The Computer Society of Kenya

Kenya National ICT Workforce Skills Demand Survey Report

(20 December 2006)

EXECUTIVE SUMMARY

Introduction

The World Information Technology and Services Alliance (WITSA) aims at significantly improving the capabilities and skills of information and Communications Technology (ICT) professionals by better aligning the training and educational curriculum with the anticipated demand of such professionals. In order to achieve this goal, WITSA and Computer Society of Kenya (CSK) would wish, to develop an ICT skills survey to among other initiatives, determine the anticipated demand for such skills in the Government, Commercial and Outsourcing sectors in Kenya. This survey therefore is in line with one of the strategic objectives of the US Agency for International Development's (USAID/the client) Leland Initiative (the "prime contact"), which is to improve the capabilities of ICT trade associations in Africa, Asia and the Near East.

The report provides some background to the survey, describes the methodology used, and highlights the major findings. This description and analysis of the results is structured using the same layout as the survey questionnaires, with sections focusing on ICT skills demand by employers and ICT skills production by training institutions.

The research team used a combination of desk research, field data collection of 420 organizations representing all sectors of the economy and personal interviews of about thirty key stakeholders to establish preliminary results, which are presented in this report. The report is structured into three chapters as follows: -

Chapter 1 of the report presents the introduction, which encompasses reason for the report, the role of information in development and the importance of ICT. It also covers the statement of the problem, objectives of the survey, scope of the survey, survey methodology and the constraints.

Chapter 2 presents the findings of the survey and discussions, where the discussion is based on the survey objectives.

Chapter 3 presents a summary of the findings, conclusions and recommendations.

Key Findings of the survey

The ICT skills needs are only partially met by the existing training institutions and the existing ICT capabilities should be assessed and reviewed on a national basis to obtain a complete picture of the needs in the country. However, the ICT skills that will be needed, and therefore the kind of training that will be required, depend very much on the ICT policy Kenya adopts.

Most institutions of higher learning, both private and public, offer varying levels of ICT skills training, mostly as part of their programs for formal academic qualifications. However, in many cases facilities are not adequate to provide the required exposure.

Most training institutions are reasonably well equipped and the faculties are considered knowledgeable and up-to-date with the latest trends in ICT. However, the courses themselves are of widely varying duration and content, making it impossible to judge the competence of graduates from these institutions. There is a need to standardize these short ICT courses so that the market can assess the true ICT skills capabilities.

The market is still very competitive, ICT professionals need to be proficient in one of the highly sought after skill areas such as network security and enterprise architecture or be proficient in more than one type of technology. There is less demand for people with more general programming skills, vendor-specific skills or limited work experience.

The biggest challenge identified by industry is developing the behavioral or non-technical skills in their technical staff. The most common behavioral skills in demand include: interpersonal and teaming skills; communication; client relationship management; and business acumen. Although the level of technical ICT skills in Kenya is quite good, there is a shortage of skilled and experienced business managers in the ICT sector. In other words, to put ideas into practice and to apply technical skills in a business context is hampered by the lack of management experience and talent. With a global downturn in the ICT industry and competition for jobs strong, employers are seeking more from ICT professionals. Employers are requiring people with a broader range of skills and the capacity to re-skill, diversify and multi-task is highly regarded.

The curricula of training institutions do not match the requirement profile for the ICT specialists the industry needs. Addressing the training needs therefore requires action in mainstream education and in workforce training. In general, industry's main priorities focus on the development of workforce training. There are many industry schemes, commercial training providers and recognized certification systems in existence, and the government is already working closely with industry to profitably exploit these existing solutions. The social partners and industry associations extend this training through their commitment to lifelong learning and incentives for organizations to upgrade their workforces.

Key Recommendations for policy and practice

Based on findings of the survey, it is expected that the stakeholders, who include the training institutions and employers will gain a better understanding of the current and five years projected ICT manpower status, upon which informed decisions will be made. The following are measures are highly recommended: -

Define the ICT industry's skills requirements.

The objective is to put in place a clear frame-work for students, education and training institutions and governments that describe the skills and competences required by the ICT industry in Kenya To date, several generic job profiles covering over various ICT job roles have been developed which provide a comprehensive description of the types of jobs in the industry, the tasks and technologies associated with each job, the skills and competences required (both technical and behavior skills), and the career opportunities available in the industry. The industry stakeholders in Kenya should go a step further to develop and expand both the descriptions and

number of job profiles and to elaborate on the specific qualifications and training required. Sustainability is dependent on accurately forecasting demand and fluctuations over time, based on addressing needs that are appropriate to businesses.

Develop new ICT curricula to match these requirements.

There is need for all stakeholders in the ICT industry to develop and implement a series of innovative programme curricula that reflect the education and training needs of industries engaged in the Information and Communications Technologies and to prepare the workforce for the new economy. This calls for identification of the required output standards at graduate level, the presentation formats and delivery modes. The work should embrace embraces issues of equal opportunities (particularly with regard to gender) and recognize the need to support cultural diversity and student mobility across the training institutions in the country, whilst satisfying the credit transfer systems. It is hoped that such Curricula thus developed would become a benchmark/ standard for all education institutions throughout Europe.

To attract more people to ICT, especially women and encourage a greater awareness and interest across the country in the learning of ICT skills.

The ICT industry should develop a Kenya-wide marketing strategy to attract more people to the industry. This will include such activities as organizing open days in companies, dissemination of flyers and brochures to schools, providing guest "lecturers" to educational institutions providing these courses; providing industry placements for students taking ICT courses; carrying out promotional activities; and developing and supporting the relevant website. Given the magnitude of the problem and in order to make a significant impact in reducing the ICT gap, public/private partnerships are necessary.

Monitoring the supply and demand of ICT skills

Activities which assist in the gathering of labor market and skill supply and demand data should be promoted, both at a governmental and organizational level. This will be better able to identify the 'boom and bust' cycles of the ICT sector and allow investment to be targeted at areas with greatest need.

Literacy Improvement and Human Resource Capacity Building

- Integrate ICT in mainstream educational curricula as well as other literacy programmes and provide for equitable access by pupils and/or students at all levels.
- Set up mechanisms that promote collaboration between industry and training institutions so as to build appropriate human resources capacity.
- Promote twinning of training institutions in Kenya with those elsewhere so as to enhance skills transfer.
- Promote appropriate incentives to public and private sector partners in order to ensure contribution to skills development in the ICT sector.
- Design and develop incentives aimed at attracting foreign-based Kenyan ICT professionals to the country.

- Develop in collaboration with professional bodies, business and other organizations, standard curricula in all institutions engaged in training communication and ICT specialists of all categories.
- There is need for better coordination in ICT training in the country. For example IT literacy courses could be standardized so that it is easy to compare course content covered by students from different IT training institutions.

Innovative Financing for ICT Development

- Identify and encourage innovative financing schemes for ICT development, including the Strategic Partnership for E-business in Kenya.
- Provide incentives, including tax-relief for innovations and experiments.
- Create and maintain, with assistance where feasible, from development partners and the private sector, a special development fund for the promotion and development of ICT.

Encourage and Support Research and Development in ICT

- Establish mechanisms for promoting and coordinating efforts in Research and Development for ICT.
- Establish a fund to support Research and Development efforts, with due regard to promoting innovation and participation of national professionals.
- Encourage private sector investment in local Research and Development in collaboration with local universities and institutions.
- Publicize and disseminate information resulting from the above efforts with a view to encouraging greater participation throughout the country.
- There is a need to attract and encourage Kenyan scientists and engineers who have been engaged in successful Research and Development work in other countries, to come and do the same in Kenya, and become agents of technology transfer.
- There is a need to establish, promote and strengthen centres of excellence in ICT Research and Development.
- A Kenya Information and Communication Technology long-term plan with set targets should be developed, and should be in congruence with the developments in the region.

Accord Due Regard to Intellectual Assets

- In the new "knowledge society", there is a need to recognize the importance of "human capital" or "intellectual assets", and find ways of measuring and quantifying this very important resource. Recognition and quantification of the value of intellectual/knowledge assets, will lead to higher values for those businesses and companies that invest in the training and retraining of their staff. Accounting practices will need to start considering investment in knowledge acquisition as increasing the asset value of a company or individual, rather than a mere expenditure.

