines, pagers, computers) are used to a limited degree by some members of the community. Public telephones are available in some parts of the community and are used regularly b y many community members. Personal computers with e-mail capability are made publicly available by some businesses, but most users are from outside the community (e.g. tourists and visiting businesspeople).	Organizations achieve sporadic efficiency gains through limited deployment of ICT systems in their internal workings. Some employees have access to telephones. Few offices have computers that are networked for internal file sharing and basic enterprise applications. In offices where there are computers, only some employees use them for their work, though not for electronic communications.
STAGE 3	Most of the population has heard of the Internet, although few have used it. Less than 10% of the population uses the Internet regularly. The overwhelming majority of Internet users are males between the ages of 10 and 35. The number of registered domains locally is at least 2 per 1000 people. Advertising in traditional media for online companies or resources is infrequent.	Some local websites are available, though most carry static content and are updated infrequently. Websites carry diverse types of information relevant to different groups within the community. Many websites are available in local languages or a dominant Web language spoken locally. There is some use of online bulletin-board systems, Usenet groups, newsletters, and/or listservs. There are opportunities for Web-related training, although they may be expensive and accessible only in certain areas.	Public telephones may be found in most parts of the community and are heavily used. Some members of the community have Internet access at home. Growing numbers of community members use telecenters, cybercafes and other businesses that offer computer use and online services to the public for a fee.	Organizations achieve some efficiency gains through some degree of deployment of ICT systems in their internal workings. Many computers in business offices are internally networked for data processing, management reporting, and other enterprise applications. Some employees conduct research and business transactions over the Web, though most often they use a shared workstation to do so. Some employees use e-mail for internal communications. 7
STAGE 4	Most of the population is interested in using the Internet and knows others who do. At least 10% of the population accesses the Internet with some regularity. Males between the ages of 10 and 35 no longer represent the overwhelming majority of Internet users. The number of registered local domains is at least 20 per 1,000 population. Advertising in traditional media for online companies or resources is fairly common.	Many websites provide dynamic information on local topics and are updated at least several times per week. Local content is generated by citizens at all levels of society, including websites and online bulletin-board systems, Usenet groups, newsletters, and/or listservs. A significant amount of information is available through websites in local languages or a dominant Web language spoken locally. Many affordable opportunities exist for Web-related training. Many members of the community use information and communication technologies (wireless phones, digital assistants, pagers, personal computers) to assist in their personal lives.	Many members of the community use information and communication technologies for household commerce (online shopping, banking, investing) and for a variety of social and commercial interactions with other people (including bartering, consumer-to-consumer trade, online chat). Citizens without access through home, school or work use a variety of public and private Internet access options, including online cafes and community centers.	Organizations achieve major efficiency gains through widespread deployment of ICT systems in their internal processes. Computers in offices are fully networked. Different office locations are connected to each other through external networks. These networks may extend nationally or internationally. Most employees have Internet access from their own workstations. Most employees have their own e-mail accounts for internal and external communications. Workers commonly list their e-mail and website addresses on their business cards.

