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Skills Needs of the ICT Sector in Tanzania

2013

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The origins of this report lie in the partnership which was established in 2007 between the Institute of Finance Management (IFM), Tanzania, and the Dublin Institute of Technology (DIT-Ireland), Ireland. IFM and DIT-Ireland have been involved in the joint delivery DIT-Ireland's BSc Computer Science in IFM, with DIT as the awarding body, and with the programme subject to the teaching, learning, assessment and quality assurance systems of DIT-Ireland.



1. EXECUTIVE SUMMARY

Information and Communication Technology will play a critical role in sustaining the high growth rates experienced by African economies in the last decade. Investment in the ICT sector enables the creation of high quality jobs and acts as an enabling technology for other key industries such as agriculture, finance, health and education. 'New Software Economy' models mean international location and company scale are less relevant and enable small organisations to compete globally in niche markets. Unlike many traditional industries which have heavy infrastructure requirements, the key resource of the ICT Sector is its people and the knowledge, skills and competencies they possess. Relatively small scale investments in developing the ICT skills of the workforce can pay rich dividends in economic returns.

The transformation of Ireland from a protectionist agri-economy in the 1970's to a present day global technology hub means the 'Irish Experience' is something which can be heavily drawn upon by emerging economies as they seek to develop their own ICT sectors. Tanzania has the advantage of having gone 'straight to mobile' and to new software economy models. It can become the software gateway to Swahili-speaking Africa, a major market of 140 million people. The massive expansion of the Tanzanian higher education system is providing a greenfield site for to produce high quality graduates with the right skillsets for the global ICT industry.

This Skills Needs research was based on similar international methodologies and was undertaken in July and August 2013 through the use of online surveys of ICT companies, interviews with key informants in industry, education and government and by analysing social media and jobs websites. As such it is not trends based and can at best provide a snapshot of the state of the Tanzanian ICT Sector at this point in time. The key findings indicate that there is a significant and vibrant ICT sector in Tanzania and it is estimated that it employs upwards of 12,000 people in over 80 companies. A third of these companies have been established in the last 5 years indicating a strong 'start-up' culture. Almost all organisations surveyed indicated that they had hired at least one new ICT practitioner in the last 2 years with one third of these stating that they hired more than 10. Almost all organisations indicated they would have further vacancies for ICT practitioners in the next 2 years with 40% indicating that they expected 10 or more vacancies to arise.

Like most countries however Tanzania is experiencing a shortage of ICT skills due to a mismatch between the needs of industry and the skills of ICT graduates. The single most important message from this report for education and training providers is that the *emphasis needs to shift from what students are expected to know to what they can do*. Such a partnership ensures that education and training programmes are designed and delivered in a way which meet the needs of the ICT sector.

2. PURPOSE OF THE SKILLS NEEDS REPORT

This report considers the workforce skills needed to develop an ICT industry and to ensure that ICT can be an enabler for other industries such as agriculture, agri-processing, health, banking and education. The aims of the report are as follows:

- 1.** To capture a snapshot of the specific ICT skills in use in the Tanzanian ICT sector and to broadly assess the relative supply/demand of these skills
- 2.** To identify what proactive actions can be taken to ensure that the supply of these skills is sufficient to meet the needs of the sector
- 3.** To assist Tanzanian education and training providers to provide programmes which meet these skills needs
- 4.** To inform national and regional development strategies
- 5.** To inform prospective ICT practitioners about the employment opportunities available to them in Tanzania and worldwide
- 6.** To give employers in the Tanzanian ICT sector a coherent picture of the skills needed across the sector

3. KEY FINDINGS AND RECOMMENDATIONS

Key findings in relation to the current state of the Tanzanian ICT sector, the supply and demand of ICT skills and the particular skills in demand are outlined in this section. Recommendations for government, education and training providers and industry are also outlined.

State of the Tanzanian ICT sector

Accurately estimating the size of a country's ICT sector is a difficult challenge. A feature of this research is the use of social networking websites for data acquisition (noting the limitations to this approach which are outlined in Section 8). By all accounts there is a significant and vibrant ICT sector in Tanzania. Estimates suggest that it employs upwards of 12,000 people in over 80 companies in both ICT practitioner and other roles. The majority of these companies indicated Tanzania as their primary location and a third of them were been established in the last 5 years. This suggests there is an emerging indigenous 'start-up' culture. Over 80% are companies can be described as small to medium sized IT companies operating in the sub-sectors of : Information Technology and Services, Computer Software, Computer Hardware, Computer and Network Security and E-Learning. Although Telecommunications companies comprised only 20% of companies they are generally larger employers and have been established for longer. Almost all organisations surveyed indicated that they had hired at least one new ICT practitioner in the last 2 years with one third of these stating that they hired more than 10. Almost all organisations indicated they would have further vacancies for ICT practitioners in the next 2 years with 40% indicating that they expected 10 or more vacancies to arise.

Supply and Demand for ICT Skills

Both the survey results and interviews indicated that there was some dissatisfaction with the availability of people with the ICT skills required to fill job vacancies, making it hard to find and retain skilled personnel with competent level of ICT for both private and public sector. This is a crucial consideration for finding and retaining the ICT educators and trainers who will pass on these skills to the wider population. Consequently skilled jobs are being outsourced to other countries, contributing to the high unemployment rate among Tanzanian people. There was agreement among interviewees from education institutions that their curriculum and delivery mechanisms need to be adjusted to meet the needs of the market. On the demand side, informants from industry highlighted the necessity of continuously updating the theory and practical parts in the educational institutions and the need for industry to co-operate closely with educational institutions. This can build upon the existing collaborations which exist. It is encouraging to see for example that two thirds of organisations surveyed host internships/work placements with some indicating that they were undertaking joint research/collaborative projects with higher education institutes.

Skills in Demand

12 disciplines were used to categorise the types of skills needed in the ICT industry, broken into two groups – technical skills and professional skills. The technical disciplines most in use in the organisations which responded to the survey were Networking & PC maintenance, Programming, Web Development, Customer Relationship Management systems and Platform Administration. Opensource technologies in particular were widely used. There is also some activity in the areas of Cloud Computing and Mobile Application development. The technical disciplines least in use were Digital Media and Computer Games however these two sectors may represent opportunities for development in the Tanzanian ICT sector particularly in the areas of content development and localisation into the Swahili language. High value was also placed on professional skills including the so-called ‘Soft Skills’, IT Management/Project Management and Call Centre / Contact centre skills

Recommendations

Tanzania is not alone in the challenges it faces in this area and it can learn from the experience of countries such as Ireland who have undergone a transformation from a protectionist agri-economy in to a global technology hub. The single most important message from this report for education and training providers is that the *emphasis needs to shift from what students are expected to know to what they can do* when they leave college. It is only possible to develop these practical skills and competencies with substantial and ongoing engagement between education providers and industry. Such a partnership ensures that education and training programmes are designed and delivered in a way which meet the needs of the ICT sector.

There is an window of opportunity to select a small number of niche sectors in which Tanzanian ICT companies can develop global competence and in which an an ‘Innovation Infrastructure’ can be established which will support indigenous start-up companies in these areas. Coupled with the greenfield site of the expansion of Tanzanian Higher Education system, it provides a golden opportunity to consider the mission of higher education institutes as the “Engines of Growth” in their regions, with an explicit role in supporting indigenous companies through teaching, research and technology transfer activities.

At national level consideration should be given to investing in a ‘Train the Trainer’ initiative whereby a cadre of Tanzanian ICT educators are trained at the highest international standards, not just in a particular technology or research area, but in the design and delivery of industry-oriented practical programmes which meet the needs of the ICT sector. Such educators would be an invaluable resource who could advise ICT departments in higher education colleges in curriculum development. Recruitment practices in third level level colleges should also consider hiring sufficient numbers of staff with experience of working in industry to inform their work.

4. BACKGROUND

This report is being delivered at a time of cautious economic optimism following years of uncertainty in the global economy. Within Europe there are signs of nascent growth with national economies seeking to return to higher levels of competitiveness, while still contending with high levels of unemployment, especially amongst the youth. Emerging economies in Africa are focusing on innovation as a means of sustaining the high economic growth rates they have experienced in the past decade. Increased stability means that in some parts of the continent there is a reversing of the Diaspora as wealth is being created and being distributed across society. By 2030 around 10% of the African population is expected to be in the middle class (earning \$6-\$30k¹. An internet and mobile communications revolution has transformed the everyday lives of many on the continent. Foreign direct investment (FDI) in Africa continues to grow at rates of more than 20% per annum. When viewed as a single entity, the East African Union has a market of 150 million people, an annual GDP of \$100 billion and an annual growth rate of 6%, placing East Africa in the 'next 11 countries' after the BRIC (Brazil, Russia, India and China) for economic development². Tanzania is forecast to be one of Top 10 fastest growing economies in the world over the next 5 years³. It's well-educated labour force and political stability ensures its attractiveness for investors. Since 2003 for example Tanzania has attracted 128 new FDI projects (2.5% of Africa's total FDI projects) which demonstrates both its capacity to attract FDI and the scale of the opportunity that still exists. Moreover there has been a significant diversification of FDI projects from traditional areas into manufacturing and business services. Over the period 2003-2011, Tanzania has attracted US\$13.2 billion of FDI with telecommunications and alternative/renewable energy attracting substantial interest.

The main barriers which have been identified to investment in Africa include (i) international perceptions of instability and risk, although foreign investors already doing business in Africa provide an overwhelmingly positive endorsement of their experiences (ii) the need to accelerate regional integration, particularly through initiatives such as the East African Union and (iii) the need to address the infrastructure deficit in key areas such as transport, power and communications³. It is arguable that investment in ICT can have a transformative effect on addressing these challenges.

¹ Bilbao-Osorio, B.; S Dutta, S, and Lanvin, B.; The Global Information Technology Report 2013

² Fortnightly Thoughts. March 2012. Goldman Sachs International. www.goldmansachs.com.

³ EY and Young's Attractiveness Survey Africa 2013. Getting Down to Business. (www.ey.com)

4.1 WORLDWIDE CONTEXT FOR ICT

When compared to traditional sectors such as agriculture, manufacturing or mining, the ICT sector has several defining characteristics. First and foremost the key resource of the ICT Sector is people and the knowledge, skills and competencies they possess. “Heavy” infrastructure requirements such as machinery, transport, buildings and other physical infrastructure are generally low. The term ‘*new software economies*’ refers to the transformation of the software industry from being a niche market segment to a dominant sector of the global economy. In the past ten years the explosion of the internet, coupled with the proliferation of computer, laptop and mobile devices has greatly increased the global demand for software. The rapid pace of technological progress means individual expectations are evolving and recent technological trends point to an app-centric world where demands of scalability and flexibility are paramount. New software economy models mean that international location and company scale are less relevant and that small organisations can compete globally in niche markets such as Cloud Computing & Mobile application development, Software as a Service, Software on Demand and Web 2.0. ICT companies generate many more jobs in sales, marketing, finance, support and localisation.

