Tanzania

This status report on Tanzania features data relating to information and communication technologies (ICTs) and higher education (HE). It provides an overview of infrastructure, usage and policies that influence the Tanzanian education sector and gives the reader background information against which current initiatives can be understood. Drawing on relevant literature, it presents a historical overview of policies, physical infrastructure and higher education institutions (HEIs). This report has two aspects: the first focuses on ICT and the infrastructure relating to Tanzanian HEIs; the second provides a status overview of the Tanzanian HEIs and issues relating to the use of ICTs for teaching and learning.

National imperatives and limitations of ICT in Tanzania

Country introduction

The United Republic of Tanzania, comprising the old Tanganyika and the People's Republic of Zanzibar, was formed on 26 April 1964. Tanzania's total geographical area of 890 km^2 makes it one of the largest countries on the African continent. It is relatively sparsely populated, with the majority of its inhabitants living in the rural districts. The population was recorded as 34.5 million at the 2002 census, with a projected figure of 38.67 million by 2006.

Agriculture accounts for by far the largest sector of the country's gross domestic product (GDP), which is made up as follows:

- agriculture – 45 per cent;
- financial and business services – 14 per cent;
- wholesale and retail trade, hotels and restaurants – 11 per cent;
- public administration and other services – 9 per cent;
- construction – 6 per cent;
- manufacturing – 6 per cent;
- transport and communications – 4 per cent;
- mining and quarrying – 3 per cent; and
- water and electricity – 2 per cent.

Tanzania's National Assembly moved to the new capital, Dodoma, in February 1996, but many government offices remain in the previous national capital, Dar es Salaam, which is still considered to be the country's commercial centre.

The National Bureau of Statistics lists Dodoma's population at almost 1.9 million in 2006, whereas Dar es Salaam had 2.8 million inhabitants. For further statistical information see URT (2006). Its coastal position makes it the trading capital of Tanzania and an important industrial centre in the East African region. Most of Tanzania's HEIs are in and around Dar es Salaam, including the country's largest educational institution, the University of Dar es Salaam (UDSM).

In 2005, Tanzania's third multiparty elections brought in Jakaya Mrisho Kikwete as the fourth President of the country, which is currently ruled by the socialist revolutionary party, Charma Cha Mapinduzi (CCM). The government is engaged in a number of initiatives to support Tanzania's economic transformation from an agricultural society to a modern 'knowledge society'.

This transformation is motivated by the need to reduce high levels of poverty and to equip the country to perform better in the global economy (MOTC, 2003). The Tanzanian government has introduced several reforms and policies with the intention of promoting new technologies, particularly in the education sector.

Economy

Tanzania is one of the poorest nations in Africa, with a GDP of US$29.25 billion in 2006, and 35 per cent of the population living below the poverty line. Foreign aid makes up 13 per cent of the country's total GDP (Bigsten et al., 2001), rising to as much as 60 per cent in the education sector. The Swedish development agency SIDA is one of UDSM's most important donors and has co-operated with Tanzanian HEIs for the past 45 years. Other significant donors providing financial assistance for UDSM and the education sector in general include agencies from Norway, the Netherlands, Denmark, Belgium, Canada, Germany and Ireland (see CIA, n.d.).

The literature does not provide precise figures for donations to the education sector. However, it is assumed that in the early 1990s more than half of the resources at UDSM came from foreign donors. The faculties of science and engineering attract about two-thirds of foreign funding, followed by arts and social science.

Despite being a developing country with a partly subsidised economy, Tanzania has experienced steady economic growth of approximately 5 per cent during the last decade, a growth rate that equals areas like South East Asia. Given the Tanzanian government's political initiatives to address national poverty issues, it is expected that Tanzania will continue to experience economic growth (Cunningham & Cunningham, 2005).

Brief history

Until 1962, Tanganyika, as it was then, was under British rule. It merged with Zanzibar in 1964 to form the United Republic of Tanzania. Colonial rule was replaced with a socialist one-party system that introduced policies to make Tanzania independent of foreign nations. These policies were commonly referred to as 'policies of self-reliance' (Omari, 1991). A consequence for the technology and education sectors during this period was that the government imposed a ban on importing technology from foreign nations – a ban that was in effect until the early 1990s (Cunningham & Cunningham, 2005).

In the post-colonial period, education became a high priority. Reforms were introduced to transform the sector from a structure that accommodated the elite of the country to one that focused on educating workers. Education came under public control, and state institutions provided free education to the public. Widespread poverty and a reduction in economic aid forced Tanzanian public institutions to introduce limited tuition fees (MOHEST, 2004). The transformation towards a system where students increasingly have to provide the means for their own education has been identified frequently as a reason for unrest among Tanzanian students.