Education and training is the principal way to overcome the shortage of ICT skills

- The government and all stakeholders in ICT need to recognize that education and training offer the long-term solution to the e-business and ICT skills gap and mismatch. It is already widely accepted that the bulk of the demand in enterprises is for a combination of ICT skills and a number of years of work experience. On the industry side, funds spent by businesses in competing for staff that are in short supply could possibly be better spent in training their own staff in aspects of ICT use. Competition would then stem from the use made of the acquired skills to develop new products, and to re-engineer business processes.

- There is some evidence that people are reluctant to see ICT as a career, due to the fast changing nature of the skills required and the technical base making it unattractive. Thus, education and training needs not only to provide the technical background necessary but more importantly to develop flexibility and a positive attitude towards the business relevance of these skills through lifelong learning. This call for flexibility and the continuous update of skills is key to the spread of ICT among users and as a means of promoting digital literacy. This is seen as a very important element in influencing productivity growth across all business sectors as well as a means of bridging social divides and of strengthening social cohesion.

Foster partnership between stakeholders

- Improved dialogue between education, businesses, and users is essential to define needs and to develop appropriate means to tackle them in ways that are mutually beneficial. Special attention should be given to defining the roles and responsibilities of the various stakeholders in tackling the e-business and ICT skills gap and mismatch issues. Individuals, in particular, should be given more responsibility in the overall effort to 'up skill' the labor force.

- Public authorities and institutions should recognize their important role as 'evangelists' for ICT adoption and skill development. As major employers with an even broader reach to businesses and individuals they must lead wherever possible by setting examples in ICT adoption and use through incorporating ICT skills in job profiles and adopting formal certification schemes.

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ABBREVIATIONS

CCK	Communications Commission of Kenya
CSK	Computer Society of Kenya (CSK)
ICT	Information & Communication Technology
ISP	Internet Service Providers
ITU	International Telecommunications Union
LAN	Local Area Network
NOC	Network Operation Centre
SNO	Second National Operator
SPSS	Statistical Package for Social Sciences (SPSS)
TKL	Telkom Kenya Ltd
USAID	US Agency for International Development's (USAID
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WITSA	World Information Technology and Services Alliance (WITSA)
XDSL	Digital subscriber lines

CHAPTER ONE: INTRODUCTION

1.1 Background to the survey

1.1.1 Reason for the report

The World Information Technology and Services Alliance (WITSA) aims at significantly improving the capabilities and skills of information and Communications Technology (ICT) professionals by better aligning the training and educational curriculum with the anticipated demand of such professionals. In order to achieve this goal, WITSA and Computer Society of Kenya (CSK) would wish, to develop an ICT skills survey to among other initiatives, determine the anticipated demand for such skills in the Government, Commercial and Outsourcing sectors in Kenya.

This survey therefore is in line with one of the strategic objectives of the US Agency for International Development's (USAID/the client) Leland Initiative (the "prime contact"), which is to improve the capabilities of ICT trade associations in Africa, Asia and the Near East.

This report is based on the results of the largest and most detailed ever survey of Information and Communications Technology (ICT) skills demand and supply in Kenya. It provides some background to the survey, describes the methodology used, and highlights the major findings. This description and analysis of the results is structured using the same layout as the survey questionnaires, with sections focusing on ICT skills demand by employers and ICT skills production by training institutions. The full questionnaire is also included in an appendix at the end of the report for reference.

1.1.2 The role of information in development

Rapid development of ICT accompanied by the convergence of telecommunications, broadcasting and computer technologies is creating new products and services, as well as new ways of learning, entertainment and doing business. At the same time, more commercial, social and professional opportunities are being created through the unique opportunity provided by ICT. As a result, the world is undergoing a fundamental transformation as the industrial society that marked the 20th century rapidly gives way to the information society of the 21st century. The new society promises a fundamental change in all aspects of our lives, including knowledge dissemination, social interaction, economic and business practices and political engagement.

In the emerging digital economy, human resources are the critical factor behind success. Therefore, scarcity in skills or in skilled personnel can pose a serious threat to knowledge intensive branches, such as the Information and Communication Technology (ICT) sector. The quantity and quality of skills have been important issues especially in the high growth development phase, which the ICT sector in many countries has gone through. But quantitative skills shortage and qualitative skills gap could still threaten the further positive development of the ICT sector. In addition, when ICT is nowadays widely integrated throughout the functions of the whole economy and society, the possible skills related problems are to be taken seriously.

When generalized to all end-users and the whole society, the qualitative skills gap could also block country's path towards true information society.

1.1.3 The importance of ICT

ICT can be broadly defined as technologies that provide an enabling environment for physical infrastructure and services development of applications for generation, transmission, processing, storing and disseminating information in all forms. These forms include; voice, text, data, graphics and video. Like other countries, Kenya has recognized the potential and enabling element of information and communication technologies as a tool for social and economic development. Reasons why ICT is considered important:

1. ICT has a very broad range of applications that span across various sectors of health, education, agriculture, government, commerce, etc.
2. ICT enhances economic growth through making enhanced competitiveness possible, increased trade and investment.
3. Creation of opportunities and empowerment by provision of access to local and global markets and promotion of rural development.
4. Improved delivery of social services and reduction of vulnerability to natural disasters as well as reducing isolation of communities and providing immediate linkage to the modern world.
5. Improved transparency and governance through availability of public domain.
6. Introduction of new management and control methods in both public and private sectors hence facilitating enterprise resource management.
7. Introduction to the new knowledge-based economy.
8. Modernization of private sector through improved market access, sales, trade and knowledge of business trends.
9. Facilitation of research and development.

For Kenya therefore, embracing ICT has a lot of specific advantages that not only will enable it improve and sustain development but will also lead to poverty reduction.

1.2 Statement of the problem

There is a growing recognition that the skills gap for ICT professionals is widening. Many organizations have come to realize that certain new technologies can optimize efficiency and make processes more effective. ICT can bring industry closer to their customer, partners and suppliers through more integrated business and communication systems, and can provide enhanced educational opportunities for students on campus and at a distance. The opportunity to gain competitive advantage through the rapid adoption of new technology has fuelled the drive to improve and develop ICT infrastructure and new applications, and has been a key factor in the demand for skilled ICT professionals outstripping supply. Even with the economic slow down in the high tech industries; other companies from outside the sector are continuing to demand more skilled workers.

Besides the dissemination of ICT across all sectors, deep organizational changes are required and new skills are needed to fully exploit the new technologies. What matters most in a knowledge-based society are people and ideas, and the ability to make commercial use of them. One of the main challenges is therefore to identify, measure, forecast, and finally to provide the necessary ICT skills to ensure economic and social sustainability.

There is need to assess the national requirement for ICT skills, establish how much of this is available, and then determine the best strategy of meeting the appropriate ICT skills demand. However the ICT skills that will be needed, and therefore the kind of training that will be required, depend very much on the ICT policy adopted by Kenya as a nation and the Government in particular.

There is need for Kenya to exploit the ICT Skills in the country to create employment. Unfortunately, Kenya does not have documented data on the ICT Workforce to enable it plan for this opportunity. In this report, ICT manpower production by training institutions are examined and compared with industry expectations. Based on recent researches, the new skills requested by the ICT firms, besides the certain educational degree, are often qualities of personal nature. Factors like attitudes and personal communication skills etc. are more important than before when firms are recruiting new staff. The new needs are reflecting the changes taking place inside the ICT industry, but also in the relationship between the ICT and other sectors.

1.3 Objectives of the survey

1.3.1 Overall objective

To conduct an ICT workforce demand survey to determine the requirements of the ICT skills in Kenya, and propose recommendations to Government and educational institutions with regards to programs related to ICT skills and development of training programs.

1.3.2 Specific objectives

1. To determine current and five year projected ICT skills supply by training institutions in Kenya
2. To determine the current and expected five year projected demand for ICT skills by employers in Kenya
3. To make policy recommendations for stakeholders in the industry with a view to addressing critical issues in the area of survey.

1.4 Scope of the survey

The main goal of the survey was to provide reasonably timely data required for monitoring, especially on the basis of available secondary information pertaining to demand and supply of ICT skills in Kenya, and to fill critical gaps in national reporting, especially for the most recent years. To this end, the survey included but was not limited to the performance of the following tasks: -

- Development of an ICT skills survey to determine the anticipated demand for such skills in the Government, Commercial and Outsourcing sectors.
- Performance of an analysis of the results
- Dissemination of the conclusions to the academic community, Government and the general public.