In order to remain competitive and retain market share developed economies seek to reinvent themselves through innovation and investment. Emerging economies also seek to find ways of increasing productivity and fostering economic growth through investment in new technologies. The link between a highly developed ICT sector and the competitiveness, growth and level of job creation in an economy has never been so clearly marked. Academic literature also highlights the high benefit-cost ratios of ICT in all sectors of production and their ability to more efficiently organise the use of natural, financial and human resources. Analysis by a recent World Economic Forum report revealed a direct correlation between investing in ICT and GDP growth - an increase of 10% in ‘digitisation’ brings about a 75% increase in GDP and a 1% drop in unemployment rates⁴. In 2011 for example it is estimated that digitisation boosted world economic output by nearly US\$200 billion and created 6 million jobs in the process.⁵

In 2013 it is estimated that close to 2.8 billion people have access to the internet whereas five years ago that figure stood at 1.8 billion (a 55% increase in global usage). The vast majority of this increase has come from the developing world where usage has almost doubled since 2009 from 974 million to 1.7 billion. Mobile technologies in particular are becoming ubiquitous with 5.2 billion mobile-cellular subscriptions in the developing world alone (76% of the global market share). Many countries in the developing world have the advantage of being ahead of the curve with regard to mobile broadband technologies. As it stands over 50% of the world’s population is covered by a 3G network⁶.

⁴ *ibid*

⁵ Bilbao-Osorio, B.; S Dutta, S, and Lanvin, B.; The Global Information Technology Report 2013

⁶ Measuring Information Society 2013, International Telecommunications Union <http://www.itu.int>

4.2 IRELAND: A GLOBAL ICT HUB

Tanzania is not alone in the challenges it faces in this area. The Republic of Ireland provides a useful case study which outlines the development of an ICT sector in a country which started with a low technology base. Ireland, and its capital city Dublin in particular, is internationally recognised as a global hub for the Information and Communications Technology industry. In 2013 Ireland is the European gateway for over 240 ICT multinationals and is also home to over 500 indigenous ICT companies. There are 75,000 people employed in the sector which represents 4% of total Irish workforce⁷. The sector attracted €25 billion of Foreign Direct Investment in 2012. Ireland has been in the Top 5 of software exporters in the world for the past decade.

A key factor in Ireland's success is its sustained investment in education and training to produce graduates with industry-oriented, practical skills aligned to its priority high technology sectors. In 2013 Ireland has one of the highest educational participation rates in the world whilst public spending on higher education remains below the European average. Over 85% of 25-34 year olds complete second level education whilst over 60% enter higher education⁸. Ireland also has the highest graduates per 1,000 inhabitants in the European Union and has been cited by standardised recruiter review as the country with "most employable graduates"⁹. The same report noted that Ireland, along with Japan, Sweden, the UK, and the Netherlands were *"the countries to be found always at the production possibility frontier"* with a graduation output *"which is not only high in number but also the best in perceived quality"*

The transformation of Ireland from a protectionist agri-economy in the 1970's to a present day global technology hub means the 'Irish Experience' is something which can be heavily drawn upon by emerging economies as they seek to develop their own ICT sectors. During the period 1970-1990, although it attracted significant foreign direct investment, Ireland's ICT sector was essentially a 'production platform' for American and other multinationals who used the island as a base to supply the European market with computers, electronics, medical devices and other manufacturing goods. The indigenous industry base in the technology sector was generally weak. In the early 1990's government policy changed to emphasise two major objectives (i) to move up the value chain to high-technology FDI and (ii) to grow high-technology indigenous industry.

⁷ Enterprise Ireland. <http://www.enterprise-ireland.ie>

⁸ Education at a Glance 2013: OECD indicators, <http://www.oecd.org>

⁹ Aubyn et al, 2009, *Study on the efficiency and effectiveness of public spending on tertiary Education*, pg. 30 <http://ec.europa.eu>

1960-1970	1970-1980	1980-1990	1990-2000	2000-2007	2008-2013
<ul style="list-style-type: none"> • From Protectionist to Open Economy • Agricultural base 	<ul style="list-style-type: none"> • Low-cost manufacturing base for FDI • Weak indigenous industry base 	<ul style="list-style-type: none"> • Low technology "Production Platform" for FDI • Weak indigenous industry base 	<ul style="list-style-type: none"> • High technology FDI • Strategy to grow indigenous technology industry 	<ul style="list-style-type: none"> • High growth Celtic Tiger • High Technology FDI • Growth in indigenous industry 	<ul style="list-style-type: none"> • Economic Crash • Sustained/ Increasing FDI • Export led recovery from indigenous firms

FIGURE 4.1 IRELAND'S DEVELOPMENT TRAJECTORY FROM AN AGRICULTURAL ECONOMY TO A GLOBAL HUB FOR ICT

Lessons learned from the Irish experience may help Tanzanian policy makers in their endeavors. Factors which contributed to Ireland's success include its decision to focus on a small set of strategic high technology sectors where Ireland could compete internationally (ICT, Pharmaceuticals, Medical Devices, Food, Financial Services). Policy and investment decisions were aligned to support these sectors and enacted through government departments, investment agencies and through education, research and development strategies. Throughout the decades Ireland has maintained a low corporation tax (12.5%) which was the 4th most competitive in the world in 2012. Conscious decisions were made to balance the pursuit of FDI with supporting indigenous organisations.



FIGURE 4.2 "BEST CONNECTED" - IRELAND'S STRATEGY FOR THE DEVELOPMENT OF ITS 'NEW SOFTWARE ECONOMY'. [HTTP://WWW.ENTERPRISE-IRELAND.COM](http://www.enterprise-ireland.com)

Policy decisions were supported by investments in further and higher education, in research funding and in an 'innovation infrastructure' which involved all actors (government, employers and education). Third level colleges are seen as the "Engine of Growth" in their region and play a key role in supporting local industry through teaching, research and technology transfer activities. Colleges engage with a wide range of stakeholders including local enterprise boards, regional development agencies, other higher education institutions, Incubation Centres and government agencies.

The 'spin-out effect' from FDI coupled with the major changes in policy direction in the early 1980's have yielded rich dividends for the country which has ensured that despite the economic crash in 2008, FDI has increased significantly and exports remain strong. While Ireland has tackled many of the challenges associated with the development of its ICT sector, and can share the lessons it has learned, some challenges still remain. Despite the strength of Irish education system and the ICT sector there is a persistent skills shortage of technology graduates, a trend which is reflected internationally.

4.3 AN EMERGING ICT HUB IN TANZANIA?

Although it can be considered to be at the 'acquisition' stage of technology development, Tanzania has all the advantages of a 'late adopter'. It has effectively gone 'straight to mobile' and to the 'new software economy models'. This gives it tremendous flexibility and many advantages over countries that invested in wired and fixed technology infrastructures. It has the opportunity to strategically select niche areas from which to develop clusters of competence which make sense in a Tanzanian and East African context. It can be a software gateway to Swahili-speaking Africa, a major emerging market of 140 million people. The massive expansion of the Tanzanian higher education system is providing a greenfield site for to produce high quality graduates with the right skillsets for the global ICT industry. Tanzania has the potential to tap into new markets which have not been reached by the global ICT industry yet due to geographical, cultural, demographics, language or other factors. With an appropriate investment in an innovation infrastructure, small start-up companies can compete globally to respond quickly to disruptive technologies and Tanzania can leverage its connectivity and its Diaspora to become the start-up hub of East Africa. Its membership of East Africa Community and other regional trade bodies such as the Southern African Development Coordination Conference (SADCC) will provide the regional integration that has been cited as a challenge for African development. Key enabling infrastructure such as the national fibre backbone and CESAT cable provide a foundation upon which to build an ICT hub in East Africa.

4.4 ICT AS AN ENABLER

ICT is an enabler for other sectors of the economy, allowing other industries to maximise efficiency and harness their full economic potential. Whilst investment in the ICT sector will create high end jobs for ICT practitioners it will also benefit ICT users in other industries who can apply new technologies and skill sets in support of their own activities. The development of a strong ICT industry can have an immediate knock-on effect for other important industries such as agriculture, finance, health and education.

Agriculture

Agriculture plays a pivotal role in many developing economies. On the African continent agriculture employs up to 65% of the labour force and accounts for 32% of GDP¹⁰. ICT therefore has the potential to increase productivity by sharing knowledge and information with rural agricultural communities, allowing increased access to credit and the scaling up of inter-linkages in development operations. On a small scale level ICT applications such as market information systems, radio frequency identification technology (RFID), precision agriculture and geographic information systems (GIS) can be used to more efficiently run both small and large scale farms. This allows for better data collection and monitoring and evaluation. Many food development operations are now using mobile phones and tablets to run new apps such as iformbuilder, cropster and episurveyor.¹¹

Finance

Key innovations in mobile technology, data storage, security and analytics can act as enablers to emerging financial services sectors. ICT plays a pivotal role in integrating these emerging economies into the global financial markets, allowing individuals and businesses access to credit. In Africa branchless banking services, like mobile financial services, are becoming increasingly popular. In Kenya the number of bank account holders has quadrupled in the space of four years through the success of companies such as M-Pesa. M-Pesa is at the forefront of mobile banking in East Africa and has 17 million mobile banking subscribers in Kenya alone. M-Pesa a branchless banking service allows its customers to withdraw, deposit and transfer money using only a mobile phone. In Kenya monthly transactions using the service exceed \$375 million¹²

Health

ICT presents an opportunity for the transformation of health sectors across the developing world with the potential to save countless lives. The challenges faced are often complex as resource strained systems do not properly allocate services or adequately communicate vital information to the public. The supply of adequate drugs and equipment is also a problem facing many health systems. In this regard ICT can be used to improve human resources, improve supply chain management

¹⁰ <http://data.worldbank.org/>

¹¹ Guardian, "How ICT tools are improving efficiency of agricultural development", 24 January 2013,

<http://www.theguardian.com>

¹² <http://data.worldbank.org/>

and more effectively communicate health information to the public. E-learning & Telemedicine programmes can be used for training purposes, the dissemination of information, and to generally improve practice. Electronic Health Information Systems (HIS) such as the BEANISH network in Southern Africa have been set up to strengthen cooperation, learning and innovation in the health sector. Likewise video-conferencing between health professionals using programmes such as Skype can also help improve practice and in emergency cases potentially save lives. ICT can also crucially act as means of collating data from the public and effectively communicating information about harmful and curable diseases.

Education

Education forms the cornerstone of all socio-economic development and is a key enabler of innovation in science and technology. ICT can greatly improve the quality of education delivered whilst also ensuring individuals have greater access to these improved forms of education. On the ground ICT can help in the improvement of teaching methods using digital learning resources and open education resources (OER).¹³ The digitisation of information means content can be easily shared and is more readily available than ever before. Physical boundaries no longer serve to hamper the pursuit of education resulting in a rapid increase in long distance learning transforming the processes of both learning and teaching globally. The proliferation of mobile devices in the developing world means that more and more individuals can access digital information. The development of educational applications in maths and other subjects to cater for these devices have already been rolled out in many developing countries. New ICT technologies can empower the individual to learn new skills and adequately prepare them for an increasingly globalised and knowledge based world.

