# THE ROLE OF UNIVERSITIES IN CREATING ICT AWARENESS, LITERACY AND EXPERTISE: EXPERIENCES FROM TANZANIAN PUBLIC UNIVERSITIES

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***Abstract***

*This paper discusses, analyses and gives a way forward on the creation of ICT awareness, literacy and expertise through public universities in Tanzania. Relevant literature and websites were reviewed and interviews with key persons were conducted to establish the current situation as well as potential in Tanzanian universities. The study limited to practical experiences of two public universities in Tanzania found the two to be actively addressing the challenge in various ways; formulation of policies and strategic plans, collaboration with institutions, agents and governments from developed countries, ICT based curricula, establishment of ICT infrastructure, ICT units, e-learning environment, ICT short courses, computer science degree programmes, organization of workshops, seminars and public lectures, use of media such as television, radio, newsletters and websites. The paper, based on this study, recommends that universities should review the methods used to enrich their communities with ICT awareness, literacy and expertise in order to bridge the digital divide gap.*

***Keywords:*** *ICT awareness, ICT literacy, ICT expertise, public universities, Tanzania*

## 1. Introduction

The rapid developments in Information and Communication Technologies (ICT) have a profound impact across all sectors of human live. Broadly defined, ICT covers any product that stores, retrieves, manipulates, transmits or receives information electronically in a digital form. It includes computers, the rapidly changing communication technologies (radio, television, mobile telephone, and internet), networking and data processing capabilities, and the software for using the technologies [18]. ICT is a general–purpose technology that has wide applicability in various sectors. It has strong spread effects and extensive linkages with the rest of the economy by imbuing greater information and development content in products and processes [7]. ICT provides new and faster ways of delivering and accessing information that can improve productivity and earning opportunities, provide effective ways for communication, create new jobs and bring about improvement in the delivery of education, health and other social services.

Despite the vast, new and unprecedented opportunities offered by ICT for human development, there are inequalities across different social and economic groups in reaping such opportunities. It has been revealed that differences in the ability of countries, regions, sectors and socio-economic groups to access and use ICT often follows and reinforces existing inequality and poverty patterns. The disadvantaged socio-economic groups of the society are also the ones with the lowest access to ICT [10]. In general, the benefits of ICT are unevenly spread between and within countries resulting into what is termed as the “digital divide”. Basically, digital divide refers to the gap between those who have access to and control of technology and these who do not. In the process of soliciting efforts to bridge the digital divide, actions from development agencies, stakeholders and the governments are needed. Universities are the type of such institutions that can play a big role in developing and utilizing ICT as well as bridging digital divide by creating ICT awareness, literacy and expertise. In most cases, one of these activities leads to achieving another. For example, in the course of achieving ICT expertise, one is exposed to the available facilities and their usage increasing awareness and literacy.

## 2. ICT awareness

ICT awareness involves knowing about the existence and importance of the ICT tools and their application. Potential ICT users should be enriched with a number of ICT awareness programmes in order to increase the usage of ICT facilities. This can be achieved through promotional programmes which include electronic media resources such as radio, TV and website; print media such as newspapers, magazines, newsletters and notice boards and organization of workshops, seminars, conferences and public lectures. ICT awareness can also be created through the inclusion of ICT courses into students' curricula [9].

## 3. ICT and information literacy: The concept

The term computer literacy has long been used as a description of people's skills and predisposition to the use of computers and information technologies [2]. Computer literacy is defined as "an understanding of computer characteristics, capabilities and applications, as well as an ability to implement this knowledge in the skilful and productive use of computer applications suitable to the individual roles in society" [19]. ICT literacy has emerged as a result of the recent technological advances, which have led to multiple convergences of content, computing, telecommunication and broadcasting. The use of a range of communication tools such as e-mail, video-conferencing and the World Wide Web (WWW) for locating information, and the subsequent dissemination of information are considered to be components of ICT literacy. Therefore, ICT literacy is defined as the use of digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society [2]. Thus, it is the set of skills and understanding required by people to enable meaningful use of ICT appropriate to their needs.

The concept of information literacy first appeared in the literature during the 1970s. Its roots emanate from the emergence of the information society that is characterized by rapid growth in the available information and accompanying changes in technology used to generate, disseminate access and manage that information. These developments have thus created challenges such as the complexity in finding, selecting and using information. Information users/seekers encounter diverse and abundant information choices in their various endeavours. An individual possesses skills that would allow them to evaluate, understand and use information intelligently and ethically [5]. Information literacy is therefore a transformational process in which the learner finds, evaluates uses and creates information in many forms for personal, social or global purposes [11].