The results are generally robust and the evidence from the various sources were consistent. Some of the estimates, however, cannot be considered to represent the national picture. There are rapid changes taking place in the ICT sector. Given this state of affairs, the information in this report will face similar changes. This will necessitate constant update of the information contained in this report.

1.5 Survey methodology

A descriptive survey was undertaken. Descriptive designs result in a description of the data, whether in words, pictures, charts, or tables, and whether the data analysis shows statistical relationships or is merely descriptive. Surveys based on a carefully selected representative sample can produce results that are broad, credible and generalisable to the whole population; the research team preferred to draw findings from the analysis of numerical data, in which case a survey became handy. It was possible for the research team to administer the data collection tools to the respondents in their workstations, which was relatively easy, and played a great role in increasing the response rate.

The population of survey included the ICT champions of the sampled organizations, which were representative of all sectors of the economy.

Specifically, the methodology used for carrying out the survey was to divide the assignment into four min activities s indicted below:-

Activity No. 1: Review of existing documents

This consisted of the following tasks:

- Obtaining and reading existing documents;
- Analyzing reports and summarizing findings in draft report.

The survey utilized a combination of both quantitative and qualitative techniques in the collection of data. The survey team used desk research to obtain background socio-economic information on Kenya, followed by the collection of previous ICT studies in order to obtain readily available baseline data.

Activity No. 2: Interview key informants

This consisted of the following tasks:

- Designing interview format;
- Conducting interviews;
- Identifying sample organizations and respondents;
- Updating draft report.

Personal interviews were conducted in order to: - Supplement the available data gathered from existing surveys; Corroborate data already available; ascertain priority implementation areas to leverage ICT rollout in Kenya; and to tap subjective opinions as to prospects for ICTs in the country. The team leader conducted over thirty interviews, in some cases with multiple interviewees, of about half an hour each.

Activity No. 3: Design and administer questionnaire to respondents

This consisted of the following tasks:

- Identifying gaps between information at hand and terms of reference
- Designing questionnaire;
- Administering questionnaire.

The main tools of primary data collection were two sets of semi-structured questionnaires, one targeting training institutions and the other targeting employers. The questionnaires were administered through drop and pick method.

Activity No. 4: Write final report

This consisted of the following tasks:

- Analyzing questionnaire returns and making conclusions;
- Updating draft report to obtain final report.
- Details of what was done in each of the activities are explained below.

1.6 Constraints

Notwithstanding the research team's determination to undertake the survey to completion within the given time frame, various constraints were encountered. For instance, some of the information sought was of a confidential nature, which the respondents either deliberately refused to divulge or did not have access to. In addition, the time allocated to data collection was not sufficient to enable the respondents complete the questionnaires as accurately as possible, considering that they were at the same time be carrying out their daily duties. This may have resulted to some of the respondents' failure to complete and return the questionnaire on time.

Though the research team would have wished to administer the data collection tools to only the ICT champions of the various organizations, this was not possible as some of them had to delegate to their juniors as they themselves were either busy or away on official duties. It was therefore assumed that the respondents would be able to give similar information as would have been provided by the ICT champions themselves.

The survey took cognizance that the exercise, of necessity, is likely to be a continuous process of updating information on ICT manpower trends. Consequently, the inadequacy of the time to cover the vast areas of the country and address information details will be addressed in the course of time.

CHAPTER TWO: FINDINGS OF THE SURVEY AND DISCUSSIONS

2.1 Introduction

Out of the 600 questionnaires that were distributed, 420 were returned completed, 70 per cent response rate. The data was analyzed by employing descriptive statistics such as percentages, frequencies and tables. Statistical Package for Social Sciences (SPSS) was used to aid in analysis. Computation of frequencies in tables, percentages, charts, standard deviations and mean scores were used in data presentation. The information is presented and discussed as per the objectives of the survey.

2.2 Analysis of findings of the survey

2.2.1 Distribution of survey respondents

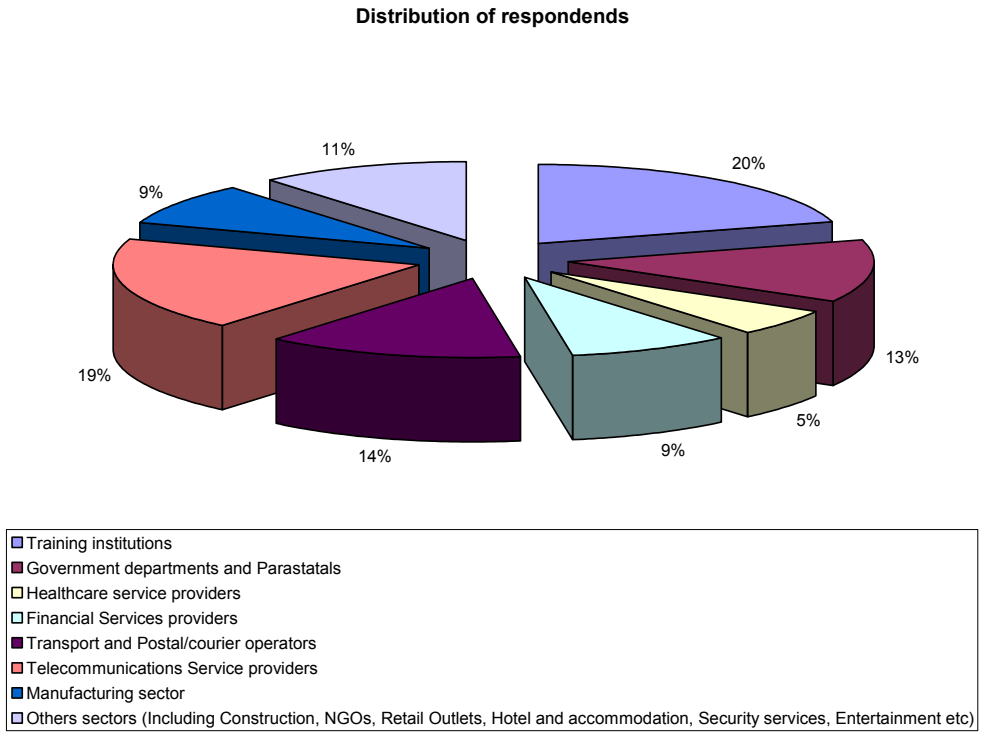
The respondents were drawn from various sectors of the economy with the aid of stratified random sampling, each respondent having an equal chance of participating in the survey. Out of the 420 respondents, the training institutions were seventy two, constituting 17.1% of the sample size. The Telecommunications service providers, who are major consumers of ICT skills constituted 16% while Transport and Postal/courier operators constituted 11.4% Table 4.1 below presents a summary of the responses received.

Table 3.1: Distribution of survey respondents by economic sector

Economic Sector/Industry	**Number of questionnaires returned completed**	**Sample percentage**
Training institutions		
Public University	3	0.7%
Private University	5	1.2%
Middle level public college	10	2.3%
Middle level private college	54	12.9%
Sub total	*72*	*17.1%*
Government departments and Parastatals	43	10.2%
Healthcare service providers	19	4.5%
Financial Services providers	30	7.2%
Transport and Postal/courier operators	48	11.4%
Telecommunications Service providers	67	16%
Manufacturing sector	30	7.2%
Others sectors (Including Construction, NGOs, Retail Outlets, Hotel and accommodation, Security services, Entertainment etc)	39	9.3%
Total	**420**	**100.00%**

Source: Field data

Chart 3.1: The distribution of the respondents by economic sectors.



2.2.2 Current and five year projected number of ICT graduates

In order to meet first objective of the survey, to determine the current and five year projected ICT skills supply by training institutions in Kenya, the 72 training institutions that participated in the survey were required to indicate in terms of academic qualifications and designated job skills listed, the number of graduates they produced annually and what their projections would be annually in the next five years. The responses were expected to give an indication of the current and five year projected ICT manpower supply by the training institutions in Kenya. Table 3.2 below presents a summary of the findings.