¹³ *ibid*

5. ADDRESSING ICT SKILLS NEEDS

As new technologies become more readily available citizens within developed and emerging economies are being granted increased access to the digital world. This transformation has seen the development of new skill needs which have become crucial for employment in increasingly knowledge-based global societies. In tandem with the growth of ICT there has been an increased demand for ICT practitioners to fill these roles. For example the European Union estimates by 2015 there will be 900,000 job vacancies in that region alone¹⁴. The skills shortages in ICT must be viewed not just in terms of the vacancies which currently exist but also in terms of its impact on potential economic growth. Countries that can ensure a continuous supply of good quality graduates capable of fulfilling ICT practitioner roles have significant competitive advantage.

5.1 DEFINING ICT SKILLS

It is important at the outset to clarify what is meant by ICT skills. The ICT sector is not as well understood by the general public as some of the older professions. For example, the different skills of specialist consultants, doctors and nurses, are more visible and therefore more readily understood. The European Union has developed a framework which distinguishes several levels of ICT Skills and two of these definitions are used in this research. This report focuses exclusively on the first category (ICT practitioners).

Term	Definition	Example Roles
ICT Practitioner	ICT practitioners have ICT as the focus of their work. They develop, maintain, support or sell ICT systems. These roles can either be in ICT organisations which develop hardware and software, or in organisations which use these products	Software developers Programmers Web designers Instructional designers Network administrators
ICT User	ICT users apply ICT in support of their own work, using common or specialised software tools that support business functions	Managers Call centre operatives Office administrators Accountants Educators

TABLE 5.1 CATEGORIES OF ICT PRACTITIONER SKILLS¹⁵

These skills are complex and evolving and above all ICT practitioners need to know 'how to learn' and engage in continuous professional development to stay abreast of technological changes. It is also possible to distinguish between various levels of ICT

¹⁴ Grand Coalition for Digital Jobs. Digital Agenda for Europe. A Europe 2020 Initiative. <http://Ec.europa.eu>.

practitioner skills. Entry level jobs are those that require a set of usable ICT practitioner skills but where the employee works under supervision or in a highly structured environment (e.g. software testing adhering to test plans, setup of equipment according to checklists etc.). Competent level jobs are jobs that require skills where the employee works independently on individual tasks or as a team member on more complex problems (e.g. software development, trouble shooting etc.). Expert level jobs require advanced ICT practitioner skills where the employee works as a technology expert or lead teams / projects (e.g. systems architect, lead designer etc.).

To comprehensively address the skills needs of a country's ICT sector a partnership approach between government, the ICT industry, education and training providers and ICT practitioners is required. Government plays a key role in providing the policy context and resource investments to enable an ICT industry to thrive. Education and training providers must engage with industry to better understand its needs and industry must support their endeavors in meaningful ways. A sufficient number of individuals must opt for a career as ICT practitioners continuously investing in their own professional development.

In the Irish context analyses of the skills needs of the workforce are regularly undertaken by national agencies. A report on addressing Ireland's skills needs for ICT identified three challenges which were (i) providing a sufficient quantity of skills (ii) providing skills of sufficient quality and (iii) providing a sufficient diversity of skills to reflect the complexity and diversity of ICT sector. Though its recommendations were made for the Irish context, they may have applicability in the Tanzanian context:-

- Ensuring third-level courses reflect the skills mix/diversity of the ICT industry
- Adopting proactive labour market strategies
- Improving progression from third-level programmes into employment in the ICT sector
- Supporting the educational capacity underpinning ICT education and training
- A strategic approach towards communicating career opportunities and skill needs
- Broadening the base of recruits for high-level ICT courses and improving the quality and quantity of intake at undergraduate level

A well developed Framework of Qualifications, such as the Irish NFQ or Tanzanian Qualifications Framework, brings both clarity and quality assurance to the various sectors of the education and training system. It is critical however that the principles of such qualifications framework are implemented *'on the ground'* in education and training programme design. The single most important message from this report for education and training providers is that **the emphasis needs to shift from what students are expected to know to what they can do**. It is only possible to develop these practical skills and competencies with substantial and ongoing engagement between education providers and industry to design and deliver education and training programmes which meet the needs of the ICT sector.

5.2 SKILLS INITIATIVES

In the Irish context the shortage of ICT graduates has meant that government, education providers and the ICT industry have come together to devise collaborative strategies and action plans to eradicate the shortfall. This has led to targeted joint initiatives aimed at up-skilling and re-skilling the workforce in ICT. Some of these initiatives are outline here.

Graduate Conversion Programme

The Graduate Conversion programmes is a joint government-industry initiative aimed a boosting the domestic supply of ICT graduates in Ireland. As the name suggests, graduates of non-ICT disciplines undertake an intensive 18 month programme of study and work experience in Computer Science.

Springboard

Launched in 2011 by the Irish government Springboard is a sstrategic initiative that provides part-time higher education courses to help unemployed people to up-skill or re-skill in areas where there are identified labour market skills shortages or employment opportunities.

Digital Skills Academy

Founded in 2008 the Digital Skills Academy is a training organisation based in Dublin's digital hub that provides training in computing and digital media to people seeking to up-skill or re-skill in ICT. 'WebActivate' for example is an online digital marketing and entrepreneurship programme that aims to equip participants to be self-employed web publishers and digital marketers. 'WebElevate' focuses on training graduates to develop applications and services for mobile devices including eCommerce services, web video products and social media marketing¹⁶.

DIT-Ireland and IFM Tanzania

An example of an international collaboration in addressing skills needs is the DIT-Ireland and IFM Tanzania collaboration which was established in 2007. IFM and DIT-Ireland have been involved in the joint delivery DIT-Ireland's BSc Computer Science in IFM, with DIT as the awarding body, and with the programme subject to the teaching, learning, assessment and quality assurance systems of DIT-Ireland.

- 39 students have graduated from the BSc Honours in Computer Science with a further 54 graduates anticipated by 2016/17.
- 2 IFM staff members have graduated with a DIT-Ireland PhD with a further 3 graduates expected by October 2014.
- 10 IFM staff members have graduated with DIT-Ireland's Masters in Computing degree and 10 staff from DIT-Ireland have visited IFM to assist with teaching, quality assurance and capacity development.

¹⁶ <http://www.digitalskillsacademy.com>

5.3 A PARTNERSHIP APPROACH TO DEVELOPING INDUSTRY-ORIENTED SKILLS

Effective engagement between education and training providers with industry stakeholders is a critical part of the solution to addressing ICT skills needs.



FIGURE 5.1 A PARTNERSHIP APPROACH TO DEVELOPING ICT SKILLS
BETWEEN EDUCATION AND INDUSTRY

Practical mechanisms for engaging industry during the design and delivery of education and training programmes are outlined here. Work placements enable a student to gain real world experience during their studies. A significant amount of project work, as a capstone learning experience, is an opportunity to involve industry in developing the project ideas and assisting with its supervision. Student projects can be demonstrated to industry at an annual Projects Fair. Industry sponsors of prizes give students recognition for the standard of their work. Students can be encouraged to submit their project work to international and national competitions such as the Microsoft Imagine Cup and others. Colleges can design pre-incubation programmes for the crucial period after a student finishes his/her study and before entering the workforce. Within the curriculum modules can be designed to give students the option to obtain industry certification in addition to their academic credits. Industry can deliver guest lectures to communicate the realities of commercial ICT to students. Recruiting higher education staff with substantial industry experience is an important consideration. Education and training providers can assist industry in their Graduate Recruitment programmes and provide career guidance, CV and interview training for their students. Industry can be engaged as external examiners which is an invaluable input into ensuring that programmes remain relevant.

6. RESEARCH METHODOLOGY

It is important this skills needs report reflects the complexity and evolving nature of the ICT industry In Tanzania and provides a picture at a sufficient level of granularity of the skills needed to be useful to industry and to education and training providers. The research methodology used was based primarily on three similar reports which analysed the skill needs of the Irish labour market¹⁷. The methodology included five main components (i) literature review (ii) a survey of 25 organisations with strong activity in ICT (iii) interviews with 13 key players in the Tanzanian ICT sector (iv) analysis of vacancies on jobs websites and (v) analysis of the social media website LinkedIn. Data was collected during the period July 2013 and August 2013. The use of both qualitative and quantitative research methods allowed for triangulation of data and strengthened the findings. In this instance the use of face to face interviews augmented the quantitative data collected in the surveys.

7. SURVEY RESULTS

The survey was undertaken during July 2013 with a total of 25 organisations who are based in Tanzania who have a substantial ICT component to their operations. Organisations were purposefully selected to ensure a broad representation of (i) organisations whose primary industry was the ICT sector (including Information Technology and Services and/or Telecommunications) and (ii) organisations with a substantial ICT support function for their primary business. Respondents therefore included (i) Tanzanian-owned SMEs whose primary sector is ICT (ii) Tanzanian public sector organisations (iii) Large international ICT companies with bases in Tanzania (iv) Large international financial companies with bases in Tanzania (v) Non-governmental organisations.

The majority of respondents completed the survey online during the months of July and August 2013. The survey design was based on a similar skills audit recently undertaken in Ireland¹⁸. One individual respondent per organisation was identified either through (i) the industry contacts of IFM, DIT (Ireland) and the Embassy of Ireland in Tanzania and (ii) through the social networking site LinkedIn. Respondents were sent an email requesting their help in completing the survey with one follow-up reminder or were contacted though the InMail function in LinkedIn. Respondents were asked to fill in background information about their organisation and then to map the main skills which were either (i) currently in use in their organisation or (ii) which they planned to use within the next 12 months. The questionnaire listed 114 specific skills categorised into 12 disciplines. Respondents could also specify additional skills in use in their organisation which were not listed on the questionnaire. A total of n=25 respondents completed the questionnaire.

¹⁷ FIT ICT Skills Audit 2012

EGSFN: Future Requirement for High-level ICT Skills in the ICT Sector 2008

FORFAS Vacancy Overview 2011

¹⁸ <http://www.fit.ie/index.php?page=ict-skills-audit>

7.1 ORGANISATION PROFILES

The organisations surveyed represent a broad cross-section of the Tanzanian ICT sector. They were generally either companies involved in the development, support or maintenance of ICT products and services (e.g. organisations who indicated their primary sector was computer software, hardware or mobile communications) or organisations that had a significant ICT function supporting their primary business function (e.g. Banking, government, education¹⁹ or NGOs). 56% of organisations were Tanzanian-owned and 44% were internationally-owned (non-African). While no two organisations surveyed were identical, the dominant profiles which emerged from respondents were as follows:

- 28% of respondents could be categorised as *'Tanzanian-owned SMEs whose primary sector is ICT'*, operating in the industry sub-sectors of computer hardware, software and/or training. These companies generally had less than 50 employees, the majority of whom are ICT Practitioners.
- 28% of respondents could be categorized as *'Tanzanian public sector organisations'* that have significant ICT support functions. They are large employers (over 250 employees) and less than 10% of employees are ICT Practitioners.
- 18% of respondents could be categorized as *'Large international ICT companies with bases in Tanzania'*, mainly operating in the telecommunications sector. They generally have more than 50 employees, the majority of whom are ICT Practitioners.
- 18% of respondents could be categorised as *'Large international financial companies'* who have significant ICT support functions. They are large employers in Tanzania (over 50 employees) and less than 10% of employees are ICT Practitioners.
- 8% of respondents were *non-governmental organisations*.