In this information age, information literacy is increasingly being equated to ICT literacy [17]. Although ICT literacy includes skills outside the concept of information literacy, such as word processing, there is some remarkable overlap [26]. Thus, there is a narrow boundary between the two concepts implying that they should be treated together. Both ICT and information literacy are important not only to students and staff in universities but to general citizens to enable them to undertake life long learning and participate effectively in the information society.

## 4. Need for ICT literacy

In developing countries, ICT is now becoming a valuable vehicle for supporting lifelong learning and other socio-economic activities, though its use demands appropriate ICT skills, which are still very low. One major way of imparting ICT skills is through ICT based curricula not only in tertiary education but also in other levels of education. Through students' ICT curricula, skills can be

imparted to students in the following areas: ability to independently operate personal computer systems; ability to use software for preparing and presenting work; ability to use the internet effectively and efficiently; and ability to access and use information from the WWW [2].

A survey done in Kenya shows that most of the academics in universities have low ICT skills because most of them were trained in the absence of ICT environment [25]. A similar situation applies to many universities in developing countries, Tanzania included. This calls for ICT training for staff, structured through grouped short courses in order not to interfere with their daily activities.

## 5. Need for Information Literacy

Lack of information searching skills is the main hindrance to the utilisation of available facilities to retrieve electronic information [1]. Information users spend long time searching for literature with limited relevant results if there is absence of information skills. Information literacy skills should be conveyed by a clear curriculum, either via separate module(s) or clearly identified and assessed elements within a core subject curriculum [24]. In some African universities however, meaningful programmes have started to emerge for example, a successful information literacy program for science undergraduate at the University of Botswana that has been integrated in the mainstream curriculum [27]. There is also encouraging information regarding information literacy in selected universities in Kenya [12].

## 6. ICT expertise

ICT expertise provides skills that support the design, development, implementation, installation, user training and maintenance of sophisticated computer technology, communication networks, information services and applications. ICT expertise is achieved through intensive long-term training in relevant areas at diploma, undergraduate or postgraduate level. Due to the rapid technological changes in ICT, short courses can also be used to impart and update ICT experts' knowledge. However, the ICT experts are very few as compared to their demand in developing countries. Besides having inadequate experts, developing countries are compelled to develop capabilities to adapt, maintain, customize, and reconfigure existing ICT solutions to their specific requirements. Universities have to promote the ICT expertise to develop software and hardware to support the local needs. This will minimise resources used for importing ICT tools. Software development will also play a big role in economic development. Lessons from India, China, Malaysia, and Singapore indicate that putting emphasis on building human capital in ICT has a great impact in supporting the ICT industry which has played a significantly big role in economic development as well as in bridging the digital divide [16][1]

## 7. Methodology

A review of websites for the University of Dar es Salaam (UDSM) and Sokoine University of Agriculture (SUA) was conducted in May, 2004 with the aim of getting information on how ICT awareness, literacy and expertise is tackled. In addition, ICT policy and strategic plans and other relevant documents were reviewed. Interviews were conducted in both universities in order to get clarification on the issues raised on the websites and documents reviewed. Furthermore, the experience of the authors as staff at SUA and as postgraduate students at UDSM at different times between the year 2000 and 2004, has helped in analyzing the ICT situation in both institutions.

[1] *Human development went together with the other factors that support the development process. These include policy change, investment in infrastructure etc*

# 8. Some experiences from two Tanzania public universities

The University of Dar es Salaam (UDSM) and the Sokoine University of Agriculture (SUA) are the two major universities in the country. They are the ones, which are relatively developed in terms of ICT infrastructure as well as in creating ICT awareness, literacy and expertise.

## 8.1 University of Dar es Salaam (UDSM)

The UDSM, founded in 1961, is the largest public university in Tanzania. UDSM has three campuses: the Main Campus, Muhimbili University College of Health Sciences (MUCHS) and University College of Land and Architectural Sciences (UCLAS). It has recently acquired the new Institute of Journalism and Mass communication (IJMC) and established the Faculty of Aquatic Science and Technology which are also located outside the Main Campus. In terms of ICT awareness, literacy and expertise, UDSM has slowly but significantly been enriching the university campuses and the community at large with a number of activities: establishment of University Computing Centre (UCC); ICT infrastructure; e-learning environment; inclusion of ICT courses in some degree programmes; ICT short courses and computer science degree programmes; electronic media resources such as radio, website; print media such as newspapers, newsletters, posters, magazines, staff circulars and notice boards and organization of workshops, seminars, conferences and public lectures.