Table 3.2: Current and five year projected number of ICT graduates (Academic qualifications)

Academic Qualifications	Current Annual productions	Project Annual production in the next five years
PhD	-	-
Masters Degree	64	250
Bachelors Degree	1225	2,450
Pre-Diploma, Diploma, Higher Diploma	7,128	19, 356
N=72	**8,417**	**22,056**

The responses indicate that the institutions of higher learning hardly produce any PhD graduates. There is mass production of Pre-Diploma, Diploma and Higher Diploma graduates, mostly from the private middle level colleges. The ICT courses offered by the various institutions are not standardized in terms of duration and course contents. For instance, a Diploma in Information Technology in the Universities take a minimum of two years while the same takes about six months in middle level private colleges, though the contents may be different. This disparity ought to be addressed. There is need for better coordination in ICT training in the country. For example IT literacy courses could be standardized so that it is easy to compare course content covered by students from different IT training institutions.

The respondents were further asked to indicate the number of graduates produced annually who fit into the various job designations. The findings indicate that it is possible to have one person fitting into more than one job designation. The findings indicate that the training institutions offer ICT courses, in which majority of the graduates fit into multiple disciplines, especially Analysis and programmers, data entry personnel, ICT help desk personnel, Network support staff, ICT Trainers, and Web designers. The middle level colleges produce the bulk of this caliber of ICT graduates. The highly skilled jobs, especially of managerial nature require training up to Degree level.

Similar to the certifications held by the ICT workers. Foreign certifications were the leading ones offered in the training institutions compared to the local ones. A+ and N+ were popular with the ICT trainees. CISCO certifications were the third popular. Oracle was the least offered among the training institutions.

Secondly, the respondents were required to indicate the number of staff required annually in various ICT disciplines (current and five year projections) in their respective organizations but the same were not available locally. This raises an important issue for policy makers. Should the development of ICT capabilities be left to market pressures to gradually create ICT skills gaps? Or should the future developing need be better anticipated by introducing initiatives that will address these needs in sufficient time to meet demand? Obviously, considerable time could be saved and economic advantage could be gained if supply could be met slightly ahead of need in these states. To do so will require the comprehensive monitoring mechanisms described earlier, along with flexible and workable policies developed on a partnership basis to make the resulting programmes sustainable as demand increases. Table 3.3 below presents a summary of the findings.

Table 3.3: Current number of ICT graduates (Job designations) compared with skills required but unavailable

Category one

ICT job designation	PhD	Masters	Bachelors	Diploma	Total graduates produced annually	Staff required by employers but unavailable (Currently)	Projected staff required in five years
Analysts/Programmers	0	0	143	1067	1,210	39	163
Application programmers	0	0	126	618	744	12	72
Computer programmers	0	0	121	1291	2156	4	48
Online producers	0	0	44	314	358	0	6
Software engineers	0	0	39	456	495	0	21
System analysts	0	0	12	210	222	6	33
System programmers	0	0	14	300	314	0	18
Web architects	0	0	159	418	577	0	14
Web designers	0	0	38	1386	1424	0	23
Web programmers	0	0	48	1697	1745	0	34
Sub Total	**0**	**0**	**744**	**7,757**	**9,245**	**61**	**432**

Category Two

ICT job designation	PhD	Masters	Bachelors	Diploma	Total	Staff required by employers but unavailable (Currently)	Projected staff required in five years
Call center personnel	0	0	131	827	958	14	72
Data entry personnel	0	0	65	2170	2235	0	585
ICT helpdesk personnel	0	0	162	1849	2011	0	202
Multimedia copywriters	0	0	15	477	492	0	22
Network support staff	0	0	49	840	889	0	29
Sub Total	**0**	**0**	**422**	**6,163**	**6,585**	**14**	**910**

Category Three

ICT job designation	PhD	Masters	Bachelors	Diploma	Total	**Staff required by employers but unavailable (Currently)**	**Projected staff required in five years**
Database administrator	0	0	182	707	889	0	88
Internet/intranet administrators	0	0	140	506	646	0	203
Intranet engineers	0	0	44	270	314	2	18
LAN/WAN administrators	0	0	160	608	768	0	113
Network administrators	0	0	47	347	394	0	73
System administrators	0	0	26	285	311	0	53
Web administrator	0	0	164	646	810	0	17
Sub Total	**0**	**0**	**763**	**3,369**	**4,132**	**2**	**565**

Category four

ICT job designation	PhD	Masters	Bachelors	Diploma	Total	**Staff required by employers but unavailable (Currently)**	**Projected staff required in five years**
Computer systems auditors	0	0	90	347	437	11	24
Data communications consultant	0	0	144	413	557	8	56
E-commerce project managers	0	33	137	127	297	0	5
ICT trainers	0	0	175	1750	1925	0	31
Information system managers	0	24	180	466	670	0	46
Network managers	0	0	46	135	181	0	19
Project managers	0	12	40	70	122	10	12
Telecommunications managers	0	40	12	146	198	0	21
Sub total	**0**	**109**	**824**	**3,454**	**4,387**	**29**	**214**

Category five

ICT job designation	PhD	Masters	Bachelors	Diploma	Total	**Staff required by employers but unavailable (Currently)**	**Projected staff required in five years**
Computer engineers	0	0	94	797	891	4	98
Network designers	0	0	143	493	636	0	13
Network engineers	0	0	45	433	478	10	33
System engineers	0	0	19	531	550	0	12
Systems architects	0	0	0	325	325	5	15
Sub Total	**0**	**0**	**301**	**2,579**	**2,880**	**19**	**171**

Category six

ICT job designation	PhD	Masters	Bachelors	Diploma	Total	**Staff required by employers but unavailable (Currently)**	**Projected staff required in five years**
E-commerce architects	0	0	155	128	283	0	5
E-commerce programmers	0	0	123	350	473	0	4
Sub Total	**0**	**0**	**278**	**478**	**756**	**0**	**9**

Category seven

ICT job designation	PhD	Masters	Bachelors	Diploma	Total	**Staff required by employers but unavailable (Currently)**	**Projected staff required in five years**
Multimedia content authors	0	0	82	426	508	0	9
Multimedia graphic designers	0	0	60	294	354	2	27
Multimedia writers	0	0	76	179	255	0	12
Sub Total	**0**	**0**	**218**	**899**	**1,117**	**2**	**48**

Source: Field data

2.2.3 Involvement of stakeholders in Curriculum development

The respondents were asked to indicate whether they involved potential employers and other stakeholders in ICT Curriculum development. Out of the 70 training institutions that participated in the survey, 65% indicated that they did not involve potential employers and stakeholders in Curriculum Development whereas 35% indicated that they did. The respondents who indicated that they involved potential employers and other stakeholders in Curriculum development were further asked to explain the role of the potential employers and the other stakeholders in Curriculum development in their institutions. Further probing indicated that the middle level public training institutions had standardized curriculum examined by the Kenya National Examinations Council.

Most of the private colleges were running courses based on syllabi picked off the shelf. These include Institute of the Management of Information System (IMIS). In Addition, the middle level private colleges offer internal courses at Certificate, Diploma and Higher Diploma levels. The courses are characterized by non-standardization, an issue that requires urgent attention.

Curricula of training institutions do not match the requirement profile for the ICT specialists the industry needs. Addressing the training needs therefore requires action in mainstream education and in workforce training. In general, industry's main priorities focus on the development of workforce training. There are many industry schemes, commercial training providers and recognized certification systems in existence, and governments are already working closely with industry to profitably exploit these existing solutions. The social partners and industry associations extend this training through their commitment to lifelong learning and incentives for organizations to upgrade their workforces.