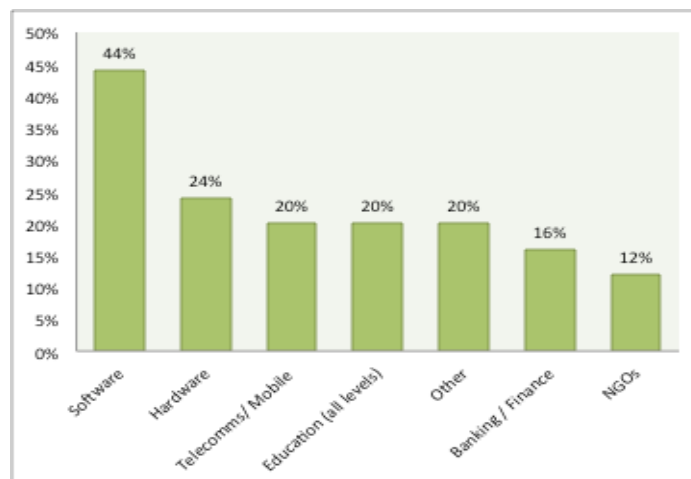


FIGURE 7.1 ORGANISATION PROFILES - PRIMARY SECTOR OF OPERATION

¹⁹ In order to ensure comparability of results respondents from the Education sector were restricted to those involved in ICT support functions only (The survey did not include academics involved in ICT programme development).

Primary Sector of Operation

Approximately two thirds of respondents indicated that their primary sector of operation was the ICT sector (software, hardware and/or telecommunications) (Figure 7.1).

Hiring of ICT practitioners

92% of respondents indicated that, in the last 2 years, their organisation had hired at least one new ICT practitioner. 40% of organisations indicated that they had hired 10 or more ICT practitioners. Furthermore 88% of respondents anticipated that they would have vacancies for ICT practitioners in the next 2 years, with 44% indicating that their organisation anticipated 10 or more vacancies.

Satisfaction with the availability of applicants from Tanzania

48% of respondents stated that they were satisfied with the availability of applicants from Tanzania with the ICT skills required to fill the vacancies in their organisations. 26% indicated that they were dissatisfied with 26% expressing a neutral opinion.

Collaboration between Industry and Tanzanian Higher Education Institutions

Respondents were asked to indicate the types of collaboration their organisation have with Tanzanian higher education institutions (HEIs) (Figure 7.2). The majority of respondents indicated that they were employers of graduates from Tanzanian Higher Education Institutes (72%) with a further 64% stating that they hosted internships/work placements. A significant percentage of respondents (36%) indicated that staff in their organisation were undertaking further training/qualifications on a part-time basis. 16% of respondents indicated that they were undertaking joint research/collaborative projects with HEIs and 16% indicated that they sponsored prizes/scholarships for HEIs.

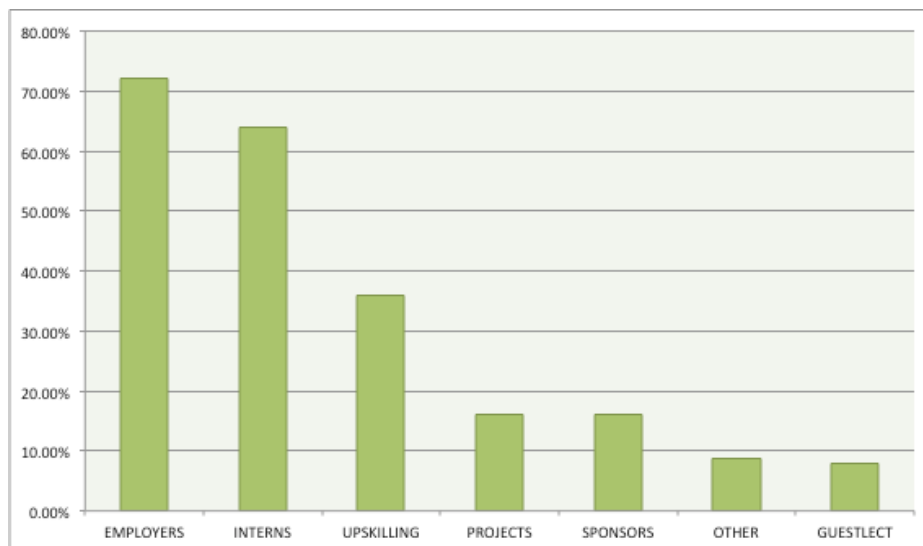


FIGURE 7.2 INDUSTRY-EDUCATION LINKAGES

7.2 SKILLS CURRENTLY IN USE IN THE TANZANIAN ICT SECTOR

Respondents completed a detailed ICT skills audit for their company. A broad spectrum of ICT skills was broken down into 12 disciplines to provide a structure for the analysis. Each discipline listed some of the most common skills and/or technologies in use internationally (e.g. the Discipline 'Web Development' listed skills such as PHP, Javascript, XHTML, CSS, etc.). There was a small amount of repetition when a skill was relevant to more than one disciplines (e.g. Linux administration was relevant to Networking & PC Maintenance, Platform Administration and others). Respondents were asked to specify whether a skill was (i) currently in use (ii) not in use or (iii) whether their organisation was planning to use it within the next 12 months. The analysis that follows presents the skills in use, but also those which are not used, which is useful information also.

The 12 disciplines can be roughly categorised in two groups – technical skills and professional skills. The technical disciplines most in use in the organisations which responded to the survey are outlined in Figure 7.3. Networking & PC maintenance is used by 84% of organisations, followed by Programming (76%), Web Development (72%), Customer Relationship Management systems (60%) and Platform Administration (52%). The technical disciplines least in use were Digital Media (20%) and Computer Games (12%). These two sectors may represent opportunities for development in the Tanzanian ICT sector particularly in areas of localisation into the Swahili language. The professional skills most in use were as follows (Figure 6.3): 'Soft Skills' such as communications and team working (76%), IT Management /Project Management (68%) and Call Centre / Contact centre skills (56%).

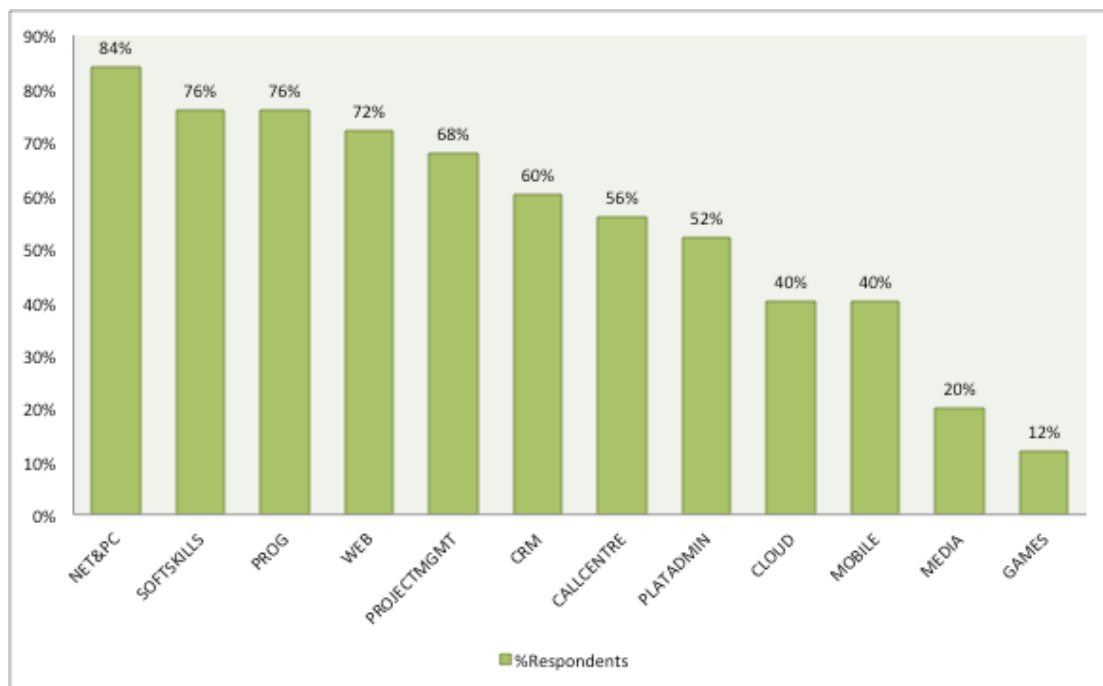


FIGURE 7.3 PERCENTAGE OF RESPONDENTS USING THE ICT SKILLS DISCIPLINES

Discipline 1 Networking & PC Maintenance

Computer networks support applications such as access to the World Wide Web, shared use of application and storage servers, printers and use of email and social media applications. 84% of respondents indicated networking and PC Maintenance skills were used in their organisation. Current uses cited included: computer hardware maintenance and repair; software maintenance and repair; network maintenance and extension; connecting branch PCs to the data centre servers; file sharing, printing and storage; internal communications; intranet; bandwidth management and external internet connectivity.

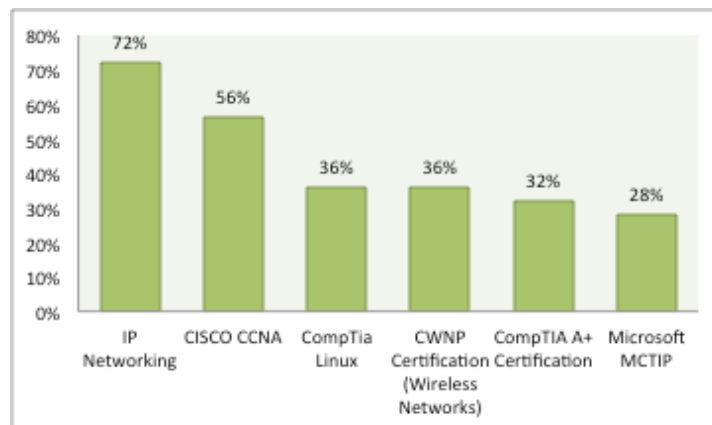


FIGURE 7.4 NETWORKING & PC MAINTENANCE – SKILLS / TECHNOLOGIES

The Networking and PC Maintenance skills which are most in use (Figure 7.4) are:-

- IP Networking 72%
- CISCO CCNA 56%
- CompTia Linux 36%
- CWNP Certification (Wireless Networks) 36%
- CompTIA A+ Certification 32%
- Microsoft MCITP 28%

Discipline 2 Programming

76% of respondents indicated that they used Programming in their organisation. Current uses of programming cited by respondents include: application development for external and internal clients; website development; managing networks and servers; security and forensics; web services; content management; knowledge management; business intelligence; mobile application development; mobile banking; GIS and business process management.