Language

After Tanzania achieved independence from Britain, English remained its official language, along with Kiswahili. Although both languages enjoy equal status, Tanzania experiences language disputes arising from issues of representation in various sectors of society, including the education sector (Brock-Utne & Holmarsdottir, 2003). Currently, the debate in education circles is whether there should be better support for mother-tongue education (Kiswahili, in this context) or continued use of English (which is promoted in education institutions). The reality is that a combination of both languages is often used as the medium of instruction, resulting in poor English and reduced status of Kiswahili. As experienced in other African countries that have mother-tongue instruction, Tanzania has a low pass rate among institutions where Kiswahili is the medium of instruction.

In addition to Kiswahili and English, Arabic is widely spoken, due to a large part of the population (particularly in Zanzibar) being Muslim.

Demography

Tanzania's population has an average age of approximately 18 years. Average life expectancy is 51 years on the mainland and 57 years in Zanzibar, with females living slightly longer than males.

A major contributing factor to low life expectancy is the high number of people with HIV/AIDS – estimated to be 8.8 per cent of adults in 2006. This affects the demography of the work force and also has an impact on the number of

people enrolling for higher education. The growth rate of the population is slow; in 2006 it was 1.8 per cent, which means that the total population of Tanzania in 2015 is expected to be 45.6 million (CIA, n.d.).

The literacy level among adults over the age of 15 was 78 per cent in 2005 (Bigsten et al., 2003), which is slightly lower than in neighbouring countries, but generally high for the region.

ICTs in Tanzania

Tanzania's national ICT infrastructure is still being developed but has accelerated recently from being insufficient and unreliable to being 'a fair system operating below capacity and being modernized for better service' (CIA, n.d.). The literature suggests that this rapid development is likely to continue.

The media constituting the Tanzanian ICT infrastructure are set out below.

Non-electronic media

- *Newspapers*. Tanzania has nine daily national newspapers.

Analogue electronic media

- *Radio*. In 2000, Tanzania had 25 radio stations (AM – 12; Short Wave – 2; FM – 11). According to Souter et al. (2005), 85 per cent of the population owns a radio.
- *Television*. Tanzania has three licensed TV stations, and an estimated 9.8 per cent of the population owns a TV set (Souter et al., 2005).
- *Telephones*. Very few households have an installed land line telephone. The ratio is one telephone line per 100 people (Hesselmark, 2003).

Digital ICTs

- *Multi-purpose community centres*. Several development organisations offer Internet access at Tanzania's few multi-purpose centres, particularly in the rural districts (Jensen, 2000). However, there are no data to show the extent to which they are used.
- *Internet/cyber cafes*. There are no exact data on the number of Internet cafes in the country, but they are estimated to exceed 1 000 (see www.apc.org).
- *Cell phones.* Currently, the number of cell phone subscribers is estimated to be 250 000. This number is potentially significantly higher, as most users employ pre-paid services (www.apc.org; Gillwald, 2005).
- *Satellite-based Internet connection.* A major decrease in price has made the acquisition of very small aperture terminal satellite (VSAT) systems attractive to major institutions and has encouraged Internet service providers to invest in equipment. VSAT is the most common form of Internet connection for universities.
- *Cable-based Internet connection*. Cable connections over phone lines are still slow and unreliable. Currently, there are only 10–15 thousand Internet subscribers in Tanzania (see www.uneca.org/aisi/NICI/country_profiles/), but this option, together with the proposed expansion of the national infrastructure using high capacity fibre-optical cables in combination with wire/wireless local networks, is expected to lower costs and increase the capacity of transmission (Kondoro & Nungu, 2006).

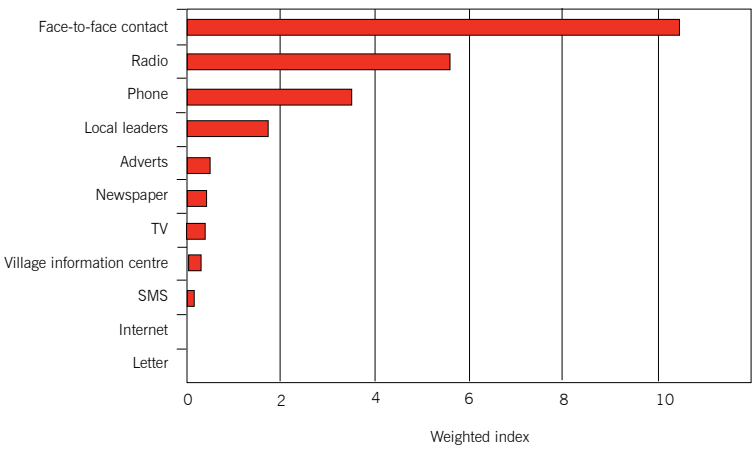
Figure 7.1 shows the media preferences of a representative group of Tanzanians.

Internet infrastructure

By 2000, Tanzania had six Internet service providers (ISPs):

- Raha. One of the first and most popular ISPs in the country, with more than 1 500 customers. It offers a satellite-based connection with a capacity of 256 Kbps.
- Zanzinet. Zanzibar Internet, also a VSAT-based ISP, operates via a satellite connection to France.