NETWORK ECONOMY

	ICT EMPLOYMENT OPPORTUNITIES	B2C ELECTRONIC COMMERCE	B2B ELECTRONIC COMMERCE	E-GOVERMENT
STAGE 1	Few, if any, local businesses hire workers on the basis of their technical background.	No businesses in the community operate websites. There is little awareness of online business, and all dealings between businesses and consumers consist of oral and/or paper-based transactions.	Businesses have few sources of market information. The efficiency of most B2B interactions is hampered by this lack of transparency, as are prospects for new business opportunities. B2B transactions are carried out in person or remotely through paper-based transactions.	No government resources are online. There is no awareness of online government, and all dealings between government and citizens or businesses are in person or paper based. There is limited information available by phone.
STAGE 2	Although there are some employment opportunities that call for technical skills, most workers with ICT experience either must leave the community to find employment or are unable to find work in their field.	Some local businesses operate websites. The basic information they provide is static and infrequently updated. Some businesses accept orders placed by telephone or fax. Some businesses distribute hard-copy catalogs for remote browsing of goods and services.	B2B interactions remain inefficient with little transparency. Faxes and telephones are commonly used to facilitate orders or for remote client support, although some paper-based transaction (e.g. signature) is required.	A few governmental websites exist, providing basic information, often directed at parties outside of the community. This information is static and infrequently updated. Some limited interaction with the government is possible by telephone or fax. The government distributes some information about services, procedures, rights and responsibilities in hard copy.
STAGE 3	Technical skills in the community are becoming a source of competitive advantage and are beginning to attract investment and employment opportunities by companies from outside the community.	Many businesses post key information on websites. Information is often not kept current and relevant. Websites provide information on goods and services for sale. Purchases take place primarily in person, by fax or by telephone, though electronic mail may expedite the process. Some businesses may have introduced online ordering.	The deployment of electronic systems has increased efficiency and transparency and lowered transaction costs in B2B interactions. Some B2B transactions are supported by electronic systems (e.g. proprietary systems and databases), but some paper-based transaction (e.g. signature) is usually required at some point. Electronic B2B transactions are a small percentage of overall B2B commerce.	Some governmental agencies post key information on websites, including directories of services, hours of operation, and downloadable forms. Information is often not kept current and relevant. Transactions take place primarily in person, by fax or by telephone, though electronic mail may expedite the process. The government manages relationships with some contractors and suppliers online or with other electronic mediation.
STAGE 4	A significant number of employees in the community require technical skills to perform their jobs. A sizeable portion of the community's economy is based on the management of and trade in information, employing a large number of "knowledge workers." Information and communication technologies are considered central to the strategies of many organizations.	Many businesses have incorporated the World Wide Web into their sales, marketing, and customer service systems. The total volume of online retail is a noticeable component of the community's commercial activity, as may be evidenced by advertisements for commercial websites in traditional media and other indicators.	Many efficiencies in B2B transactions are apparent as a result of the deployment of electronic systems. These efficiencies have changed market structures and redefined industry practices. Many businesses have incorporated the Web into sales, procurement and inventory management. Some transactions occur online over automated, fully-integrated systems. Order processing and delivery may be executed electronically and monitored through online tracking systems. Overall levels of electronic B2B transactions are a noticeable and growing percentage of total B2B transactions within the community.	All governmental agencies post key information on websites and some have incorporated the Web into their strategy for interaction with the public. Interactive government websites allow the Many businesses in the community have public to conduct transactions (e.g. apply for permits, pay taxes) online. Much government procurement and many interactions with suppliers take place online or with other electronic mediation.

NETWORK POLICY

	TELECOMMUNICATIONS REGULATION	ICT TRADE POLICY
STAGE 1	There are no plans for the liberalization of the community's telecommunications sector. There are no regulatory provisions which promote universal access to telecommunications services. All services are provided by a single operator, whether private or state-owned. Voice and data service offerings are limited.	Trade in equipment for information and communication technologies is impeded by high tariffs and other restrictions, including cumbersome technical standards or licensing requirements. Service sectors are not open to trade, creating a barrier for electronic commerce and the building and operation of ICT networks. Domestic regulations may create de facto trade barriers for ICT use. There is little or no foreign direct investment.
STAGE 2	Plans for the liberalization of telecommunications services are in place or are being formulated. Provisions for universal access to services have been established, though they are ineffective.	Trade barriers for ICT equipment have been reduced, but are still relatively high. There has been some opening in service sectors related to electronic commerce and ICT networks. Foreign direct investment is allowed in network sectors under certain conditions.
STAGE 3	Plans for the liberalization of the telecommunications sector are in place and are being implemented. Progress is being made in achieving universal access, but there are many hurdles in implementation. Services such as data, paging and mobile telephony are available from competing private providers Alternative carriers compete for private network services, leased lines and other telecommunications services for businesses. Incumbent provider networks are being opened to competition through interconnection and/or unbundling obligations	Trade in ICT equipment is not restricted through unnecessary standards or licensing requirements, and tariffs are low and uniform. The community has at least temporarily agreed not to apply disproportionate tariffs on electronically delivered products. There has been significant opening in services that facilitate electronic commerce and building and operations of ICT networks, but some restrictions remain. Foreign direct investment in the ICT sector is encouraged with some restrictions.
STAGE 4	The telecommunications sector has been liberalized, with a regulatory regime in place to promote open competition. Regulation is effective in promoting universal access. An independent regulatory body sets and enforces telecommunications regulations. Citizens and businesses have a number of options for their telecommunications and data services. Incumbent networks have been opened to competitors, and new competing carriers are taking advantage of these arrangements to offer services. There is vibrant competition among mobile wireless providers. Spectrum has been allocated consistently with international standards, and licensing arrangements encourage new market entrants. The provision of value-added services such as broadband Internet is recognized as a source of competitive advantage.	If tariffs exist on ICT goods, they are low and uniform. Trade in services is fully liberalized, including services delivered electronically. The community has explicitly affirmed that it will not apply disproportionate tariffs on electronically delivered products. Foreign investment in the ICT sector is encouraged and subject to few or no restrictions.