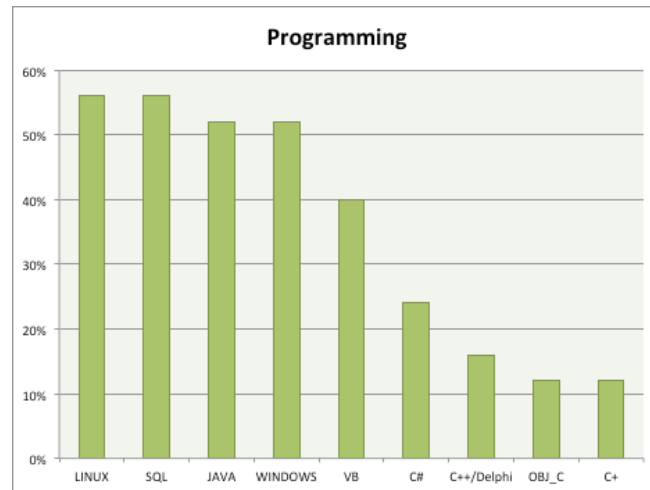


FIGURE 7.5 PROGRAMMING – SKILLS / TECHNOLOGIES

The Programming skills which are most in use (Figure 7.5) are:-

- Linux administration (56%)
- SQL Server Databases (56%)
- Java Programming (52%)
- Windows 2000/NT, XP/2000/98 (52%)
- Visual Basic 40%
- Other programming skills uses include C Sharp (24%), C++ and Delphi (16%) and Objective C (12%).

Discipline 3 Web Development / Web Technologies

72% of respondents indicated that they used web development / web technologies in their organisation. Current uses cited by respondents include: website development; content management; development of front-end user interfaces; development of web services and web-based applications; intranet portals; internal blogs and intranet sites.

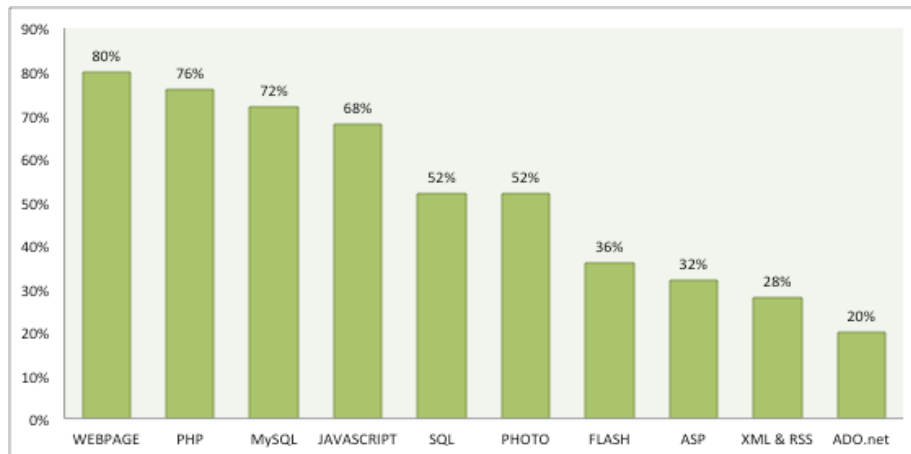


FIGURE 7.6 WEB DEVELOPMENT / WEB TECHNOLOGIES

The Web Development/Web Technology skills which are most in use (Figure 7.6) are:-

- Web page development (HTML/XHTML, Javascript and CSS) 80%
- PHP 76%
- My SQL 72%
- Javascript 68%
- SQL 52%
- Photoshop 52%

Discipline 4 Customer Relationship Management Systems

Wikipedia defines Customer Relationship Management Systems (CRM) as:

A model for managing a company's interactions with current and future customers. It involves using technology to organize, automate, and synchronize sales, marketing, customer service and technical support

60% of respondents indicated that they used CRM systems in their organisation. Current uses cited by respondents included supporting primary banking operations, an offender management system and supporting an electronic voucher system.

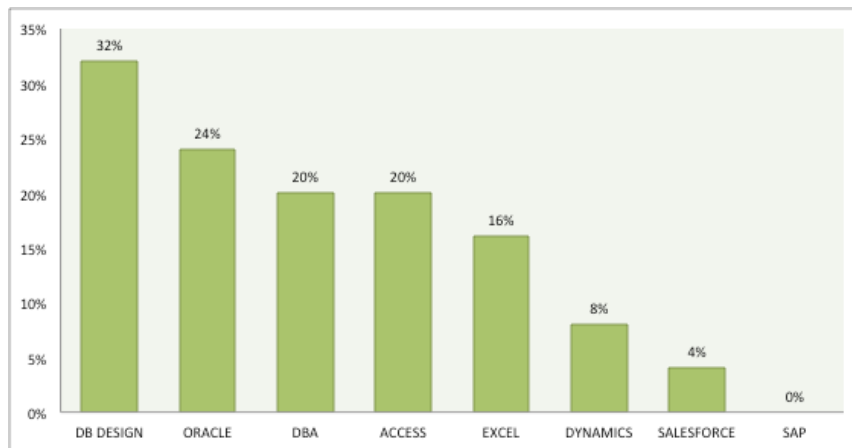


FIGURE 7.7 WEB DEVELOPMENT / WEB TECHNOLOGIES

The CRM system skills which are currently most in use include (Figure 7.7):-

- Database Design (32%)
- Oracle (24%)
- Database Administration (20%)
- Microsoft Access (20%)
- Excel (16%)

Discipline 5 Platform Administration

Wikipedia defines Platform Administration as:

'A computing platform includes a hardware architecture and a software framework (including application frameworks), where the combination allows software to run. Typical platforms include a computer architecture, operating system and Runtime libraries'

52% of respondents indicated that they used platform administration in their organisation. Current uses cited by respondents included server management and network administration, systems administration, managing user accounts, emails and communications.

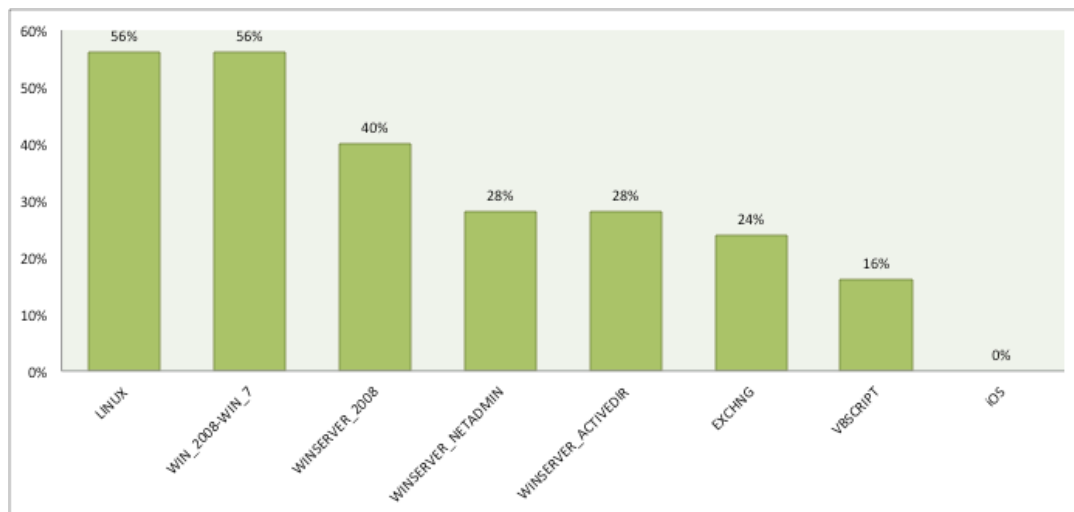


FIGURE 7.8 PLATFORM ADMINISTRATION

The platform administration skills which are currently most in use include (Figure 7.8):-

- Linux (56%)
- Windows Systems Administration (Windows 2008- Windows 7) (56%)
- Windows Server 2008 Administrator (40%)
- Windows Server 2008 Network Infrastructure (28%).
- Windows Server 2008 Active Directory (28%)

Discipline 6 Cloud Computing / Virtualisation

Wikipedia defines Cloud Computing as:

'a colloquial expression used to describe a variety of different types of computing concepts that involve a large number of computers connected through a real-time communication network (typically the Internet). The phrase is also, more commonly used to refer to network-based services which appear to be provided by real server hardware, which in fact are served up by virtual hardware, simulated by software running on one or more real machines. Such virtual servers do not physically exist and can therefore be moved around and scaled up (or down) on the fly without affecting the end user - arguably, rather like a cloud'

40% of respondents indicated that they used cloud computing in their organisation. Current uses cited by respondents included virtualisation technologies, server management, e-voucher systems and data centre management.

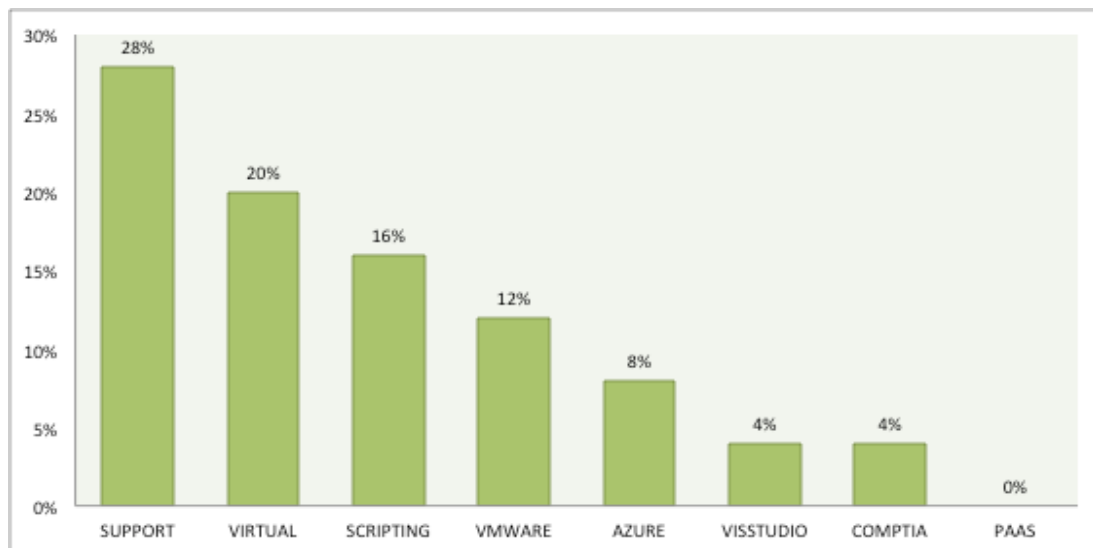


FIGURE 7.9 CLOUD COMPUTING

The cloud computing skills which are currently most in use include (Figure 7.9):-

- Support Engineers (for Redhat, Ubuntu and Debian) (28%)
- Virtualisation Technologies (21%)
- Scripting languages (Shell/Perl/Python/ PHP scripting) (16%)
- VMware (12%)
- Azure (8%)

Discipline 7 Mobile Technology / Mobile Development

Wikipedia defines Mobile Technology/Mobile development as:

The process by which application software is developed for low-power handheld devices, such as personal digital assistants, enterprise digital assistants or mobile phones. These applications can be pre-installed on phones during manufacturing, downloaded by customers from various mobile software distribution platforms, or delivered as web applications using server-side or client-side processing (e.g. JavaScript) to provide an "application-like" experience within a Web browser. Application software developers also have to consider a lengthy array of screen sizes, hardware specifications and configurations because of intense competition in mobile software and changes within each of the platforms

40% of respondents indicated that they used mobile technology / mobile development in their organisation. Current uses cited by respondents included application development for clients, customer experience management, subscriber data management, systems integration and user interfaces to existing systems. Future uses of mobile technology/mobile development cited by respondents included client mobile application development, customer experience management, subscriber data management, systems integration, user interfaces to existing systems.