Figure 7.1: Preferred media of communication



Source: Souter et al. (2005)

- Africa Online Tanzania. A subsidiary of Africa Online, it was founded in 1994 by four Kenyan students in collaboration with students from Harvard University.
- CyberTwiga. Tanzania's first commercial full ISP. Like Raha it uses a 256 Kbps VSAT connection. By 2000, it had an established presence in the city of Arusha, from where is also provided wireless Internet connection.
- Internet Africa. This ISP has VSAT access to a gateway in Norway via a 256 Kbps connection.
- Cats-Net. Established in 1997, it provides a full Internet service.

Since 2000, the following ISP companies have been established:

- Afsat Tanzania Ltd;
- Arusha Node Marie, currently in the process of acquiring a license by TCRA;
- Benson Online;
- Kicheko;
- Tanzania Telecommunications Company (TTCL), the state telephone service provider;
- University Computing Centre (UCC), the main provider for the University of Dar es Salaam;
- ZanLink, a Zanzibar-based ISP; and
- Juasun.net, which provides service mainly in the rural districts.

In addition to these companies, there are data providers who also offer services via VSAT connections with a bandwidth (in 1999) of between 64 and 128 Kbps. They include:

- Sita, an airline communication co-operative that has entered the telecommunications market;
- Datel, a joint venture between TTCL (49 per cent) and Nexua International, which is a subsidiary of the France Telecom Group; and
- Wilken/Afsat, a subsidiary of Wilken International, a Nairobi-based company that started out delivering voice communication over wireless networks.

The above outline shows that the strong growth in the Internet market has resulted in a significant increase in ISPs. The number of Internet users has risen accordingly. In 1999, it was estimated that only 25 000 people were frequently using the Internet, whereas by 2006 that number had risen to 300 000 (see www.uneca.org/aisi/NICI/country_profiles/).

The same source reveals that in the same period the total international bandwidth grew from 1 Mbps to 12 Mbps. Meanwhile, several VSATs have been upgraded in order to provide a higher capacity along with the employment of new systems. The commercial sector appears to be responsible for the highest volume of use, followed by the academic sector, research facilities, international NGOs and government institutions.

The status of Internet use

Although the Internet has been available in Tanzania since the late 1990s, surveys indicate that its use as a means of communication is limited and progressing slowly. In 2005, only 2 per cent of Tanzanian households had a working computer with an Internet connection. These households were all located in urban areas. Equally, surveys show that only 2 per cent of household members have an e-mail account, of which 76 per cent were free accounts, such as Yahoo and Hotmail. Only 2 per cent of the total number of e-mail accounts was work related. Souter et al. (2005) conclude that Internet penetration is negligible in Tanzania, which seems to be confirmed by the numbers above.

The cost of acquiring an Internet connection is still very high compared to other countries, which creates a barrier in a resource-poor context. The World Bank notes the average cost of Internet connection in 2005 as US$93 for 20 hours per month (World Bank, 2005). The amount can range from US$57 a month for low bandwidth access, at 33.6 Kbps from Africa Online, to US$250 for the new high-speed service at 256 Kbps (see www.africaonline.com/country.cs.php?cid=13).

The telecommunications infrastructure for providing the necessary capacity for transferring data still needs to be developed. It currently comprises older open-air telephone cable connections, microwave connections and satellite VSAT connections.

A major obstacle for developing the infrastructure has been the limited availability of bandwidth and the fact that unreliable networks provide a very limited connection abroad. However, there has been rapid development in recent years, especially with regard to bandwidth, and indications are that this development will increase as international tariffs and the cost of satellite equipment decrease. As pointed out by Jensen (2000), at the turn of the millennium it was really only South Africa that had an international connection exceeding 64 Kbps.

VSAT in higher education

For many higher education institutions, VSAT has provided high-bandwidth Internet. The UDSM adopted a VSAT system, which made it possible to establish a connection to

the South African university network, Uninet. This provided the university with a 64 Kbps connection. In 1998, the university established a 128 Kbps satellite connection to the USA.

Sokoine University of Agriculture established a satellite connection funded by the Norwegian government, which provides the university campus with a full e-mail and Internet service supported by the Tanzania Commission for Science and Technology (COSTEC).

Muhili Medical School has a VSAT system that allows it to make a connection to the USA and to establish a 14.4 Kbps phone connection.

TENET and education networks

Other initiatives to boost the national ICT infrastructure and provide education with high-capacity Internet connection are projects to replace expensive satellites (and thus reduce consumer tariffs) with high-capacity fibre-optic cables. Tanzania Education Network (TENET) is the vision of an electronic network that will connect all HEIs in the country, as well as research facilities and teacher training colleges. Launched in 2002, it is intended to be the backbone of the Tanzanian education sector and a motivating force for foreign investment.

Also, there is the East African Carrier Project that aims to establish a regional network that will extend the effective use of the submarine cable and give the East African Community (EAC) the opportunity to rapidly improve regional telecommunications services, greatly benefiting the economies of partner states. When operational it will provide a connection via 150 Mbps or 622 Mbps and will interlink cities with a 2.5 Gbps connection (Kondoro & Nungu, 2006).