2.2.4 Current number of ICT staff

In order to meet the second objective of the survey, to determine the current and expected five-year projected demand for ICT skills by employers in Kenya, various questions were posed to the respondents. Firstly, the respondents were asked to indicate the number of ICT staff in their respective organizations. The responses indicate that the ICT skills that are highly required across the various sectors of the economy include Data entry, Call Center personnel, and ICT help desk personnel. Middle level colleges produce the bulk of these graduates. Table 3.4 below presents a summary of the responses obtained from the 420 organizations that responded

Table 3.4: The number of ICT staff

Category one

ICT job designation	PhD	Masters	Bachelors	Diploma	Total number of current ICT staff	Staff required by employers but unavailable (Currently)
Analysts/Programmers	0	7	27	61	95	39
Application programmers	0	2	20	26	48	12
Computer programmers	0	1	11	18	30	4
Online producers	0	0	2	4	6	0
Software engineers	0	4	5	6	15	0
System analysts	0	0	12	5	17	6
System programmers	0	1	5	5	11	0
Web architects	0	1	4	7	12	0
Web designers	0	1	10	8	19	0
Web programmers	0	1	7	21	29	0
Sub Total	**0**	**18**	**103**	**161**	**282**	**61**

Category Two

ICT job designation	PhD	Masters	Bachelors	Diploma	Total number of current ICT staff	Staff required by employers but unavailable (Currently)
Call center personnel	0	0	5	795	800	14
Data entry personnel	0	0	7	1016	1023	0
ICT helpdesk personnel	0	0	10	135	145	0
Multimedia copywriters	0	0	2	7	10	0
Network support staff	0	3	11	14	28	0
Sub Total	**0**	**0**	**35**	**1,967**	**2,006**	**14**

Category Three

ICT job designation	PhD	Masters	Bachelors	Diploma	Total number of current ICT staff	Staff required by employers but unavailable (Currently)
Database administrator	0	2	28	50	78	0
Internet/intranet administrators	0	1	21	41	63	0
Intranet engineers	0	1	10	11	22	2
LAN/WAN administrators	0	3	21	50	74	0
Network administrators	0	4	17	27	48	0
System administrators	0	3	22	26	51	0
Web administrator	0	1	6	7	17	0
Sub Total	**0**	**15**	**125**	**212**	**353**	**2**

Category four

ICT job designation	PhD	Masters	Bachelors	Diploma	Total number of current ICT staff	Staff required by employers but unavailable (Currently)
Computer systems auditors	0	2	7	5	14	11
Data communications consultant	0	2	9	11	22	8
E-commerce project managers	0	1	2	0	3	0
ICT trainers	0	6	12	17	35	0
Information system managers	0	12	20	29	51	0
Network managers	0	3	6	8	17	0
Project managers	0	3	5	0	8	10
Telecommunications managers	0	4	10	12	26	0
Sub total	**0**	**33**	**71**	**82**	**176**	**29**

Category five

ICT job designation	PhD	Masters	Bachelors	Diploma	Total number of current ICT staff	Staff required by employers but unavailable (Currently)
Computer engineers	0	2	16	31	49	4
Network designers	0	3	15	2	20	0
Network engineers	0	4	9	25	38	10
Systems Solutions architects	0	1	1	5	7	5
System engineers	0	2	4	6	12	0
Sub Total	**0**	**0**	**45**	**69**	**126**	**19**

Category six

ICT job designation	PhD	Masters	Bachelors	Diploma	Total number of current ICT staff	Staff required by employers but unavailable (Currently)
E-commerce architects	0	2	2	4	8	0
E-commerce programmers	0	2	2	3	7	0
Sub Total	**0**	**0**	**278**	**478**	**756**	**0**

Category seven

ICT job designation	PhD	Masters	Bachelors	Diploma	**Total number of current ICT staff**	**Staff required by employers but unavailable (Currently)**
Multimedia content authors	0	0	7	3	10	0
Multimedia graphic designers	1	0	5	13	18	2
Multimedia writers	0	0	2	1	3	0
Sub Total	**1**	**0**	**14**	**17**	**31**	**2**

Source: Field data

2.2.5 Level of skill competence of staff at the time of joining organizations

Thirdly, the respondents were asked to indicate the level of competence of the staff in terms of the required skills at the time of entry to the various organizations on a 10-point scale (10 being perfect). The responses indicate that by the time of making entry into the organizations, the graduates' level of competence is relatively good. Majority of the organizations that participated in the survey indicated that the fresh graduates require on-the job training under the guidance of old employees in order to blend the skills acquired, mostly through theory lessons and the actual practice in real life situations.

It was noted that the skills lacking in the industry were the same ones that the ICT training institutions. This is expected since what ever is lacking in the industry has to be met by the training institutions and if the training institutions lack the staff to produce the particular skill then the industry would continue suffering. Table 3.5 below presents a summary of the findings

The findings indicate that with the market is still very competitive, ICT professionals need to be proficient in one of the highly sought after skill areas such as network security and enterprise architecture or be proficient in more than one type of technology. There is less demand for people with more general programming skills, vendor-specific skills or limited work experience.

Table 3.5: Skills adequacy of staff at time of engagement (Scale 1-10)

ICT job designation	Mean score	Standard deviation
Analysts/Programmers	0.989	1.979
Application programmers	0.874	1.748
Call Centre personnel	0.915	1.830
Computer engineers	1.213	2.426
Computer programmers	0.976	1.952
Computer systems auditors	1.021	2.042
Data communications consultant	1.131	2.262
Data entry personnel	0.876	1.752
Database administrator	0.997	1.994
E-commerce architects	1.056	2.112
E-commerce programmers	0.896	1.792
E-commerce project managers	1.231	2.462
ICT helpdesk personnel	0.781	1.562
ICT trainers	1.112	2.224
Information system managers	1.213	2.462
Internet/intranet administrators	0.868	1.736
Intranet engineers	1.132	2.264
LAN/WAN administrators	0.917	1.834
Multimedia content authors	0.897	1.794
Multimedia copywriters	1.125	2.250
Multimedia graphic designers	1.071	2.142
Multimedia writers	0.984	1.968
Network administrators	0.998	1.996
Network designers	1.021	2.042
Network engineers	1.126	2.252
Network managers	1.216	2.432
Network support staff	0.867	1.734
Online producers	1.313	2.626
Project managers	1.226	2.452
Software engineers	1.361	2.722
Solutions architects	1.162	2.324
System administrators	0.864	1.728
System analysts	0.897	1.794
System engineers	1.371	2 .742
System programmers	0.967	1.934
Telecommunications manager	1.221	2.442
Web administrator	0.897	1.794
Web architects	1.232	2.464
Web designers	0.976	1.934
Web programmers	0.989	1.978
N=420		

Source: Field data

2.2.6 *Level of competence of staff in terms of business knowledge at the time of joining organizations*

The respondents were asked to indicate the level of competence of the staff in terms of business knowledge besides the required ICT skills at the time of entry to the various organizations on a 10-point scale (10 being perfect). The findings indicate that the more technical the skills required by industry, the less business skills the workforce tend to have at the time of entry in to the organizations.

ICT is nowadays more and more integrated into other sectors of economy. It has become part of their business. Consequently ICT professionals have to have more versatile skills profiles. They must not only have to master ICT broadly, but they also have to have some narrower fields' expertise of their own. In addition it is desirable that they have good business skills. Besides right education new ICT professionals have to have right attitude and willingness to learn new things.

In other branches than ICT these issues are emphasized. ICT professionals have to be able to understand business perspective and they have to be able explain technical terms to non technical people and change their technical vocabulary to suit listeners' background. When planning ICT education and training, these results should be remembered. Because changes in the education systems are slow, firms may find reasonable to arrange their own courses and education to their employees. The possibility for needs-tailored education inside firms and companies could be utilized more effectively than now. Co-operation between educational institutions and employers should be encouraged because it is everyone's interest that students become well educated and find job. Table 3.6 below presents a summary of the findings

Table 3.6: Business knowledge at time of engagement

ICT job designation	Mean score	Standard deviation
Analysts/Programmers	1.217	2.434
Application programmers	1.081	2.162
Call Centre personnel	1.110	2.220
Computer engineers	1.315	2.630
Computer programmers	1.213	2.426
Computer systems auditors	1.101	2.202
Data communications consultant	0.918	1.836
Data entry personnel	0.998	1.996
Database administrator	1.091	2.182
E-commerce architects	0.897	1.794
E-commerce programmers	1.271	2.542
E-commerce project managers	0.917	1.834
ICT helpdesk personnel	1.213	2.426
ICT trainers	0.996	1.992
Information system managers	0.892	1.784
Internet/intranet administrators	1.134	2.268
Intranet engineers	1.132	2.264
LAN/WAN administrators	1.211	2.422
Multimedia content authors	1.003	2.006
Multimedia copywriters	1.251	2.502
Multimedia graphic designers	1.117	2.234
Multimedia writers	1.091	2.182
Network administrators	0.979	1.958
Network designers	1.011	2.022
Network engineers	1.215	2.430
Network managers	0.998	1.996
Network support staff	1.251	2.502
Online producers	1.324	2.648
Project managers	0.897	1.794
Software engineers	1.104	2.208
Systems Solutions architects	1.427	2.854
System administrators	1.094	2.188
System analysts	1.362	2.724
System engineers	1.271	2.542
System programmers	1.109	2.218
Telecommunications manager	0.992	1.984
Web administrator	1.241	2.482
Web architects	1.126	2.252
Web designers	1.095	2.190
Web programmers	1.285	2.570
N=420		

Source: Field data

CHAPTER THREE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

3.1 Summary of the findings

- Key issues addressed in the survey not only touch on the boosting of the supply of raw recruits but training them in the right disciplines, as well as retraining those with outdated ICT skills. Also discussed were issues related to improving supply through increasing labor mobility, government action and the availability of robust and flexible training and retraining opportunities to attract candidates from other professions.