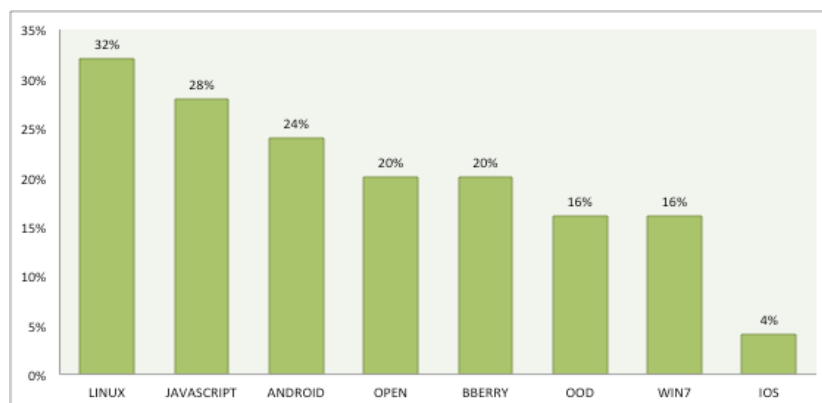


FIGURE 7.10 MOBILE TECHNOLOGIES / MOBILE DEVELOPMENT

The mobile technology / mobile development skills which are currently most in use include (Figure 7.10):

- Linux (32%)
- Client side application scripting / Javascript (28%)
- Android (Honeycomb, Ice Cream, Sandwich) (24%)
- Opensource tools (20%)
- Blackberry (20%)

Discipline 8 Digital Media

Wikipedia defines Digital Media / Creative Media as:

A form of electronic media where data are stored in digital (as opposed to analog) form. It can refer to the technical aspect of storage and transmission (e.g. hard disk drives or computer networking) of information or to the "end product", such as digital video, augmented reality, digital signage, digital audio, or digital art. Florida's digital media industry association, Digital Media Alliance Florida, defines digital media as "the creative convergence of digital arts, science, technology and business for human expression, communication, social interaction and education".

20% of respondents indicated that they used digital media in their organisation, mainly for creating graphics for web page design. Skills used included:-

- Object-oriented design (4%)
- Fireworks and 3D animation (4%)

None of the following were used: 3D Live, MXRToolkit, ARToolkit, Silverlight, InDesign, Paperivision 3D.

Discipline 9 Computer Games Development

Wikipedia defines computer games development as:

The process of creating a video game. Development is undertaken by a game developer, which may range from a single person to a large business. Mainstream games are normally funded by a publisher and take several years to develop. Indie games can take less time and can be produced cheaply by individuals and small developers. The indie game industry has seen a rise in recent years with the growth of new online distribution systems and the mobile game market.

12% of respondents indicated that they used computer games development in their organisation, mainly for creating graphics for web page design. Skills used included:-

- Object-oriented design
- Games logic and design
- HTML 5
- Javasript
- 3D Graphics Theory

Discipline 10 Professional Skills - Soft skills

Wikipedia defines 'soft skills' as:

A sociological term relating to a person's "EQ" (Emotional Intelligence Quotient), the cluster of personality traits, social graces, communication, language, personal habits, friendliness, and optimism that characterize relationships with other people. Soft skills complement hard skills which are the occupational requirements of a job and many other activities.

76% of respondents indicated that they used soft skills in their organisation. Current uses cited by respondents included project appraisals, presentations, responding to customers, client interactions, daily operations.

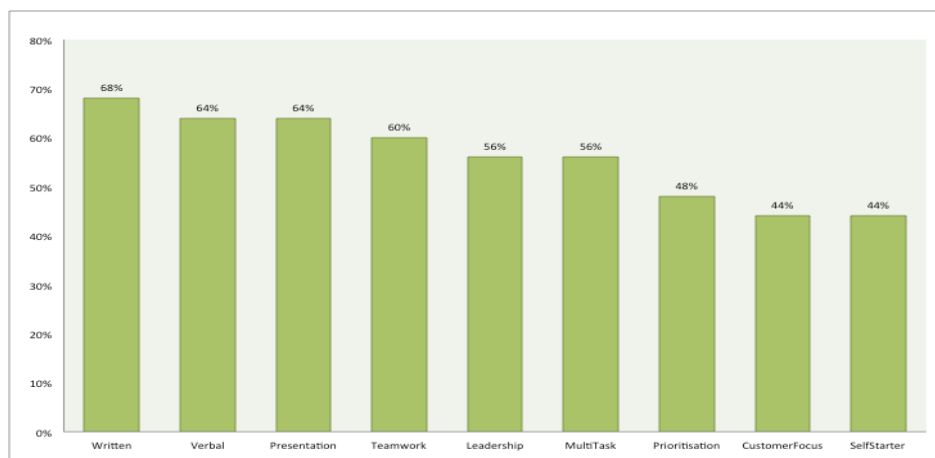


FIGURE 7.11 SOFT SKILLS

The soft skills which are currently most in use include (Figure 7.11):-

- Written Communication 68%
- Verbal Communication 64%
- Presentation Skills 64%
- Teamwork 60%
- Leadership 56%
- Multitasking 56%
- Prioritisation 48%
- Customer Focus 44%
- Self Starter 44%

Discipline 11 Professional Skills IT Management/Project Management

Wikipedia defines IT Management as:

'The discipline whereby all of the information technology resources of a firm are managed in accordance with its needs and priorities. These resources may include tangible investments like computer hardware, software, data, networks and data centre facilities, as well as the staff who are hired to maintain them. Managing this responsibility within a company entails many of the basic management functions, like budgeting, staffing, change management, and organizing and controlling, along with other aspects that are unique to technology, like software design, network planning, tech support etc.'

And Project Management as:

'The discipline of planning, organizing, motivating, and controlling resources to achieve specific goals. A project is a temporary endeavor with a defined beginning and end (usually time-constrained, and often constrained by funding or deliverables), undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value. The temporary nature of projects stands in contrast with business as usual (or operations), which are repetitive, permanent, or semi-permanent functional activities to produce products or services. In practice, the management of these two systems is often quite different, and as such requires the development of distinct technical skills and management strategies'

68% of respondents indicated that they used IT management and project management skills in their organisation. Current uses cited by respondents include: planning for new projects to ensure business success, managing ICT projects and daily operations.

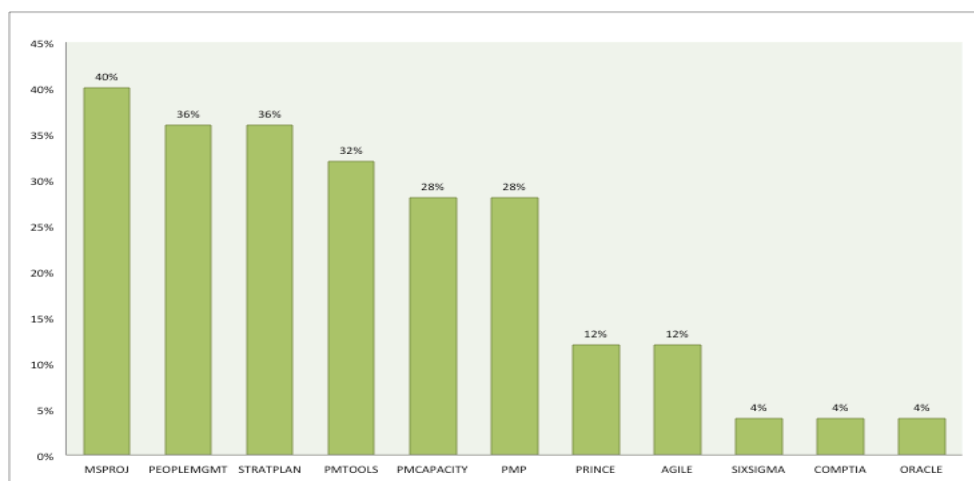


FIGURE 7.12 IT MANAGEMENT AND PROJECT MANAGEMENT

The IT management / project management skills which are currently most in use include (Figure 7.12):-

- Microsoft Project 40%
- People Management skills 36%
- Strategic Planning skills 36%
- Project Management Tools 32%
- Project Management capacity 28%
- PMP 28%

Discipline 12 Call Centre / Contact Centre

Wikipedia defines Call Centre / Contact Centres as:

A call centre is a centralised office used for the purpose of receiving or transmitting a large volume of requests by telephone. An inbound call centre is operated by a company to administer incoming product support or information inquiries from consumers. Outbound call centers are operated for telemarketing, solicitation of charitable or political donations, debt collection and market research. In addition to a call centre, collective handling of letter, fax, live support software, and e-mail at one location is known as a contact centre.

56% of respondents indicated that they used call centre skills in their organisation. Current uses cited by respondents include: first aid centre for client problems, global service delivery centre, single point of contact for bank customers and service desk.

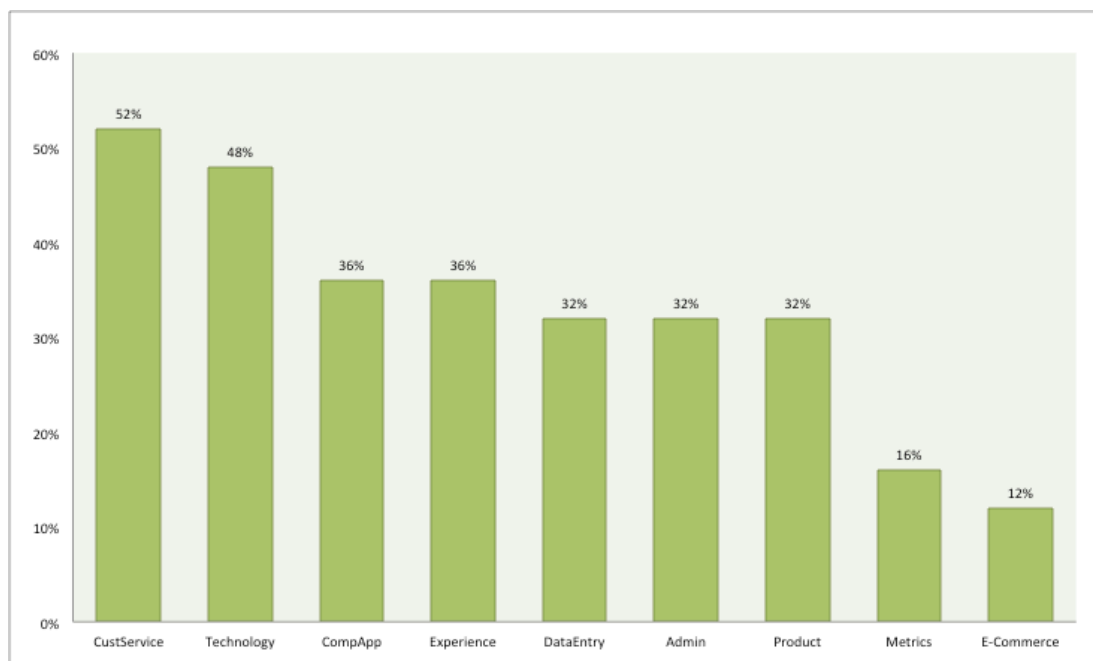


FIGURE 7.13 CALL CENTER / CONTACT CENTRE

The call centre skills which are currently most in use include (Figure 7.13):-

- Customer Service Principles and Practices 52%
- Call Centre Telephony and Technology 48%
- Computer Applications 36%
- Customer Service Experience 36%
- Data Entry / Keyboard Skills 32%
- Administration and Clerical processes 32%
- Knowledge of Products & Services 32%

8. ANALYSIS OF TANZANIAN ICT SECTOR THROUGH SOCIAL NETWORKS

Accurately estimating the size of a country's ICT sector can be a difficult challenge, particularly in the ICT sector which changes rapidly and where there is relatively high percentage of small startup companies. A feature of this research was its use of social networking websites for data acquisition. The professional network service "LinkedIn" was used to (i) identify companies operating in the Tanzanian ICT sector and (ii) identify potential respondents for the survey and interviews. LinkedIn is the world's largest professional network with over 120 million members. LinkedIn does allow users to connect with trusted contacts allowing them to exchange knowledge, ideas, and opportunities with a broader network of professionals²⁰. It is important however to be aware of the limitations of this approach which include issues surrounding representation, sampling and self-completion. Not all companies or employees will have a LinkedIn presence. LinkedIn profiles publically promote the company/employee online and may therefore portray a more positive picture than would otherwise be the case. There are issues with respect to the transparency of the search engines in LinkedIn and how results are returned. Therefore this element of the research is in no way definitive but is included here as it provides another perspective from which to triangulate.