Meanwhile, a Tanzania Internet Exchange Point (IXP) has been established to discourage local traffic from going through a few expensive international links; some ISPs are already connected, while others are preparing to do so. Other EAC states have done the same and this has led to another project that will link IXPs in East Africa and further reduce the need to go through international links.

Institutional e-learning centres and resource location

As proposed in the TENET project (and supported by a paper from the Sokoine University of Agriculture), the implementation of e-learning facilities in the libraries of HEIs and universities would improve the infrastructure for the provision of academic information (Kondoro & Nungu, 2006). However, most universities have dedicated computer centres. For details of equipment at UDSM and Sokoine, see Table 7.1.

The status of telephone connections

Although indicators show rapid growth in the Tanzanian ICT infrastructure, teledensity (telephones per 100 people) is still low when compared to other countries. In 2003, Tanzania measured only one telephone line per 100 people, which was lower than countries like Zambia and Kenya (Hesselmark, 2003). By 2005, it was estimated that 6 per cent of all Tanzanian households had a fixed telephone landline and that 88 per cent of these were located in the urban areas. Very few are found in the rural areas of the country.

This means that access to telecommunication is often only via public pay phones or borrowed cell phones (Souter et al., 2005). The slow spread of fixed landlines in the country can be ascribed partly to the fact that the national telephone operator, TTCL, had a monopoly on the market until recently and was the sole provider of fixed landlines (Gillwald, 2005).

Table 7.1: Equipment status at two Tanzanian universities

Institution	Equipment	Connection	Bandwidth
University of Dar es Salaam	Facilities for videoconferencing 300 computers for staff and students	VSAT	128 Kbps (1 Mbps to be established)
Sokoine University of Agriculture	30 computers (undergraduate) 200 computers (postgraduate)	VSAT	128 Kbps

Zantel has become the second operator and, with TTCL, dominates the fixed landline market. According to a report issued in 1999, the average household in Tanzania had to wait 3.6 years between submission of an application and the installation of a fixed landline (see www.uneca.org/aisi/NICI/country_profiles/).

The status of cell phone use and infrastructure

Cell phone use in Tanzania has experienced such growth that the number of people with access to mobile phones now exceeds the number of people with fixed line telephones. In 2005, approximately 10 per cent of the population had access to a cell phone. Roughly half this number of people lived in urban areas. Some surveys attribute the proliferation of cell phones to the introduction of alternative business models such as prepaid accounts, which is the system of choice for 99 per cent of cell phone users (Gillwald, 2005).

Currently, the following companies provide cell phone connections:

- Celtel;
- MIC Tanzania-Tigo;
- TTCL;
- Vodacom;
- Zantel;
- Sixtelcom;
- Broadpoint;
- Mycell;
- Dovetel; and
- Betafone.

Six new companies have appeared on the market since 2000. Vodacom dominates with a market share of 49 per cent. The liberalisation of the market for fixed landline telephony and the growth in the number of mobile telephone operators have reduced communication costs significantly. The arrival of Zantel as the second fixed line service provider in 2004 saw telecommunication costs decrease by 60 per cent (Cunningham & Cunningham, 2005).

Usage pattern of cell phone communication

As noted, communication facilities (mobile or fixed landline phones) are available mainly in the urban areas. The rural areas, where the majority of Tanzanians live, are generally under-served. Rural people could make use of local pay phones, but indications are that few people make use of these phones on a regular basis. One survey reports that only 8 per cent of the population used a pay phone during the three-month period preceding the survey.

When looking at the overall pattern of telephone use, cell phones appear to be the most widely used medium for speech communication, far exceeding the use of fixed landlines. According to a survey conducted by the UK Department for International Development (DFID), this trend is going to evolve rapidly. When respondents were asked about the likelihood of owning a cell phone within a year, 30.3 per cent responded 'likely' and 29.6 per cent responded 'very likely'.

Usage patterns: a gender perspective

Looking at ICT use from a gender perspective, men make use of ICT more often than women, despite the fact that the overall gender ratio is 0.98 male per female. The majority of these users are in the urban areas. In terms of fixed landlines, where ownership of a phone is involved, there are indications that the head of the family (in most cases, male) would be the most frequent telephone user (Souter et al., 2005).

As regards cell phone use, 12.5 per cent of male respondents indicated having access to a cell phone, compared with 7.5 per cent of female respondents. Males indicated a higher frequency of use; on a scale of 1 to 5, the average intensity of use among males was 2.49 compared to 2.03 among females (Souter et al., 2005). Data for ICT use in the workplace show the same trend, but this is not surprising as more men than women are employed as salaried workers, and therefore have more exposure to ICTs.

In respect of Internet and e-mail use, one survey reports that among participants with access to free e-mail accounts, 79.3 per cent were male and 74.6 per cent were female.