### 8.1.1 ICT infrastructure

It is obvious that ICT infrastructure has to be put in place before ICT awareness, literacy and expertise is created. ICT infrastructure encompasses computers, computer laboratories, computer networks, and other important accessories. Through Technology Enhanced Independent Learning (TEIL) project, the UDSM has managed to complete the computer networks in almost all faculties, institutes, administrative building through fibre optic cabling and also between main campus, MUCHS and UCLAS through 11Mbps wireless connection. It has also established computer laboratories which are called Public Access Rooms (PARs) in almost all faculties, administrative buildings and students' halls [22]. A total of 300 computers have been installed into PARs, 300 computers have been bought and loaned to staff at a reduced rate and video conferencing facilities are now being installed at the University. To enhance the process of teaching and learning, a course management software blackboard has been purchased and installed. In general, these facilities have enabled lecturers to teach more students in different classrooms at the same time [13].

UDSM approved an ICT policy Plan and an ICT Master Plan in 1995 with assistance from Delft (Netherlands) University of Technology. The University Computing Center (UCC) was established and given the role to supervise and offer lectures in all computer related courses, to be involved in research in ICT and to provide computing services and consultancy in ICT to the campuses and the rest of the country. In 2000, UCC was transformed into a limited liability status such that it now concentrates on offering ICT services to the society.

### 8.1.2 ICT awareness and literacy

In the creation of ICT awareness and literacy, UCC organizes computer training for the University community and the rest of the society. It conducts short courses and certificate in ICT through its five centers located in Dar es Salaam, Dodoma, Mwanza and Arusha. **In addition,** Instructional Technology Resource Unit (ITRU) has also developed a Trainer of Trainers course website for encouraging and equipping the academicians as well as students with the basic skills of designing and conducting online course at the UDSM. Currently, the African Virtual University (AVU) and Faculty of Commerce and Management conduct online degree programs where students and teachers have to get e-learning skills in order to interact in online environment. Other units within

the university that conduct ICT user training at a nominal fee include Center for Continuing Education (CCE), Bureau of Industrial Cooperation (BICCO) and University Library ICT Training Unit [13]. As previously noted, inclusion of ICT courses into the curriculum is one effective way of creating ICT awareness and literacy. UDSM has already integrated computer courses into the curricula of all degree programmes in the faculties of Law, Commerce, Education and Engineering in response to computer literacy demands.

Apart from a number of workshops, seminars, public lectures and conferences that are conducted to publicize the existence of ICT and deliver ICT competencies, UDSM uses a number of media to make ICT awareness. They include Mlimani newsletter, UDSM website, posters, staff circulars, notice boards etc. The recent establishment of Mlimani FM Radio is expected to make a big contribution as far as ICT awareness is concerned.

### 8.1.3 ICT Expertise

The UDSM plays a major role in creating ICT expertise in the country through its various computer science degree programs (both bachelor and masters degrees) provided by the Faculty of Science, Prospective College of Engineering Technology (PCET), Faculty of Commerce and Management and African Virtual University (AVU). In addition, UCC promotes ICT expertise by providing long courses (i.e. a diploma in computer science) as well as ICT services and consultancies to the UDSM campuses and to the community at large which include web designing, web hosting, software development, computer networking and internet services.

## 8.2 Sokoine University of Agriculture (SUA)

Sokoine University of Agriculture (SUA) is the second largest university in the country and one of the universities in Africa dealing with the disciplines of Agriculture and related fields. SUA was established in July 1984 from the former Faculty of Agriculture, Forestry, and Veterinary Science of the University of Dar es Salaam. As far as ICT is concerned, SUA has made some advances in the application and creation of ICT awareness, literacy and expertise by establishing ICT infrastructure and policies, a computer centre, ICT short courses, inclusion of ICT course to all degree programmes and the use of media. In that way the university has slowly but significantly made ICT as the central tool for its operations.

### 8.2.1 ICT Infrastructure and policies

In 1993, SUA established the Computer Centre (CC), which is responsible for teaching, research, consultancy and managing all matters related to ICT in the university. In 2002, the Computer Centre established the ICT policy in order to guide the university in appropriate identification, promotion and utilization of ICT. It has also conducted various activities in order to strengthen and promote the ICT utilization, which include: installation of Local Area Network (LAN) with a server that facilitates connections within LAN and the outside world; establishment of two computer laboratories, one at the main campus and another at the Solomon Mahlangu Campus (SMC); internet connection via the Tanzania Telecommunication Corporation Limited (TTCL) [21].