8.1 ANALYSIS OF LINKEDIN COMPANIES IN THE ICT SECTOR

A search of LinkedIn²¹ undertaken on 1/8/2013 for companies which specified Tanzania as their location and one of the following as their industry: Information Technology and Services; Computer Software; Computer Hardware; Computer Games; Computer and Network Security; E-Learning or Telecommunications. This yielded an overall an initial search result of 132 companies. This list was further refined by selecting only companies with a physical office location or employees based in Tanzania. Companies which saw Tanzania only as a potential market with no 'on-the-ground' activity were therefore excluded. Companies had to have at least one employee with an active LinkedIn profile which specified the company as their current employer. After this refinement a total of 86 companies remained which were analysed as follows.

Company Location and Primary Sector

76 (88%) of companies specified Tanzania as their primary location. A further 5 were located in East Africa with the remaining 5 from Europe, South Africa and the United States.

²⁰ Case et. Al, 2013, A LinkedIn Analysis of Career Paths of Information Systems Alumni, *Journal of the Southern Association of Information Systems*

²¹ The Authors had a 'premium account' on LinkedIn....

84% of companies are IT companies with 16% from the Telecommunications industry. IT Companies included : Information Technology and Services; Computer Software; Computer Hardware; Computer Games; Computer and Network Security and E-Learning.

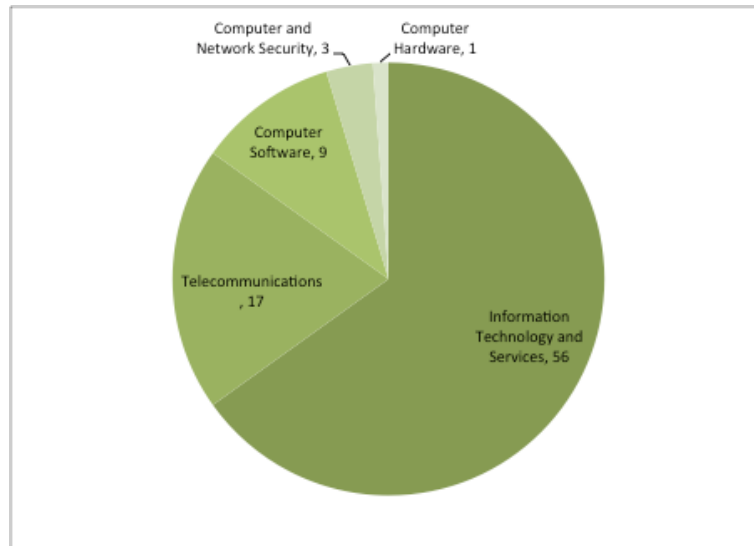


FIGURE 8.1 ANALYSIS OF LINKEDIN : SUB-SECTORS

Company Size

It is mandatory to complete the number of employees when completing a LinkedIn profile. It is also possible to specify the year a company was founded however not all companies completed this field. This information was used to further analyse the types of companies. IT companies are generally smaller than Telecommunications companies. Over 30% have been established for more than five years. What particularly interesting in the analysis is the large percentage of IT companies (nearly 45%) which have been established in the last 5 years (Figure 8.2).

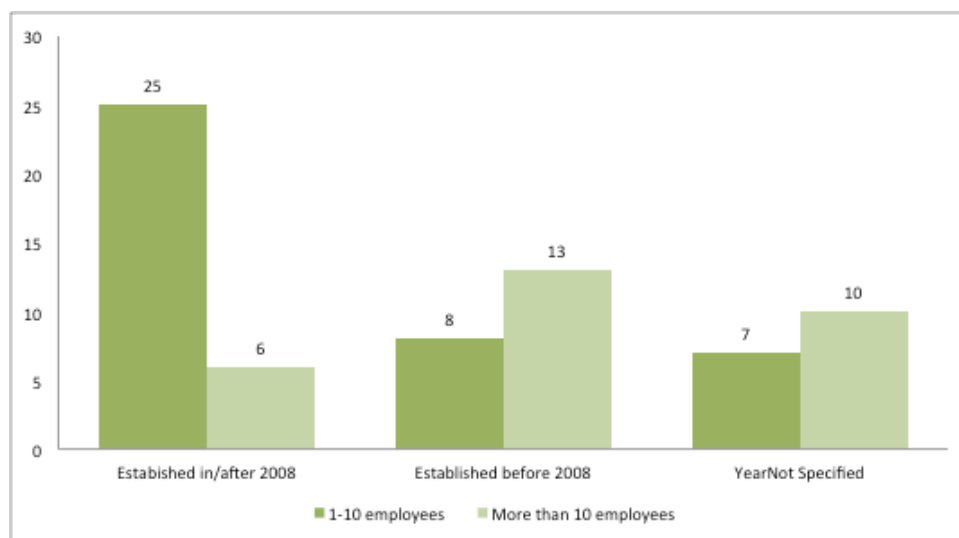


FIGURE 8.2 ANALYSIS OF LINKEDIN : IT COMPANIES, SIZE AND YEAR ESTABLISHED

Telecommunications companies in Tanzania are generally much larger than IT companies and have been established for longer (Figure 8.3). More than 90% of Telecommunications companies have been in operation for more than 5 years.

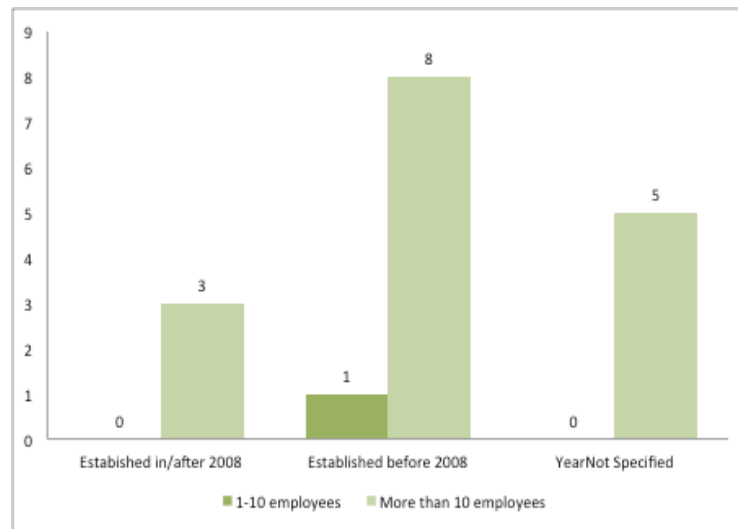


FIGURE 8.3 ANALYSIS OF LINKEDIN :
TELECOMMUNICATIONS COMPANIES, SIZE AND YEAR ESTABLISHED

8.2 ANALYSIS OF LINKEDIN PROFILES OF PEOPLE EMPLOYED IN THE ICT SECTOR IN TANZANIA

A search of LinkedIn²² undertaken on 2/8/2013 for people which specified Tanzania as their location and one of the following as their industry: Information Technology and Services; Computer Software; Computer Hardware; Computer Games; Computer and Network Security; E-Learning or 'Telecommunications'. This yielded an overall search result of 13,444 results.

Caution is needed when interpreting these results. Each result reflects an individual profile on LinkedIn however there may be issues in relation to (i) whether profiles are up to date (ii) the transparency of the search algorithms in LinkedIn in terms of the results returned. While the search results for companies were manually verified by reviewing each profile individually, this was not possible for employee data due to the number of results involved (13,444). It should also be noted that while people are employed with IT or Telecommunications companies their actual job might not be that of an IT practitioner. However, LinkedIn does impose some security with respect to creating profiles and with these caveats in mind, 13,444, even as a rough estimate, is a substantial number.

²² The Authors had a 'premium account' on LinkedIn....

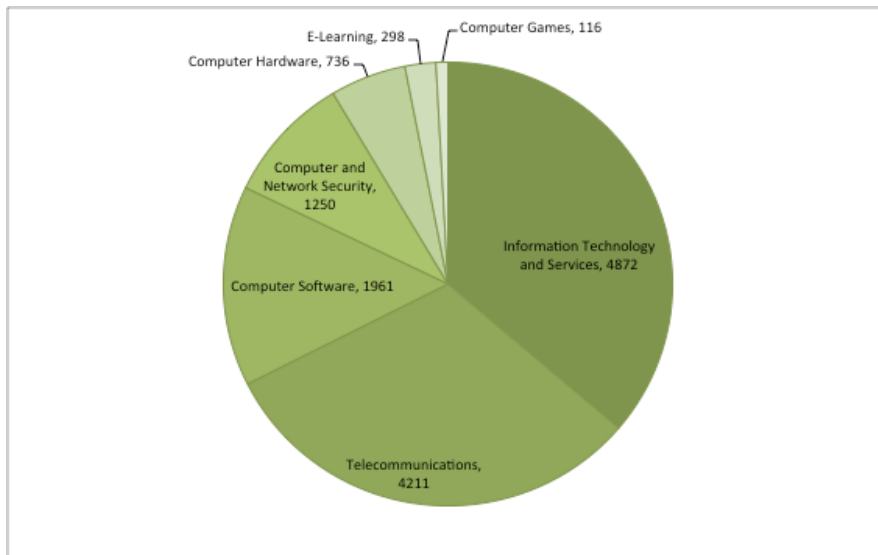


FIGURE 8.3 ANALYSIS OF LINKEDIN : PEOPLE AND INDUSTRIES (NUMBERS EMPLOYED)

The relative distribution of employees across various sub-sectors of the Tanzanian ICT sector as per LinkedIn profiles is shown in Figure 8.3. It can be seen that Information Technology and Services and Telecommunications are the largest employers with more than two-thirds of the profiles. Computer Software and Computer and Network Security are significant employers also (25%).