- Although there has not been a comprehensive survey of ICT human resources in Kenya, findings of the survey indicate that that the need for at least some ICT skills exceeds the current supply. Some industry sectors have responded to the skills shortage by implementing less labour intensive solutions including the outsourcing of certain ICT operations to various XSP providers such as Application Service Providers: by buying computing functionality from one place, shortages can be addressed. The needs are only partially met by the existing training institutions and the existing ICT capabilities should be assessed and reviewed on a national basis to obtain a complete picture of the needs in the country.

- The general ICT skills gap has resulted in inflated wages in many ICT skill areas which has helped to attract more people to training programmes, but this is proving problematic for smaller companies who cannot afford the inflated labor costs**.** With a market downturn and increased training opportunities, the shortage are expected to stabilize but will not decrease for some time unless increased measures to address the problem are put in place**.**

- Findings of the survey obtained from personal interviews indicate that most institutions of higher learning, both private and public, offer varying levels of ICT skills training, mostly as part of their programs for formal academic qualifications. Their qualifications are categorized in terms of academic qualifications rather than specific skills. However, in many cases facilities are not adequate to provide the required exposure. The courses themselves are of widely varying duration and content, making it impossible to judge the competence of graduates from these institutions. There is a need to standardize these short ICT courses so that the market can assess the true ICT skills capabilities.

- As well as formal education and qualifications, there are numerous industry-led certification schemes in existence. The majority of the main ICT industry players have their own training programmes being delivered, for example, Microsoft, Novell, Cisco and IBM. The majority of the certification schemes are aimed at training in specific tasks, such as network administration and helpdesk support, with the majority focusing on network skills. Some organizations (for example Microsoft and Cisco Systems) are also working closely with national and vocational qualification structures in Kenya to offer their courses within existing further education systems.

- Most organizations have also taken steps to assess the skills of their workforce and to formulate plans to manage and grow the necessary technical skills to face future challenges. The biggest challenge identified by industry is developing the behavioral or non-technical skills in their technical staff. The most common behavioral skills in demand included: interpersonal and teaming skills; communication; client relationship management; and business acumen.

- Although the level of technical ICT skills in Kenya is quite good, there is a shortage of skilled and experienced business managers in the ICT sector. In other words, to put ideas into practice and to apply technical skills in a business context is hampered by the lack of management experience and talent. Employers are increasingly seeking non-technical skills and greater flexibility from their employees. With a global downturn in the ICT industry and competition for jobs, employers are seeking more from ICT professionals. Employers are requiring people with a broader range of skills and the capacity to re-skill, diversify and multi-task is highly regarded.

- The survey findings indicated that the curricula of training institutions simply do not match the requirement profile for the ICT specialists the industry needs. Addressing the training needs therefore requires action in mainstream education and in workforce training. In general, industry's main priorities focus on the development of workforce training. There are many industry schemes, commercial training providers and recognized certification systems in existence, and governments are already working closely with industry to profitably exploit these existing solutions. The social partners and industry associations extend this training through their commitment to lifelong learning and incentives for organizations to upgrade their workforces.

- Influencing the education system was traditionally seen by industry as the domain of the public sector as it elicited longer-term solutions. However, education reform is becoming a major political issue, as a growing number of business and industry associations link the shortfall of highly skilled ICT staff with weaknesses in educational curricula and associated teaching methods. Various business and industry associations have been directly lobbying for education reforms designed to improve the technical skills of school leavers, and to increase the number of school leavers moving on to higher education.

3.2 Conclusions

Although the prime objective of this report is to analyze the nature of the ICT skills gap and to identify key initiatives in response to this challenge, some general conclusions can be drawn.

- The various stakeholders in the ICT industry have reacted, in one way or another, to the challenge of the ICT skills gap. There is, however, no institutionalized dialogue to discuss the best available solutions. This is demonstrated by the fragmented nature of the available statistics, the lack of any common means of measuring this significant issue in the Kenyan context and the dependence of commercial statistics in an area that should be monitored and acted upon at national level.

- The lack of common data and poor understanding of the issues results in there being no real common ground upon which to discuss ICT skills issues, and therefore no platform

from which to take consolidated action. For these reasons a Kenyan ICT skills Forum should be created as a first step to addressing these issues, which are vital to the future economic well, being of Kenya and its citizens.

- The ICT skills gap calls for consistent policy responses and a better cooperation between the government and the private sector. Policy development in conventional economic models has tended to address specific needs and market failures as sectors have changed due to shifts in world markets. The e-revolution is very different in this respect. The horizontal nature of ICT adoption across all sectors and in every home warrants far reaching policies that demand the involvement of all stakeholders.

- The ICT skills shortage has both a qualitative and a quantitative element. The gap itself is a qualitative measure whereas the skills shortage is quantitative. They need to be addressed in different ways. Recruitment difficulties, that may be linked to pay and conditions have and are being dealt with in ways described above. The skills shortage relates to a situation where there is a genuine lack of adequately skilled individuals available in the accessible labor market, while the skill gap, or mismatch refers to the situation where employers feel that their existing workforce have lower skill levels than are necessary. Instead, it is the duty of the government, businesses and individuals, supported by their representative bodies, to act in coordinated partnerships that match the far-reaching nature of the problem.

- The productive use of ICTs calls for more skills, higher levels of skills and different kinds of skills. Whatever the exact numbers, the demand for ICT skills is not just about the quantity of skilled people needed, but also their quality. The current and future roles of ICT require not just technical skills across converging technologies, but also commercial and interpersonal skills to match service and products to customers' needs. In this respect, “soft” skills such as communication skills or even artistic skills are becoming increasingly relevant.

- The problem of ICT skills is complex, with many distinct elements. Some relate to all levels of ICT skills, others particularly to professional skills. A normal market-driven economic model would expect that market forces would drive the need for new skills, which in turn will be developed by businesses that need to recruit/train new staff to meet with the market demands for their products. Whilst this model applies in certain sectors of ICT, such as computer hardware and software products, it only applies indirectly to the areas, which will result in the greatest potential economic gain – the improved efficiency of businesses in non-ICT sectors. A market failure therefore exists. Businesses need to upskill their staff and bring in new employees who can help them change the way they work to meet the challenges of the e-economy, but the benefits are not as tangible as investing in a new product or manufacturing equipment. Free market philosophies would say that such businesses would eventually change, or fail, as others seize the opportunity, but action taken now will avert the potentially massive economic implications of simply letting this process happen.

- There is a growing realization in many quarters that many school and university curricula do not encourage or provide the necessary skills and understanding for many skilled jobs

in the Information Society. Microsoft, Cisco, 3Com SAP (and others from the business application side), Gartner Group (e.g. Project Management), SAS (and others from the system development side) have made attempts to plug the divide by offering courses in education that will prepare young people for job opportunities in the ICT sector. Making these courses part of the standard curriculum and building accreditation into the assessment system is one way of addressing this issue. However, it needs education and industry to work closely together with government to ensure these courses are integrated into the education system and are pedagogically sound

3.3 Recommendations for policy and practice

Based on findings of the survey, it is expected that the stakeholders, who include the training institutions and employers will gain a better understanding of the current and five years projected ICT manpower status, upon which informed decisions will be made. The following are measures are highly recommended: -

Define the ICT industry's skills requirements.

- The objective is to put in place a clear frame-work for students, education and training institutions and governments that describe the skills and competences required by the ICT industry in Kenya To date, several generic job profiles covering over various ICT job roles have been developed which provide a comprehensive description of the types of jobs in the industry, the tasks and technologies associated with each job, the skills and competences required (both technical and behavior skills), and the career opportunities available in the industry. The industry stakeholders in Kenya should go a step further to develop and expand both the descriptions and number of job profiles and to elaborate on the specific qualifications and training required. Sustainability is dependent on accurately forecasting demand and fluctuations over time, based on addressing needs that are appropriate to businesses.