### 8.2.2 ICT awareness and literacy

Computer applications training started to feature in SUA's curricula in 1998. By 2001, computer application courses were already included in all degree programs [21]. Besides, the Computer Centre offers ICT short courses to the community at a low cost though on an irregular basis. Although the SUA Corporate Strategic Plan states that training of SUA staff must be done at least once per year in order to upgrade their knowledge and skills in computer applications, it is unfortunate that this has not been done due to number of reasons including the inadequate ICT staff and facilities at the Computer Centre.

A number of electronic media are also used to promote ICT usage at SUA, which includes SUA website, mailing lists (allsuasa@suanet.ac.tz ), Television (SUATV) and print media (i.e. newsletters, posters, notice boards). Through SUATV, the Institute of Continuing Education (ICE) broadcasts informative programs that include the ICT awareness programme which is called “Elimu na Taaluma” or “Education and Academy” to the Morogoro municipality in Tanzania. However, the effect of these ICT awareness programs has been insignificant due to its small coverage and few ICT awareness programs as well as poor management, less recognition of ICT programmes and inadequate staff to manage and prepare useful ICT awareness programs. In addition, workshops, seminars, exhibitions and public lectures are also used to promote the usage of ICT at SUA.

### 8.2.3 Information Literacy

The Sokoine National Agricultural Library (SNAL), which is also the university library for SUA has an important contribution in the creation of ICT awareness and literacy by providing information literacy programs. Between 2000 and 2001, SNAL used to teach information literacy as a subtopic in communication skills course to all undergraduates students. However, Dulle and Lwehabura (2004) report that teaching of information literacy topics has almost stopped though unofficially due to problems with timetabling; student strikes that interrupted the university academic calendar; shift from term system to semester system which could not accommodate the information literacy subject and disapproval of integrating information literacy programs into the curriculum by the university strategic plan committee. In addition, SNAL conducts information literacy programs through SUA website (http://snalwww.suanet.ac.tz) where information literacy tutorials are available [20]. Other information literacy programs at SNAL includes: conducting library tours and orientation to newly admitted students and any newcomer with a given request and seminars to staff and students. However, some of these programs have been observed to be insignificant due to a number of reasons such as bad timing, large number of students for a single group being oriented, insufficient time spent for the whole exercise.

## 8.3 Challenges on ICT awareness, literacy and expertise in Tanzanian public universities

Tanzanian universities are facing a number of challenges in their struggle to achieve their ICT related visions. Most of these challenges are characteristic to developing countries and they include over-dependency on donor support, low bandwidth, inadequate ICT facilities, underutilization of the few available ICT facilities, inadequate ICT training and failure to retain ICT manpower.

### 8.3.1 Over-dependency on donor support

There is no local manufacturer of ICT equipment in Tanzania and most of the dealers or agents import these products. In addition, the usage of open-source software which relieves the funds constraints is still low in most African countries. Overall, Tanzania has a small emerging skilled capacity to support the ICT industry in terms of developing, selling or supporting hardware and software [23]. Most of the ICT tools are expensive and internet service fees are also too high for most public Tanzania universities because the government provides inadequate funds to public universities which lead them to rely heavily on donor support to acquire computers. For example, most of the computers at SUA and the UDSM are acquired through governmental and non-governmental donor funding agencies based in Scandinavia, Netherlands, Belgium, Japan, United States and Britain. This situation puts the ICT awareness, literacy and expertise in question as they cannot be conducted well if there are no funds.

### 8.3.2 Low bandwidth

Low bandwidth discourages most ICT users in the universities to acquire ICT skills. The recent meeting between SUA and ASARECA staff revealed that most users at SUA complain of spending

a lot of time only to download one document (for example e-journals), that is why they do not see a need to acquire ICT skills and use ICT tools. SUA's bandwidth is as low as 256 kbps and UDSM has 1 mbps international link to the internet [22].

### 8.3.3 Inadequate ICT experts

High learning institutes in Tanzania face a number of hindrances when they seek to build up ICT expertise. Trainers with the necessary skills in Tanzania are often in short supply because there are few computer graduates and the supply of ICT graduates is still low in the country [23]. Such as, the number of annual graduates per million habitants is about 5 percent in Tanzania, where degree graduates in ICT per year (2001/2002) were 25 while Diploma graduates in ICT per year (2001/2002) were 50-150 [8].