There is a significantly higher level of education among males than females, and the indications are that people with higher education tend to use and value ICTs more than people with less education (Souter et al., 2005). Later in this report, indicators from HEIs will be shown to display a similar gender pattern.

Policies

Although the Tanzanian government initiated a number of reforms in the communication sector in the early 1990s, the literature suggests that there has been little interest in the adoption and use of computer technology (see, for example,

Gillwald, 2005). Between 1976 and 1993, the government had banned the import of technology on the grounds that it was unaffordable (Etta & Elder, 2005). The restrictions around the acquisition of technology were discouraging, and, according to some observers, resulted in a lack of interest that still inhibits the acquisition of technology today (Cunningham & Cunningham, 2005).

Despite the government's change of attitude towards technology and communication during the 1990s, interest in computer technology remained very limited and was mostly confined to grassroots attempts to create an ICT sector in Tanzania. Computer interest groups had been working since the 1980s for recognition of the role of computer technology, but attempts to create an alliance to promote ICT were unsuccessful. However, as the new millennium approached, awareness of a potential Y2K crisis sparked a forum that later came to be known as eThinkTankz. It was established primarily to discuss Y2K issues but also lobbied for a national ICT policy.

In 2001, an information paper was created in co-operation with an international NGO e-secretariat and was subsequently presented to the Tanzanian government. This paper created the foundation for the inauguration of Tanzania's first national policy on ICT, implemented in 2003 (Etta & Elder, 2005). Since the introduction of this policy, ICT has become a highly prioritised area for the Tanzanian government (MOTC, 2003). In order to contribute towards rapid adoption of ICTs, the government has exempted all computer products from value added tax.

The importance of ICTs and a telecommunication structure was only recognised by the Tanzanian government in the early-to-mid 1990s. Reform of the telecommunications sector began in 1993, when the government dissolved the public communication authority, Tanzania Posts & Telecommunications Corporation (TP&TC). The next stage involved creating three new institutions: the Tanzania Communications Commission (TCC), which operated as an independent regulating authority, and the Tanzania Posts Corporation (TPC) and the TTCL, both of which functioned as service providers. In the same year, the first national mobile operator Mobiltel was granted an operating licence that was formalised in 1995. Another licence was granted to a now defunct mobile operator, TriTel.

However, the TCC and the Tanzanian Broadcasting Commission merged when the government passed the Tanzanian Communication Regulatory Authority Act No. 12 of 2003, and established the Tanzania Communication Regulatory Authority (TCRA), which became the country's only regulating authority. It oversees competition in the communication sector, issuing licences to telecommunication providers such as mobile operators, broadcasters and ISPs. By 2004, the TCRA had already issued a number of licences, including the following:

- 1 basic telephone provider (TTCL);
- 4 land-based cellular mobile telephone operators;
- 1 global mobile personal communication service;
- 11 public data companies;
- 9 private dedicated data services companies;
- 23 public ISPs;
- 17 cable television licences;
- 23 radio stations;
- 17 terrestrial televisions;
- 12 television broadcasters;
- 3 pay-television licences; and
- 16 community television operators (Gillwald, 2005).

The licensing framework permits the leasing of excess capacity of communication infrastructure owned by institutions such as Tanzania Electric Supply Company (TANESCO), Tanzania Railways Corporation (TRC), Songo Songo Gas Company (SONGAS) and Tanzania Zambia Railways Authority (TAZARA). The new framework allows services to be provided to customers after acquiring the necessary licence from the TCRA. These services include infrastructure development, network, content and applications like voice-over Internet protocol (VOIP) services, thus reducing the tariff while increasing coverage, bandwidth and overall quality of services.

Tanzania has a low level of Internet penetration in terms of infrastructure and patterns of use. The only really successful ICT to enjoy a high degree of penetration is the cell phone. Yet at a government level, high priority is given to the Internet and the rapid adoption of computer technology. The government policy gives priority to the following sectors:

- e-health – using ICT to improve and make the health sector more efficient;
- e-government – improving delivery of communication and services to the population, as well as enhancing the government's internal organisation; and
- e-education – computer technologies have the potential to bring about an overall qualitative improvement in education, and to overcome resource-related issues currently faced by educational institutions.

In the policy document, ICT is outlined as a powerful developmental facilitator in the fight against poverty, ignorance and disease. It sees the potential for ICT to be used in many ways to improve the lives of the general population.

However, the policy also ensures that the government has control of the ICT sector, in that it allocates the finances to promote ICT and is obliged to set standards in order to ensure compatibility. The document also states that the government should encourage all sectors in the country to invest in ICT development, and, in this way, demonstrates a shift in the attitude towards technology.

The goal is for Tanzania to become a knowledge society that can participate in the global economy and improve domestic infrastructure (MOTC, 2003). The recognition of the developmental opportunities offered by ICT is in line with international targets, such as those outlined by the United Nations, to deploy ICTs in the education sector. Prioritising IT supports Tanzania's Vision 2025, which refers to 'the new opportunities that [are being] opened up, which can be harnessed to meet the goals of the vision'.