APPENDIX D
QUANTITATIVE QUESTIONNAIRE FOR TECHNICAL TRAINING INSTITUTES

General Information

1. Date: _____ Interviewer: _____

2. Interviewee: _____Position: _____

3. Name of institution: _____

4. Address: _____

_____

_____

_____

5. Total number of full-time teaching staff.

(a) Male: _____ (b) Female: _____

6. Total number of part-time teaching staff

(a) Male: _____ (b) Female: _____

7. Total number of non-academic staff: (a) Male: _____ (b) Female: _____

8. Total number of students _____

9. Total number of diploma students (a) Male:_____ (b) Female:_____

10. Total number of certificate/short-course students _____

Network Access Indicators

Network infrastructure

1. What is the total number of employees in your institute? _____

2. What is the number of active telephone extensions on your Private Branch Exchange (PBX)? _____

3. How many external fixed (Telkom) direct exchange lines are connected to your PBX?

_____

4. How many mobile telephone lines are connected to your PBX? _____

5. Do you have structured cabling in all staff offices, library, and computer labs?

Yes ☐ No ☐

Internet availability

1. How does your institute access the global Internet (i.e., connection to ISP)? (Please tick all that apply)

Copper ISDN leased line ☐	ADSL leased line ☐	Wireless leased line ☐	VSAT leased line ☐	Optical fiber leased line ☐

2. What is the capacity of your leased line (in kb/s)? _____

3. Does your institute have an external optical fibre connection to the public telephone exchanges or nearest ISP?

Yes ☐ No ☐

4. What is the distance between your institute and the nearest ISP?

Within 40Km ☐ >40Km radius ☐

5. Does your institute use a wireless local loop?

Yes ☐ No ☐

6. Do you have a download VSAT connection?

Yes ☐ No ☐

7. If Yes, what is the capacity of your download VSAT connection in kb/s?

8. Does your organization have an Intranet?

Yes		No	

9. Does your institute network have any wireless LAN segments?

Yes		No	

10. What is the size of your Intranet or corporate LAN in terms of total number of networked PCs? _____

12. Where is your institute websites hosted? (Please tick)

Not applicable ☐	Within Intranet ☐	By local ISP ☐	Outside country ☐	Inside & Outside ☐

Internet and telephone communications affordability

1. What is the total annual ISP charge for the Internet connection to your institute (Ksh) _____

2. What is the total annual cost of fixed line telephone bills in Ksh _____

3. What is the total expenditure of your institute per year in Ksh_____

Network speed and quality

1. What is the maximum Internet access network speed available to your organization? (if you could afford)
   < 128 kbps ☐ 128 – 2048 kb/s ☐ 2 Mb/s – 8 Mb/s > 8 Mb/s ☐

2. Does your organization monitor the packet loss for Internet traffic?

Yes		No	

ICT hardware and software products

1. What is the value (in Ksh) of your ICT hardware inventory? _____

2. What was the total cost of software purchases by your organization last financial year

3. What is the total number of ICT applications (e.g., payroll application or human resource application) does your organization use? _____