### 8.3.4 Inadequate ICT training

ICT skills of teaching staff, researchers and postgraduate students at SUA and UDSM are still low (Busagala, 2001). For example, despite all the ICT investment undertaken at UDSM, the use of ICT is yet to be fully internalized and electronic information fully utilized to justify continued investments [14]. The evidence of limited information searching skills is presented by 72.5% of the academicians, researchers and graduate students of both SUA and UDSM who acknowledged that they did not know how to formulate information queries, only 27.5 knew phrase and possibly Boolean query formulation [3].

### 8.3.5 Failure to retain ICT manpower

Tanzania universities are unable to recruit and retain ICT experts because they are always attracted to the high remunerations (greener pastures) offered by private companies. For example, observations reveal that between 2001 and 2004, about five ICT staff left SUA to work in private companies. Recently, in response to staff retention, SUA Computer Centre proposed to the higher university authority to increase remuneration package to all ICT staff at SUA but the higher authority rejected the idea.

### 8.3.6 Inadequate ICT facilities

ICT facilities purchased by public universities do not suit the increasing demand of the institutions. For example, at SUA, the number of computers is too small as compared to the total population of student and academic staff which is over 2500 and 250, respectively. Thus, the demand for computers is so great that today University computing centres at SUA, UDSM and Mzumbe cannot meet the demand of their students and staff [15].

### 8.3.7 Underutilization of ICT facilities

Most of ICT tools are underutilized due to the low level of ICT literacy within the university communities. [15] observes that at one university surveyed in Tanzania almost every academic and administrative staff had access to a computer, but most of the staff used them only for simple basic functions due to lack of adequate computer skills. The majority of older professors were not accustomed to searching for literature in their specialty subjects or to publishing their research activities on the internet.

### 8.3.8 Lack of local contents

Lack of content relevant to satisfy the needs of local communities in developing countries is now one of the main criticisms levelled against ICT awareness, literacy and expertise. Without local content it is unlikely, if not impossible, that the benefits of ICTs will be realized. For example, in a recent study conducted to find out if African governments are contributing to bridge the content divide through their websites, only 10% of the websites had information resources relevant to their citizens [5]. As higher learning institutions, universities are then challenged to take a leading role in advocating the development of local content that suits the local communities' needs.

### 8.3.9 Language and cultural pertinence

Many of the new ICTs rely on a capability to understand English while most of Africans are more comfortable speaking their own local languages such as most Tanzanians are more comfortable in speaking Swahili. The poor need to have access to information in their own language, and presented in a format that they can easily understand, culturally appropriate and that does not threaten the existence of indigenous knowledge. Since they are more involved in research, universities are then challenged to take the advantage of open source software to develop packages which are in local languages. Such as, other universities should take the example of the UDSM initiative of developing the Swahili Language Interface of Linux software.

## 9. Conclusion

This paper concludes that Tanzania universities contribute to some extent in creating ICT awareness, literacy and expertise in their institutions and to the community at large. Creation of ICT awareness, literacy and expertise in the universities has improved a variety of domains including teaching and learning, research, consultancy, extension and other universities administration and management activities. Similarly, the effects of ICT awareness, literacy and expertise are being felt by the surrounding communities and the whole country. Despite the fact that universities in developing countries face a number of problems in their struggle to create ICT awareness, literacy and expertise, there are a number of lessons from the two universities. They include formulation of policies and strategic plans, collaboration with institutions, agents and governments from developed countries hence availability of funds and technical advice, ICT based curricula, establishment of ICT infrastructure, e-learning environment, ICT short courses, computer science degree programmes and ICT units, use of electronic media resources such as TV, radio, website, mailing list; print media such as newspapers, newsletters, posters, magazines, staff circulars and notice boards; organization of workshops, seminars, public lectures, exhibitions.

A number of recommendations were made, which are expected to help the universities to enrich their communities with ICT awareness, literacy and expertise in order to bridge the digital divide gap in their campuses as well as to the community at large. Those recommendations are as follows:

- Information literacy should be increased or introduced through university curriculum;
- Involving the governments and other stakeholders in the private sector regarding issues related to ICT including creation, literacy and expertise;
- Foster the growth of ICT expertise by conducting research and introduction of computer science degree courses to the universities which do not offer such degree course but already have ICT infrastructures;
- Retain staff by increasing salaries and remuneration packages, by involving them in planning and procurement of ICT equipments and by conducting both ICT's short and long courses;
- Mobilize the usage of free and open source software and Open Course Ware (OCW);
- Expand access and training in ICT to reach the community through telecasters; and
- Commercialise computer centres like that of the University Computing Centre of UDSM in order to increase revenues and remuneration packages for ICT staff retention and to foster ICT expertise growth

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