Noting the limitations outlined above, the types of roles performed by employees in these companies is illustrated in Figure 8.4. This demonstrates that while the majority of roles in IT Companies require IT Practitioner or Engineering skills, there are also a significant percentage of roles which require more generic skills (administrative) or specialist business support skills (accounting, finance, sales). A sizeable number of profiles specified 'Entrepreneur' as their role (373).

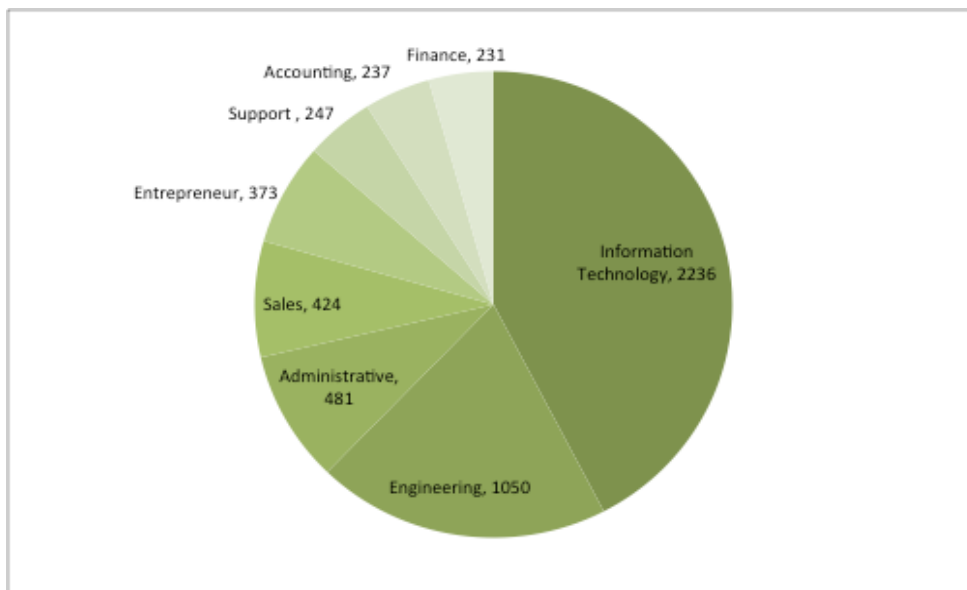


FIGURE 8.4 ANALYSIS OF LINKEDIN : ROLES WITHIN IT COMPANIES

9. INTERVIEWS WITH KEY INFORMANTS

A series of face to face interviews were conducted in Dar Es Salaam in late July 2013, which contributed invaluable qualitative inputs and strengthened the findings of the measurable data collected in the survey. 13 informants were selected purposefully as representatives of the education sector, industry and government agencies who could provide an informed perspective on the state of the ICT sector in Tanzania. The purpose of the interviews was (i) to identify the main opportunities and challenges facing the Tanzanian ICT sector and (ii) to identify what proactive actions need to be taken to ensure that the supply of ICT skills is sufficient for the sector.

9.1 CHALLENGES AND OPPORTUNITIES IN THE TANZANIAN ICT SECTOR

Without exception the informants agreed that the ICT sector in Tanzania is growing, in some cases very rapidly. Particular mention was made of the growth in the telecommunication and banking sectors, highlighting the merits of mobile-phone based money transfer services (Tigo-Pesa, M-Pesa and Airtel money). The reason cited for this growth was the fibre-optic cable which started to operate in 2009. However despite the rapid growth of the sector, informants believed it is still at its 'infancy stage' in terms of its maturity and there are numerous challenges to be addressed to fully realise its potential (Table 9.1). These include a lack of awareness of the benefits of ICT, a lack of ICT skills in the workforce and infrastructural challenges.

Lack of ICT knowledge and skills in the workforce
Lack of Awareness of the potential of ICT
Facilities, infrastructure, funding and resources
Unreliability of internet and network connectivity
Unreliability of power supplies, particularly in rural areas

TABLE 9.1 MAIN CHALLENGES FACING THE TANZANIAN ICT SECTOR

However informants generally viewed these challenges as creating the perfect environment for new opportunities to emerge not only in the ICT sector, but in the sectors related to and supported by ICT. They identified mobile applications, cyber security, education and automation of services as some of the major opportunities which could be enabled by a strong ICT sector.

9.2 SUPPLY AND DEMAND OF ICT SKILLS IN TANZANIA

All informants believed there is a gap between the skills demanded by the ICT sector and the skills supplied to it and all agreed that the demand is growing much faster than the supply of skills. Some noted that this widening gap creates further problems in the retention of the personnel. This is especially true of the public sector where the salaries of employees are lower compared with the salaries in the private sector. Without exception respondents from education institutions agreed that their curriculum and delivery mechanisms need to be adjusted to meet the needs of the market. On the demand side, informants from industry highlighted the necessity of continuously updating the theory and practical parts in the educational institutions. Informants saw the need for industry players to co-operate closely with educational institutions.

Informants welcomed this skills needs report identify the real demand in the market is. The mismatch between the skills demanded and the skills supplied causes a problem of filling the vacancies in the ICT sector. It is hard to find skilled personnel with competent level of ICT for both private and public sector including the ICT trainers in educational institutions. Consequently skilled jobs are outsourced to other countries, contributing to the high unemployment rate among Tanzanian people. According to the report of The National Bureau of Statistics in Tanzania on Employment and Earnings, only 2.5% of all employees were youth employees (aged between 15 and 24) in 2012 and only 1.0% and 1.2% of all employed people were working in Information and Communication industry respectively in 2011 and 2012²³.

The informants believed that skills in these ICT related areas need to be prioritised (which were a close match to those identified as part of the survey). The respondents especially emphasised ICT security, mobile applications and databases skills for graduates and / or jobseekers (Table 9.2).

ICT security	Wireless technology	Auditing
Mobile applications	Engineering	Data analytics
Databases	Customer Service	Software development
Java application	Networking	System integration
Forensics	Operating Systems	Business analysts
IT management	Web development	
ATM technicians	Automotive	

TABLE 9.2 ICT SKILLS IN DEMAND AS IDENTIFIED BY INTERVIEW INFORMANTS

²³ http://www.nbs.go.tz/index.php?option=com_content&view=article&id=398:employment-and-earnings-survey-2012-analytical-report&catid=100:employment-and-earnings&Itemid=135

9.3 FUTURE TRENDS FOR THE ICT SECTOR

Informants believed that the changes in the ICT sector promise a better future. Taking into account the growth of telecommunication companies and Internet service providers, prices have dropped significantly which allows more people to use these services. Universities and other higher education providers offer more and more places to study ICT related programmes meanwhile consolidating competition among the educational institution. The majority of the respondents consider that the gap between the skills supplied and the skills demanded will narrow in the near future. Tanzania is attracting the investors from all over the world which gives a perfect possibility for further development. However some informants noted that the government has to make sure that the education starting from primary schools is updated and associated with the current world as there is a need to react quickly to the market changes. One informant noted that *“People have started to see the benefit of the ICT even in the rural areas; the remaining issue is to keep it affordable and relevant to their situation”*.

10. ANALYSIS OF JOB VACANCY WEBSITES

Another source of data on skills needs is job vacancy websites. Whilst there are obvious limitations to this process it does allow us a snapshot overview. The methodology used is similar to a recent vacancy report carried out by FORFAS on the Irish labour market²⁴. The data presented in this report refers to new job posts advertised using three channels (i) Tanzanian jobs web and blog sites (ii) Government Employment Agencies and (iii) National Newspapers

As identified in the Irish Forfas report, there are many limitations which arise with the interpretation and analysis of advertised job vacancy data which include

- Job vacancies may be advertised through channels not presented in the analysis, leading to an underestimation of demand.
- As job vacancies are simultaneously advertised through different channels this may lead to overestimation of demand.
- There is no way of knowing if positions have been filled at the time of viewing
- Circumstances that lead to the position becoming available are not made clear e.g. retirement, replacement, new position
- There exists an occupational bias within each of the channels used e.g. ICT jobs more likely to be advertised online
- Online recruitment may not be common in many countries owing to broad connectivity issues.

Advertisements in the newspapers are the main method to advertise vacancies, but the prices of the advertisements are still high, especially for SMEs. Companies also

²⁴ Vacancy Overview 2012, A report produced by the Skills and Labour Market Research Unit (SLMRU) in FÁS for the Expert Group on Future Skills Needs, Forfas Report

advertise on their websites, use the recruitment agencies or even word-of-mouth communication to hire a new person. ICT practitioners have a possibility to use mobile applications also such as the free application “Jobs Tanzania”.

The analysis focuses on the occupations and job titles of vacancies advertised in September-October 2013 with the objective of identifying skills for which there is currently a demand in the Tanzanian ICT labour market. Job definitions were based disciplines used for the survey. Jobs were categorized into three competency levels, entry level; competent level; and expert level. For the purpose of this analysis job descriptions were categorised into the 9 technical disciplines used in the survey (Section 6).

Tanzanian web and blog jobsites	Government Agencies	National Newspapers
<p>The job vacancy websites used in the analysis include:</p> <ul style="list-style-type: none"> • http://www.zoomtanzania.com • http://ajirazetu.com/ • http://www.jobstanzania.org/ <p>The list also includes a host of forums and blog sites specifically catered for advertising jobs in Tanzania, these included:</p> <ul style="list-style-type: none"> • http://naombakazi.blogspot.com/ • http://kazibongo.blogspot.com/ • http://www.jamiiforums.com/nafasi-za-kazi-na-tenda/ 	<p>This data consists of all jobs advertised in the Tanzania Employment Services Agency (TaESA) website. TaESA is an executive agency under the Tanzanian Ministry of Labour and Employment. TaESA has been given a mandate by the government to monitor, regulate, administer and coordinate all matters related to the provision of employment services in Tanzania.</p>	<p>This is comprised of data obtained from National newspapers, included are the following publications:</p> <ul style="list-style-type: none"> ○ http://www.thecitizen.co.tz/ ○ http://www.theeastafrican.co.ke/ ○ http://www.dailynews.co.tz/

TABLE 9.2 JOB VACANCY WEBSITES USED IN TANZANIA

Composition of ICT vacancies

A small amount of data was obtained from this analysis as many of the websites weren't clearly presented and in many cases relevant data was not forthcoming. The competency levels of the job vacancies were evaluated based solely on the educational and experience requirements posted.

- ‘Expert level’ vacancies were deemed to require an Masters qualification in an ICT relevant degree, and a minimum of 5 years industry experience.
- ‘Competent Level’ vacancies were deemed to require a Bachelors qualification in relevant ICT degree and a minimum of 2 years industry experience.

- 'Entry Level' vacancies consisted of internships and any vacancy requiring less than two years experience

In descending order vacancies were most frequently found in the following ICT Disciplines:

1. Networking/PC Maintenance (11)
2. IT Management/Project Management (8)
3. Web development (2)
4. Programming (1)
5. Mobile Technologies (1)

There were no vacancies found in cloud computing, games development and digital media. This correlates closely with both the findings of the survey and the interviews.

The majority of positions required an undergraduate degree and between 2-5 years industry experience. All the jobs posted which required a postgraduate degree also required the candidate to have at least four years of industry experience. Only two jobs would accept a diploma in a relevant ICT field. Some of the interview informants admitted that not all companies can hire graduates straight from universities due to the particular needs of the company.