The responsibility for introducing ICT in schools and HEIs lies with the Ministry of Education and Vocational Training (MEVT) (mainly for secondary schools) and the Ministry of Higher Education, Science and Technology (MOHEST) (for universities and colleges). Together with the Tanzanian Education Authority (TEA) and other institutions responsible for ICT in the education sector, the following objectives relevant to HEIs have been identified:

- To establish an education network (EDUNET) for all higher learning institutions in the country. This will act as the national ICT infrastructure responsible for increasing access and reducing costs.
- To develop contextually defined e-learning and ICT curriculum materials, and to avoid the negative impacts of foreign e-learning materials in Tanzanian schools.
- To establish e-learning centres throughout the country in phases. The idea is to connect all institutions for data sharing through Internet services.
- To train e-learning and ICT trainers including tutors and administrators in teacher training colleges from different zones. These individuals will be responsible for training other teachers and students in their respective colleges.
- To integrate ICT in classroom teaching and learning processes for all teacher training colleges.
- To ensure constructive and effective use of the national infrastructure among public and private institutions (Cunningham & Cunningham, 2005).

The government aims to develop a state-of-the-art ICT infrastructure, which will ensure high-capacity and reliable broadband connections nationwide. Along with this initiative, the government's intention to establish more IXPs, in collaboration with other countries, will facilitate connecting to and using the Internet. Aside from contributing to the creation of the necessary infrastructure, the policy paper serves to encourage the public and private sectors to explore ways to fund and develop the national ICT infrastructure. It also places emphasis on the role of universities and other HEIs to conduct research that will lead to the development of hardware and software.

Institutional ICT policy and institutional implementation

In the wake of the adoption of the national ICT policy, most HEIs began to formulate their own policies. Tanzania's largest university, UDSM allocates many of its resources to developing computer applications and prioritises those digital learning environments that facilitate e-learning (Komba, 2003). The Institutional Transformation Programme (ITP), which aims to improve education and finances through a restructuring of its organisation and teaching methods, indicates that the vision of e-learning and the introduction of ICTs is having an impact.

Tanzanian education falls under two ministries: the MEVT controls general education at the primary- and secondary-school levels, while universities and other HEIs are under the authority of the MOHEST (see www.tanzania.go.tz/msthe). The MOHEST also administers several national technology-related entities, such as COSTEC, which is instrumental in the co-ordination of ICT-related projects. As a state unit, COSTEC is also the entity that is responsible for accepting national ICT projects and for allocating and administering grants. It is a key player in projects that facilitate e-learning in higher education. This unit plays an executive role in the government ICT policy for the advancement of ICTs in the overall effort to establish Tanzania as a 'knowledge society' (MOTC, 2003).

Higher education

Current status of higher education in Tanzania

University infrastructure

According to the MOHEST, the country has 43 institutions of higher education, including 21 universities (8 public and 13 private), 4 technical institutions and 18 government-

accredited institutions or colleges that offer bachelor-level studies in disciplines such as fine art, business and technical studies see Table 7.1).

In 2005, UDSM had a total of 12 945 students, making it the biggest university in the country. It has the largest intake of students and offers the widest selection of courses, amounting to 53 degree programmes. Sokoine University of Agriculture follows UDSM with 15 degree programmes (see www.tanzania.go/msthe).

Teacher-student ratio

In 2005, Tanzania had 48 236 students engaged in higher education. The number of students in higher education doubled in the five-year period 2000–2005. All HEIs are experiencing growth, with the public universities (UDSM, in particular) experiencing the highest. However, the staff ratio at public institutions has not kept pace with this growth.

Table 7.2: Tanzanian HEIs

Public universities
University of Dar es Salaam
Muhimbili University College of Health Science
University College of Land and Architectural Studies
Sokoine University of Agriculture
Open University of Tanzania
Mzumbe University
State University of Zanzibar
Moshi University College of Co-operative and Business Studies
Private universities
St. Augustine University of Tanzania
Tumaini University KCMC
Tumaini University Makumira College
Tumaini University Iringa College
Tumaini University Dar es Salaam College
University of Arusha
University College of Education Zanzibar
Zanzibar University
Hubert Kairuki Memorial University
IMTU
Bugando CHS
Aga Khan University
Mount Meru University

Private colleges/institutions
Dar es Salaam Institute of Technology
Arusha Technical College
Mbeya Institute of Science and technology
Karume Technical College
IFM
IAA
NIT
TENGERU
Mweka Wildlife College
Tanzania Institute of Accountancy
Institute of Social Work
IRDP – Dodoma
College of Business Education
Dar es Salaam Maritime Institute
PHCI – Iringa
Advanved Theatre Management School – MBEYA
Vector Control Training Centre – Muheza
Masoka Management Training Centre
Regional Dermatology Training Centre
Mirembe Nursing School
MPHN – Morogoro
St. Joseph's College of Engineering and Technology

Source: MOHEST (n.d.)