4. Do you have in-house software developers who customize or develop your business applications?

6. Do you purchase ONLY branded (HP, Dell, IBM) machines?

Yes		No	

7. What is the total number of PCs in your institution? _____

8. Total number of application servers? _____

9. What is the total number of printers? _____

10. How many PCs or notebook computers are connected to the Intranet? _____

11. How many printers are connected directly to the LAN? _____

ICT Service and support

1. How many ICT personnel do you have? _____

2. How many system or network administrators do you have? _____

3. How many software/hardware technicians do you have? _____

Networked learning Indicators

Access to ICT

1. How many computers of different types are available in the institution?

   a. Number of mail servers _____

   b. Number of Web servers: _____

   c. Number of application servers: _____

d. Number networked personal computers (Pentium IV or later) _____

e. Number of laptops/ notebooks for use by academic staff _____

2. How many computer laboratories do you have? _____

3. How many computers are in classrooms? _____

4. How many students share one computer in laboratory lessons or class group work?

_____

5. Are computers available to students at the following times?

a. Mon – Fri 8 a.m.–5 p.m Yes ☐ No ☐

b. Mon – Fri after official lessons Yes ☐ No ☐

c. Weekends Yes ☐ No ☐

d. Always Yes ☐ No ☐

6. Are networked computers available to academic staff at the following times?

a. Mon – Fri 8 a.m.–5 p.m Yes ☐ No ☐

b. Mon – Fri after official lessons Yes ☐ No ☐

c. Weekends Yes ☐ No ☐

d. Always Yes ☐ No ☐

7. Do all academic staff have institutional networked computers in their offices?

Yes ☐ No ☐

8. Do students have access to the institutional automated library resources from the computer labs or over the Internet?

Yes ☐ No ☐

9. Do all students have an institutional e-mail address?

Yes ☐ No ☐

10. Do all students have access to the Internet from the computer labs?

Yes ☐ No ☐

11. Do students have access to the e-learning platform on or off-institute?

Yes ☐ No ☐

12. What is the total number of hours per week can a student use computers in the lab

_____

13. Is the institutional LAN connected to other education institution networks?

Yes ☐ No ☐

14. What type of Internet access does your institute have?.

a. Non-existent ☐

b. Dial-up ☐

c. Dedicated 64 Kbps ☐

d. Dedicated >128 Kbps ☐

Enhancing Education with ICT

1. Percentage of academic staff with basic ICT literacy skills:

<20% ☐ 20-40% ☐ 40 – 60% ☐ 60 – 80% ☐ 80-100% ☐

2. Are the following software resources available in the institution?

a. Productivity tools Yes ☐ No ☐

b. E-learning and Educational software Yes ☐ No ☐

c. Management Information Systems Yes ☐ No ☐

d. Other (Specify) Yes ☐ No ☐

Other _____

3. How do teachers/lecturers use computers?

a. Word Processing Yes ☐ No ☐

b. Spreadsheets and DBMS Yes ☐ No ☐

c. Communicating to students $ others by email Yes ☐ No ☐

d. Accessing resources in the Internet Yes ☐ No ☐

e. Incorporating ICTs in their instruction and curricula Yes ☐ No ☐

4. Level of integration of ICT into the educational and learning processes:

a. ICT is fully integrated into curriculum Yes ☐ No ☐

Yes ☐ No ☐

b. ICT is used in classrooms for learning

c. ICT is used in project-based learning activities | Yes | | | No | |

5. How many courses are supplemented by the Web or E-learning content

_____

6. What is the total number of courses are offered by your institution

_____

Developing the ICT workforce

1. What training opportunities are available to your junior ICT workforce?

None ☐ Local ICT colleges ☐ In-house programs ☐ External Consultants ☐

Local vendor training ☐

2. What training opportunities are available to your senior ICT professionals?

None ☐ Local colleges/universities ☐ Training abroad ☐ External consultants ☐

3. How many of the ICT personnel are graduates of local institutions?_____

4. How many of the senior ICT personnel have received all their academic education from local Universities?_____

5. How many of your ICT employees have professional certification (e.g., Cisco, MCSE, Linux, SAP)? _____

6. What was the total ICT training budget last year _____

ICT in the Libraries

1. Is the library on your institute automated?

| Yes | | | No | |

2. If Yes, which of the following functions are automated?

a. Issue Desk

b. All library operations

3. Does your institute library have budget for automation and ICT operations?

| Yes | | | No | |

4. If Yes, what is the total annual library ICT budget in Ksh? _____

5. Does your institute library have a senior librarian in charge of the library information systems?

Yes		No	

6. If Yes, what is the highest academic qualification of the librarian in charge of the library information systems?

Diploma in library sciences ☐

Post-graduate diploma in ICT ☐

Bachelors degree in information sciences ☐

7. Has library staff received regular training on ICT systems for libraries?

Yes		No	

8. Does you library have a multimedia center for viewing or access to multimedia resources such CD, DVDs, or Internet databases?