Develop new ICT curricula to match these requirements.

- There is need for all stakeholders in the ICT industry to develop and implement a series of innovative programme curricula that reflect the education and training needs of industries engaged in the Information and Communications Technologies and to prepare the workforce for the new economy. This calls for identification of the required output standards at graduate level, the presentation formats and delivery modes. The work should embrace embraces issues of equal opportunities (particularly with regard to gender) and recognize the need to support cultural diversity and student mobility across the training institutions in the country, whilst satisfying the credit transfer systems. It is hoped that such Curricula thus developed would become a benchmark/ standard for all education institutions throughout Europe.

To attract more people to ICT, especially women and encourage a greater awareness and interest across the country in the learning of ICT skills.

- The ICT industry should develop a Kenya-wide marketing strategy to attract more people to the industry. This will include such activities as organizing open days in companies, dissemination of flyers and brochures to schools, providing guest "lecturers" to educational institutions providing these courses; providing industry placements for students taking ICT courses; carrying out promotional activities; and developing and supporting the relevant website. Given the magnitude of the problem and in order to make a significant impact in reducing the ICT gap, public/private partnerships are necessary.

Monitoring the supply and demand of ICT skills

Activities which assist in the gathering of labor market and skill supply and demand data should be promoted, both at a governmental and organizational level. This will be better able to identify the 'boom and bust' cycles of the ICT sector and allow investment to be targeted at areas with greatest need.

Literacy Improvement and Human Resource Capacity Building

- Integrate ICT in mainstream educational curricula as well as other literacy programmes and provide for equitable access by pupils and/or students at all levels.
- Set up mechanisms that promote collaboration between industry and training institutions so as to build appropriate human resources capacity.
- Promote twinning of training institutions in Kenya with those elsewhere so as to enhance skills transfer.
- Promote appropriate incentives to public and private sector partners in order to ensure contribution to skills development in the ICT sector.
- Design and develop incentives aimed at attracting foreign-based Kenyan ICT professionals to the country.
- Develop in collaboration with professional bodies, business and other organizations, standard curricula in all institutions engaged in training communication and ICT specialists of all categories.
- There is need for better coordination in ICT training in the country. For example IT literacy courses could be standardized so that it is easy to compare course content covered by students from different IT training institutions.

Innovative Financing for ICT Development

- Identify and encourage innovative financing schemes for ICT development, including the Strategic Partnership for E-business in Kenya.
- Provide incentives, including tax-relief for innovations and experiments.
- Create and maintain, with assistance where feasible, from development partners and the private sector, a special development fund for the promotion and development of ICT.

Encourage and Support Research and Development in ICT

- Establish mechanisms for promoting and coordinating efforts in Research and Development for ICT.
- Establish a fund to support Research and Development efforts, with due regard to promoting innovation and participation of national professionals.
- Encourage private sector investment in local Research and Development in collaboration with local universities and institutions.
- Publicize and disseminate information resulting from the above efforts with a view to encouraging greater participation throughout the country.
- There is a need to attract and encourage Kenyan scientists and engineers who have been engaged in successful Research and Development work in other countries, to come and do the same in Kenya, and become agents of technology transfer.
- There is a need to establish, promote and strengthen centres of excellence in ICT Research and Development.
- A Kenya Information and Communication Technology long-term plan with set targets should be developed, and should be in congruence with the developments in the region.

Accord Due Regard to Intellectual Assets

- In the new "knowledge society", there is a need to recognize the importance of "human capital" or "intellectual assets", and find ways of measuring and quantifying this very important resource. Recognition and quantification of the value of intellectual/knowledge assets, will lead to higher values for those businesses and companies that invest in the training and retraining of their staff. Accounting practices will need to start considering investment in knowledge acquisition as increasing the asset value of a company or individual, rather than a mere expenditure.

Education and training is the principal way to overcome the shortage of ICT skills

- The government and all stakeholders in ICT need to recognize that education and training offer the long-term solution to the e-business and ICT skills gap and mismatch. It is already widely accepted that the bulk of the demand in enterprises is for a combination of ICT skills and a number of years of work experience. On the industry side, funds spent by businesses in competing for staff that are in short supply could possibly be better spent in training their own staff in aspects of ICT use. Competition would then stem from the use made of the acquired skills to develop new products, and to re-engineer business processes.

- There is some evidence that people are reluctant to see ICT as a career, due to the fast changing nature of the skills required and the technical base making it unattractive. Thus, education and training needs not only to provide the technical background necessary but more importantly to develop flexibility and a positive attitude towards the business relevance of these skills through lifelong learning. This call for flexibility and the continuous update of skills is key to the spread of ICT among users and as a means of promoting digital literacy. This is seen as a very important element in influencing

productivity growth across all business sectors as well as a means of bridging social divides and of strengthening social cohesion.

Foster partnership between stakeholders

- Improved dialogue between education, businesses, and users is essential to define needs and to develop appropriate means to tackle them in ways that are mutually beneficial. Special attention should be given to defining the roles and responsibilities of the various stakeholders in tackling the e-business and ICT skills gap and mismatch issues. Individuals, in particular, should be given more responsibility in the overall effort to 'up skill' the labor force.

- Public authorities and institutions should recognize their important role as 'evangelists' for ICT adoption and skill development. As major employers with an even broader reach to businesses and individuals they must lead wherever possible by setting examples in ICT adoption and use through incorporating ICT skills in job profiles and adopting formal certification schemes.

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APPENDIX I: COUNTRY PROFILE

Demographic information

The Republic of Kenya is situated in Eastern Africa, with an eastern coastline between Somalia and Tanzania. Its major seaport is in Mombasa. Kenya covers an area of 582 650 sq km, of which 13 400 sq km is covered by water, mainly located in the Great Rift Valley on the western side of the country. Its direct neighbors are Tanzania, Somalia, Ethiopia, Kenya and Sudan.

Kenya's population of 32,021,856 million (July 2004 estimate) is largely youthful, with over 40% of its population being under the age of 14 years. According to the Central Bureau of Statistics, the population growth rate is estimated at 1.14%. The incidence of HIV/AIDS is taking its toll on the population and present life expectancy is estimated at 45 years. According to 2001 figures, over 2,5 million people are infected with HIV/AIDS. Literacy rates are high at 85,1% although there is a gender discrepancy between men (90,6%) and women (79,7%).

Economy

The country's GDP is estimated at about USD 33 billion in 2003, with an estimated GDP per capita of USD 1000. Poverty data indicates that more than 50% of the population lives below the poverty line. Unemployment figures are estimated at over 40%. Although only 19,1 % of GDP is contributed by agriculture, it employs about 75% of the labor force (2003 est.). The main agricultural products are tea, coffee, corn, wheat, sugarcane, fruit, vegetables; dairy products, beef, pork, poultry, eggs.

Industry contributes 18,3% with the remainder provided through services. The major industrial activity is based on the production of small-scale consumer goods (plastic, furniture, batteries, textiles, soap, cigarettes, flour), agricultural products processing; oil refining, cement; and tourism. The main export products are tea, horticultural products, coffee, petroleum products, fish, and cement. Inflation rates have fluctuated over the past five years but have generally been in the single digit range, accompanied by an almost constant USD/KES exchange rate.

Kenya is a member of both COMESA and the more recently formed East African Community (EAC), which comprises Kenya, Kenya and Tanzania. A new customs union is planned to come into effect on 1 January 2005 between Kenya, Kenya and Tanzania; Rwanda has also applied for admission. This is an important step in terms of regional economic development.

Some barriers to development include shortage of electricity, corruption, the foreign debt burden, unstable international commodity prices, poor communication infrastructure and HIV/AIDS, which is having its effect on the most productive group of the population.

ICT Human Resource

Currently, there is no proper audit of the existing ICT human resource capacity. The Computer Society of Kenya estimates that there is a total of 5,500 ICT professionals in the country, with 300–500 graduates in computer science, electronics/electrical engineering and library scientists per year.