In 2005, HEIs had 2 735 teachers. The ratio was 22 students to one teacher at public institutions, but only eight students per teacher at private institutions. The teacher-student ratio for public HEIs almost doubled between 2000 and 2005, whereas the private HEIs experienced only a slight increase from 1:06 in 2000 to 1:08 in 2005, despite increased numbers of students (see MOHEST, n.d.).

Staff characteristics

Most lecturers at HEIs fall into the age category 50–54. A few HEIs indicated that their staff members were in the age group 45–49 (see www.msthe.go.tz/). Most have master's degrees and hold posts as lecturers or senior lecturers. At UDSM there is a higher number of teaching staff with doctorates. There is a similar pattern for the private HEIs but, in general, the staff tend to be slightly younger with a high representation of educators between the ages of 30 and 40 years.

HE programmes and student course selection

It is worth noting that the majority of university programmes are located within the humanities and business faculties. Technical and scientific subjects have limited representation, both in terms of what the institutions offer and in terms of the number of students selecting these options. The areas of law, accounting and education are the most popular. Studies relating to computer and information technology are poorly represented at non-technical HEIs.

A similar trend is seen at technical institutions, where studies like civil engineering and accounting are chosen over ICT-related studies. This trend belies government policy to promote ICTs. Also, there are no indications that these would be subjects for study abroad; only 236 students studied abroad in 2005, showing that there is a limited amount of international outreach from Tanzanian HEIs. The majority of these students went to Algeria, Uganda, Russia and China; only 16 went to either Europe or the USA. There are no figures to show how many foreign students attend Tanzanian HEIs, so the extent of international exchange is unknown.

HE demography from a gender perspective

Students and gender

With the exception of nursing, male students are significantly over-represented in all fields of higher education in Tanzania. Despite policies highlighting the necessity for working towards gender equality, only 33 per cent of all students enrolled for 2005 were females. This figure was almost constant for the period 2000–2005, with only a 5 per cent increase shown in the number of female students (see MOHEST, n.d.).

Although policies are being put in place to actively address the issue of gender equity in higher education, there is a long way to go before Tanzania attracts equal numbers of male and female students.

Staff and gender

A similar pattern is evident among educators: only 16–20 per cent of educators in Tanzanian HEIs are female, and this percentage remained fairly constant in the period 2000–2005. However, the ratio of female educators to male educators is slightly higher in private institutions than in public institutions (see MOHEST, n.d.).

Specific challenges faced by Tanzanian HEIs

Tanzanian HEIs are faced with the challenge of creating institutions that are able to educate candidates and enable them to take part in the global economy. The most pressing challenges to address are:

- financing HEIs;
- student fees;
- teacher shortages;
- skills shortages;
- language difficulties; and
- lack of technical resources.

Tanzania is heavily subsidised by foreign donors. The education sector, in particular, relies on donations to sustain its universities' economies. However, despite major sponsorships, many institutions still battle to remain financially sound. For example, in 1999/2000 the UDSM had a shortfall of US$4.8 million.

As most HEIs struggle financially, it has become necessary for them to charge student fees. Public universities generally charge far less than private institutions, but even so, in a country where poverty is so widespread, this presents a major obstacle to many and restricts the promotion of general education in the country. As noted in a World Bank report (Sawyerr, 2002), a potential consequence is that university enrolment becomes determined by socio-economic profile, allowing only those students whose parents can pay for tuition to enrol in higher education. High fee structures add to the growing social disparities in the society and are extremely problematic in a country where such a high percentage of people already live in poverty.

At the UDSM, the introduction of the Institutional Transformation Programme has had a positive impact on the organisation of financial structures and has already led to a significant reduction in costs.

The issue of social inequalities

To enrol in a master's programme at UDSM, the fee would be TSh 577 500, compared to TSh763 000 for the same course at the private University of St. Augustine or TSh600 000 at the Open University of Tanzania (see www.udsm.ac.tz; www.saut.ac.tz; www.out.ac.tz). Many students must finance this substantial sum through loans. However, there is a growing trend in Tanzania's public universities, and most East African universities, to reduce or waive fees for students who pass their exams. Those who fail must pay the

tuition fee at another institution in order to qualify for re-examination (EGHDN, 2002).

Further widening social disparities is the fact that English is the language of instruction at all Tanzanian HEIs, which potentially disadvantages students from a purely Kiswahili background (Brock-Utne, 2002). In primary and secondary schools, especially outside the urban areas, the preferred medium of instruction is Kiswahili.

E-Learning and open-source software

Another challenge to HEIs, and especially public universities, is the fact that a shortage of skilled teachers is compromising the quality of education. A proposal by the UDSM is to explore e-learning as a way to improve education. Komba (2003) argues that investment in computer technology to facilitate e-learning would help to overcome a growing problem faced by most HEIs.