Yes		No	

9. If Yes, how many networked PCs are available for student use in the multimedia center and in the library? _____

10. Do students or academic staff have access to any Internet databases from the library or on the institute network

Yes		No	

11. Does library send out regular updates and information on library to students and staff via e-mail?

Yes		No	

12. Does library process (cataloguing and classifying) all book, journals, and non-book materials electronically?

Yes		No	

13. Does library receive e-invoices from the suppliers?

Yes		No	

Enhancing Research with ICTs

1. Are students required to use the Internet for their assignments or projects?

Yes		No	

2. Do lecturers subscribe to on-line journals _____

3. Do you subscribe to any e-journals?

Yes		No	

4. Do you collaborate with researchers in other institutions in Kenya or abroad?

Yes		No	

5. Do you use your computer to prepare your own research papers?

Yes		No	

Networked Society Indicators

People and organizations online

1. For what purpose mainly does your organization use Intranet and Internet?

E-mail/Basic Communication ☐

Teaching and Learning ☐

Internal Administrative systems ☐

All of the above (transformation) ☐

2. How many employees use the Internet (e-mail, Web, etc.) for their work? _____

3. Has your organization registered a Kenyan domain name (i.e., .ke)?

Yes		No	

4. Does your organization have a corporate e-mail system (e.g., Microsoft Exchange or Linux E-mail server)?

Yes		No	

5. If yes, how many employees have individual corporate e-mail addresses?

_____

Locally relevant content

1. What type of website does your organization maintain?

None ☐

Information website ☐

Interactive or Transaction website ☐

2. Do you monitor the number of visitors to your website per month?

Yes		No	

3. If yes, how many people on average visit your organizational website per month?

_____

4. What local websites does your organization need to access regularly?

The Institutional website ☐

Local Newspaper websites ☐

Other local educational websites ☐

Search engines or Web e-mail sites ☐

Local company websites ☐

Do not know ☐

5. Where is your website hosted?

In Kenya ☐ Abroad ☐ Both in Kenya & Abroad ☐

6. Does your organization advertise its website in other media (e.g., radio, TV, print etc.)

Yes		No	

7. Do employees in your organization subscribe to any local mailing lists?

Yes		No	

ICTs in Workplace

1. How many employees have a PBX telephone extension? _____

2. How many employees are allowed to make external calls? _____

6. Are all computer labs secured by a security guard?

Yes		No	

7. Have you had a security breach into your network in the last two years?

Yes		No	

8. How often do you back-up data on the servers? _____

9. Have you installed electronic or radio alarm security equipment in your server room?

Yes		No	

10. Have you installed electronic or radio alarm equipment in each of your computer labs?

Yes		No	

11. Do you maintain off-site data backup? _____

12. Do you have an ICT disaster management policy?

13. What is the total cost of physical security (guards, electronic)) _____

ICT strategy

1. What is the status of ICT in your institution?

A section in a department

A Department

Other (Specify)_____

2. What is the title of the head of ICT? ˜

Head of IT/ICT ☐ Head of Dept IT/ICT ☐ Manager IT/ICT ☐

Director ☐

Other (Specify) _____

3. To whom does the head of ICT report?

CEO ☐

Principal ☐

ICT Director ☐

Dean/Director ☐

Head of Dept ☐

Other (Specify) _____

4. Who is the champion for ICT (exerts the greatest influence in the strategic direction for ICT, in the prioritization of ICT projects, etc.) in your institution?

CEO ☐

Principal ☐

ICT Director ☐

Dean/Director ☐

Head of Dept ☐

Other (Specify) _____

5. Does your institution have an ICT policy?

Yes ☐ No ☐

6. If YES, to what extent is it known/understood by students and staff?

75%-100% ☐ 50%-75% ☐ 25%-50% ☐ 5%-25% ☐

Not Known/Understood ☐

7. If YES, what is the extent of implementation?

75%-100% ☐ 50%-75% ☐ 25%-50% ☐ 5%-25% ☐

Not Implemented ☐

8. If NO, are there efforts to develop one?

Yes ☐ No ☐

9. Does your institution have an ICT strategic plan, whether separate or an integral part of the corporate plan?

Yes ☐ No ☐

10. To what extent is it aligned to the corporate strategic plan?

75%-100% ☐ 50%-75% ☐ 25%-50% ☐ 5%-25% ☐

Not Aligned ☐

11. What is the main focus of the ICT strategic plans?

Support administrative processes (e.g. student management, financial management, etc.) ☐