Table 3: Estimates of Computer and Related Qualifications in Kenya (2001)

Level of Qualification	Estimated Figures (2001)
Post-graduate	350
Graduate	800
Pre-diploma/Diploma & Higher Diploma	2,500
Skills Literacy	1,100,000
Schools (4 th form)	5,000

Source: Computer Society of Kenya, 2003

Size of domestic ICT market

The ICT market share has been growing steadily in the country. For instance, the computer market reached US$40.63 million in 1998, representing a growth of 33 per cent from the previous year. In the following year, it increased to US$60 million, representing a further 40 per cent growth due to the year 2000 bug preparations. Personal computers and medium range servers dominate the hardware scene; while financial software, dominated by banking packages, is most popular, followed by manufacturing and office automation software.

According to the Information and Communication Technology team of the U.S. Department of Commerce, the Kenyan telecommunications equipment market in 2004 was estimated at about USD150 million, and it was generally considered the most lucrative economical sector in the country. Total Kenyan telecommunications market growth for 2003-2007 is expected to range from 5 to 10% annually in real terms.

Key trends in the ICT sector in Kenya

Kenya has experienced a number of exciting developments in the ICT sector during 2004:

- A very ambitious e-government strategy that, if implemented, will create numerous new procurement opportunities for the private sector. This will however require upgrading of the ICT skills levels of government procurement officials if fair and transparent procurement procedures are to be followed.

- The appointment of the new Minister of Information and Communications has generally changed the perceptions of the ICT sector from pessimistic to cautiously optimistic since July 2004. The extensive ICT experience, both abroad and in the region, of the Minister and the Permanent Secretary, are seen as very positive for accelerating change in the ICT policy and regulatory environment.

- The CCK's recent drive to assess universal access strategies may result in specific interventions to address improved telephone penetration and affordable access in rural areas.

- The end of the exclusivity period for TKL and Jambonet in June 2004 has already started opening up competition through the likely appointment of an SNO and competition in the provision of international gateway services, VSAT and other services.

- The Economic Recovery Strategy for Wealth and Employment Creation (ERSWC) has identified the ICT sector as an investment focus area (albeit at an extremely low level). Likewise the Investment Promotion Center includes ICTs as an area of opportunity

- The East Coast submarine cable project is likely to provide major investment opportunities, but on the flip side, provide more affordable technology for a broader spread of users throughout the country.

- The formidable growth of GSM and other mobile networks and the subscriber base is likely to continue for at least a few more years before saturation is reached. The potential market for value-add services should give rise to new opportunities for software applications developers in areas such as health, citizen information, entertainment, sport and tourism. Almost all new applications are being built on wireless platforms. At the same time, long distance fixed-line traffic has reduced by 15%. There are many ICT entrepreneurs with ideas and concepts looking not only for funding but hoping for increased competition in the market place and more predictability in the policy environment.

- The demand for broadband services is rapidly increasing in industry, government and tertiary education, which make the need for new and expanded fiber-optic networks even more critical.

APPENDIX II: QUESTIONNAIRE FOR EMPLOYERS

Computer Society of Kenya
Kenya National ICT Workforce Survey 2006

Questionnaire For Employers

This questionnaire has been designed to collect information from employers about their current and future manpower needs for Information and Communications Technology (ICT) staff. The purpose is to see whether there is necessity to better coordinate the requirements of employers and the ICT manpower produced by training institutions. All the information in this questionnaire will be treated in confidence.

1. Which of the following best describes your organization's business? (Please tick as appropriate)

No.	Type of business	Tick as appropriate
1	Construction and Real Estate	
2	Electricity Generating	
3	Entertainment (Casinos etc)	
4	Financial Service providers (Banks, Insurance firms, Micro Finance Institutions, Building Societies etc)	
5	Food and Accommodation (Hotels, restaurants, etc)	
6	Health service provision	
7	Manufacturing (Foodstuffs, drinks, equipment etc)	
8	Media	
9	Non-Governmental Organization	
10	Public sector	
11	Regulatory body	
12	Research and Consultancy	
13	Telecommunication service provider	
14	Transport service provider	
15	Whole sale or retail enterprise	
16	Other (Specify)	

2. Kindly fill in the table starting on the next page.

ICT Job Designation	No. of Current Staff	Typical Qualification P=PhD M=Masters B=Bachelors D=Diploma	No. of Staff Required now but unavailable in the Kenyan market	Projected staff required in 5 years time	General Skill Adequacy of staff at time of engagement on scale of 1-10 (10 being perfect)	Business Knowledge at time of engagement on Scale of 1-10 (10 being very knowledgeable)
Analyst/Programmers						
Application Programmers						
Call Centre Personnel						
Computer Engineers						
Computer Programmers						
Computer Systems Auditors						
Data Communications Consultant						
Data Entry Personnel						
Database Administrators						
Database Administrators						
Ecommerce Architects						
Ecommerce Programmers						
Ecommerce Project Managers						
ICT Helpdesk Personnel						
ICT Trainers						
Information Systems Managers						
Internet / Intranet Administrators						
Intranet Engineers						
LAN/WAN Administrators						
Multimedia Content Authors						
Multimedia Copywriters						
Multimedia Graphic Designers						
Multimedia Writers						
Network Administrators						

Network Designers						
Network Engineers						
Network Managers						
Network Support Staff						
Online Producers						
Project Managers						
Software Engineers						
Solutions Architects						
Systems Administration Analyst						
Systems Administrator						
Systems Analysts						
Systems Architects						
Systems Engineers						
Systems Programmers						
Telecommunications Management						
Web Administrators						
Web Architects						
Web Designers						
Web Programmers						
Other (Specify)						
Other (Specify)						
Other (Specify)						
Other (Specify)						
Other (Specify)						
Other (Specify)						

APPENDIX III: QUESTIONNAIRE FOR TRAINING INSTITUTIONS

Computer Society of Kenya
Kenya National ICT Workforce Survey 2006

Questionnaire for Training Institutions

This questionnaire has been designed to collect information from Information and Communications Technology (ICT) training institutions about their current and future training and educational programs. The purpose is to see whether there is necessity to better coordinate the requirements of employers and the ICT manpower produced by training institutions. All the information in this questionnaire will be treated in confidence.

SECTION I: PROFILE OF RESPONDENTS ***(To be completed by all respondents)***

1. Which of the following best describe the category to which your training institution belongs? (Tick as appropriate)

(a). Public University ☐
(b). Private University ☐
(c). Middle level Public College ☐
(e). Middle level Private College ☐
(f) Other (Specify) _____

2. Please indicate the indicative annual number of graduates your institution now and the 5 year projection

Academic qualifications							
PhD		Masters Degree		Bachelors Degree		Pre-diploma/Diploma/Higher Diploma	
Now	In 5 Years	Now	In 5 Years	Now	In 5 Years	Now	In 5 Years

3. Does your institution involve potential employers and other stakeholders in ICT Curriculum development? (Tick as appropriate)

(a). Yes (b). No

If the answer to Question 3 above is Yes, Briefly explain the role of potential employers in Curriculum development in your institution.

_____

_____

_____

4. Kindly fill in the following table indicating the number of your graduates annually who can fit into the various job designations (note: one person can fit into more than 1 job designation)

ICT Job Designation	PhD	M=Masters B=Bachelors D=Diploma	Bachelors	Diploma
Analyst/Programmers				
Application Programmers				
Call Centre Personnel				
Computer Engineers				
Computer Programmers				
Computer Systems Auditors				
Data Communications Consultant				
Data Entry Personnel				
Database Administrators				
Database Administrators				
Ecommerce Architects				
Ecommerce Programmers				
Ecommerce Project Managers				
ICT Helpdesk Personnel				
ICT Trainers				
Information Systems Managers				
Internet / Intranet Administrators				
Intranet Engineers				
LAN/WAN Administrators				
Multimedia Content				

Authors				
Multimedia Copywriters				
Multimedia Graphic Designers				
Multimedia Writers				
Network Administrators				
Network Designers				
Network Engineers				
Network Managers				
Network Support Staff				
Online Producers				
Project Managers				
Software Engineers				
Solutions Architects				
Systems Administration Analyst				
Systems Administrator				
Systems Analysts				
Systems Architects				
Systems Engineers				
Systems Programmers				
Telecommunications Management				
Web Administrators				
Web Architects				
Web Designers				
Web Programmers				
Other (Specify)				
Other (Specify)				
Other (Specify)				
Other (Specify)				
Other (Specify)				
Other (Specify)				