The ICT policy document of the Sokoine University of Agriculture concurs:

The main objective of information and communication technology in teaching is to facilitate effective teaching and optimize the student/lecturer ratio. ICT should be exploited to ease handling of large classes by providing lectures to such classes through links available to students even after class hours. (www.saut.ac.tz)

Using the UDSM as an example, a 2007 report from the Carnegie-Mellon Foundation says that although transformational policies at the university have been addressed, there is still a need to improve the teaching and learning process through staff training and acquisition of computer equipment.

Various research initiatives at the universities have been established to explore and develop applications for the improvement of teaching and learning among university candidates. One option is distance education offered by institutions such as the Open University of Tanzania and the African Virtual University, but due to limitations imposed by the lack of telecommunication and computer facilities outside a university campuses, only a few distance learning courses are offered to students via the Internet and/or e-mail. They rely predominantly on the postal service, sending out course material and receiving completed assignments from students. However, based on the overview of the development in infrastructure, it can be predicted that these educational facilities will increasingly be making use of ICT.

Tanzanian HEIs offering e-learning courses make use of digital learning environments. Only two institutions, the UDSM and the Open University of Tanzania, provide information on the use of digital learning environments. Other universities (such as the University of St. Augustine) provide a web site interface for browsing library catalogues, but not a distance or e-learning system as such.

The UDSM has installed the USA-developed digital learning environment, Black Board, which offers various kinds of courseware. In addition, UDSM has launched projects revolving around teacher training, combined with various open-source initiatives. Information about these projects, known as the Technology Enhanced Institutional Learning Environment (TEIL), is not available.

The Open University of Tanzania is using MIT courseware, which is an open-source system developed by the Massachusetts Institute of Technology. The university uses it to facilitate distance education. A university newsletter reports that there are plans to expand the use of this system (see www.out.ac.tz).

In spite of limited finances, choosing a free or inexpensive open-source system as an e-learning application is not the obvious route to go. Although a proprietary system would involve a major initial cost, payable once, an open-source system would involve major recurrent development costs (Komba, 2003).

The computer centres of UDSM, St. Augustine University and Sokoine University of Agriculture all offer general ICT training for teachers and access for students, yet only the UDSM's independent University Computing Centre (UCC) is conducting research into the development of software for teaching and learning purposes.

It is, therefore, difficult to determine whether open-source software is going to be widely used in HEIs. Government policy encourages local development of software in order to create a 'vibrant' national ICT sector (MOTC, 2003); however, at the same time, the government has invited major proprietary software companies like Microsoft to service large parts of the public sector (Kikwete, 2006). There is also awareness in the academic environment that open-source software may be 'free' but does require resources for local deployment and implementation.

In this context, it is important to note the emergence of cell phone technologies, although there are no indications that these will be considered for education purposes. Equally, it is noteworthy that there is high motivation for developing an education infrastructure, as exemplified through the TENET initiative (Kondoro & Nungu, 2006), and that this motivation is based on specific challenges such as the teacher-student

ratio faced by most HEIs and their ability to face these challenges.

One of the few initiatives that point in the direction of the use of open-source software is the Tanzania Free and Open Source Software Association (TAFOSSA). Housed at the UCC at UDSM, this initiative was started in 2005 to promote the use of open-source software. TAFOSSA argues that open-source software fits well into the government's vision and stated intention to create national software production (www.tafossa.or.tz).

To date, TAFOSSA has concentrated on and promoted localised Kiswahili versions of Open Office and the Fire Fox Web browser (www.tafossa.or.tz). However, it has not been possible to establish whether this entity does or is intending to play a role in the promotion of open-source software in higher education. According to the web site of TAFOSSA, there are currently no projects in progress and this report found no material specifying formal agreements on the delivery and/or use of open-source software in higher education or other contexts.

Nevertheless, developments in this field are ongoing: the Highway Africa News Agency reports that Nigeria and Uganda have recently joined the Linux Professional Institute (promoters of open-source technologies) and that the East African Centre for Open Source Software (EACOSS), located in Uganda, will cater for Tanzania, too, thereby expanding the country's range of options.

Conclusion

This country-specific report has provided insight into the Tanzanian ICT infrastructure and how it relates to HEIs. Tanzania is currently experiencing significant growth in its telecommunications infrastructure. There has been an equally significant growth in the number of people who own or have access to digital communication devices, with cell phones appearing to have had the most significant degree of penetration. As briefly outlined in the report, rapid development in the Tanzanian telecommunications market means that the cost of owning and using digital devices continues to decrease, making ICTs increasingly accessible to the average Tanzanian.

Since the introduction of the first national ICT policy, which strongly prioritised the education sector, Tanzanian HEIs have been playing an important role in developing the use of ICTs for educational purposes. Despite the challenges faced by most HEIs, such as lack of funding and skills shortages, the priority given to ICT and the education sector by the Tanzanian government could help to address some of these problems.

Overall, there appears to be potential for the continuous use and implementation of ICTs in Tanzanian higher education, and for a strong drive to promote advancement in this area.

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