Support teaching & learning (e.g. e-learning ☐

Support research ☐

Other (specify) _____

12. What transformation has ICT brought into your organization?

Efficiency and effectiveness ☐

Openness and transparency ☐

Increased productivity of staff ☐

Organizational change ☐

Other (specify) _____

APPENDIX E

QUALITATIVE QUESTIONAIRE FOR TECHNICAL TRAINING INSTITUTES

1. Name of Respondent: _____ Date: _____
2. Name of Institution _____
3. Box_____Tel_____
4. Gender_____
5. Department _____
6. Current status (Student/Lecturer)_____
7. If student, what is the name of the course undertaken and year of study

_____

8. Do you have an e-mail account? _____
9. If yes, what is the name of the body from which you have an account.

_____

10. Do you find the Internet speeds from your institution better than that from Cyber Café's in nearest town or other local ISPs?

_____

11. In case there is network failure in your institutes network, how long does it take to restore the network failure _____
12. How often do you encounter failure of the computer in your the lab or offices?

_____

13. When there is a failure, how long does it take to fix the fault?

_____

14. On average, how often do you experience power failure and you are unable to use your computer? _____
15. Have you ever used Internet services? _____
16. If yes, what do you use the Internet for?

_____

_____

_____

17. How regularly do you use the Internet? _____
18. If you have never used the Internet, are you interested in accessing the Internet?

_____

19. How would you classify the contents of your Institutional website?

_____

20. Have you seen your Institution's website advertised in other media (e.g. radio, TV, print etc.) _____

21. Do you subscribe to any local mailing lists? _____

22. Name one of the local websites you find most useful _____

23. In what language(s) are the websites that you visit?_____

_____

24. What type of information do you seek through these local websites. _____

_____

25. Do the web-sites that you visit carry different types of information relevant to different groups within the community _____

_____

26. Do you have opportunities for web-related training?_____

27. If yes, who pays for it?

_____

28. Are there web-related skills that you feel you require but are not available locally?

_____

_____

29. What proportion of your institute website content is on local issues?

_____

30. State the languages used in your institute website. _____

_____

31. How regularly is the content of your Institution's website updated?

_____

32. Do you have access to a fixed telephone line? _____

33. If yes, where mainly do you obtain fixed telephone services?

_____

_____

34. For what purpose do you use the computer?

_____

_____

_____

35. How often do you use the Internet for academic work (research, teaching or learning)?

_____

36. Do you have unlimited access to telephone services? _____

37. Do you have access to a personal computer? _____

38. If yes, who provided this to you?

_____

39. Do you use mobile-based Internet services (e.g., EDGE, PDA, Laptop access)?

_____

40. What local web-sites do you visit regularly when in your office?

_____

41. How long do you stay on-line on the Internet for email or web-sites while in your office?

_____

42. How frequently do you access the Internet for email or web-sites from your office?

_____

43. Do you have access to a telephone extension in your office or institute?

_____

44. Do you have a PC in your office? _____

45. Do you have Internet access from your office computer?

_____

46. How often do use ICT facilities (telephone, faxes, pagers and computers) for your work in the Institution?

_____

47. How do you use computers at work? (Chose more than 1 where applicable)

_____

48. Do you think the IT department is important in your organization?

_____

49. Is the Head of IT department in your institution a senior officer?

_____

50. Does the head of IT department in your institution provide effective leadership of the IT function? _____

51. Are the ICT professionals in your institution motivated?

_____

52. Are the ICT professional in your institution qualified and experienced?

_____

53. Does your organization retain experienced and qualified IT professionals?

_____

54. Does your institution have enough IT professionals to support you in your workplace?

_____

55. Does the head of your institution (Principal) consider the head of ICT department in your institution important? _____

56. Do most of your colleagues need to use computers and the Internet for their work?

_____

57. Do you type your own letters, reports, notes or presentations? _____

58. Is ICT literacy important for your career progression?

_____

59. Do computers increase your productivity? _____

70. Is access to Internet essential for your work? _____