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# Silent Adoption of Bring-Your-Own-Device in Tanzania Higher Learning Institutions - Adoption Policies

Mawazo MAGESA[1], Camilius SANGA[2]
*Centre for Information and Communication Technology, Sokoine University of Agriculture, Morogoro, Tanzania*
*Tel: +255 23 2640025, Email: magesa@sua.ac.tz, sanga@sua.ac.tz*

**Abstract**: Tanzania Higher Learning institutions (HLIs) have not fully deployed the ICT infrastructure to facilitate smooth performance of their business functions. They have inadequate computers, insufficient network infrastructure, low bandwidth; their computers are ageing and have limited ICT investment. The research examined usage of employees' personal ICT devices for performing office work and the policies, guidelines and practices that can be implemented by HLIs while adopting usage of employees' personal devices in the work environment. As an interpretive research, data were collected through interviews and observations during the survey at HLI, Sokoine University of Agriculture (SUA). Results confirmed inadequate computers, low bandwidth at HLIs and revealed usage of employees' personal ICT devices for office work and for communicating issues related to employers' work. Further, HLIs are not concerned if employees use their ICT devices for office work. It is like HLIs have silently adopted the Bring Your Own Device (BYOD) concept and thus allowed employees to use personal devices to perform office work. The BYOD phenomenon helps to improve the availability of ICT devices at the institution while improving communications and work efficiency and productivity. The research has explored the BYOD concept in Tanzania HLIs and contributed by proposing policies and procedures that can guide in its adoption. Due to its potential benefits, the study recommends HLIs explore how best they can adopt and practise the concept. Further research can explore on the organizational and user characteristics that can facilitate adoption of BYOD.

**Keywords:** Bring Your Own Device, BYOD Policies, Higher Learning Institutions, Information and Communication Technology.

## 1. Introduction

Higher learning institutions (HLIs) in developing countries are adopting the use of information and communication technologies (ICTs) at work and in service delivery. The essence of using ICTs is to improve efficiency in service delivery, enhance transparency and in turn lower transaction costs. In Tanzania, HLIs use ICTs in communication, teaching, management of students' information and results, keeping employees' records, organizing and conducting meetings. In this regard, ICTs have become part and parcel of the HLIs' everyday activities. Therefore, HLIs have purchased different ICT devices, established network infrastructure and ICT laboratories, and even increased access to the Internet through their networks.

However, the effective use of ICTs in Tanzania HLIs is limited by a number of factors such as inadequate computers and slow Internet speed. Inadequacy of computers was among the factors limiting Internet access by students of University of Dar es Salaam (UDSM) [1], and also limiting access to open education repositories by UDSM instructors

 

[2]. Inadequate computers also limited access to subscribed electronic resources by Mzumbe University (MU) library users [3, 4]. Generally, inadequacy of computers is one of the barriers of e-Learning adoption across HLIs in Tanzania [5], and also it is a barrier to adoption of e-learning in promoting the participation of female students in science and technology disciplines [6]. Lwoga et al. [7] also indicated that there was increasing demand for ICT facilities (e.g. computers) in three HLIs in Tanzania (UDSM, MU, and Sokoine University of Agriculture (SUA)).

Low bandwidth leading to slow Internet was also identified as a barrier of using HLIs network infrastructure to access the Internet, due to growing user base (students, employees). Insufficient low bandwidth was among the challenges of enhancing ICT use at UDSM [8]. Slow Internet at UDSM, MU and SUA was found to limit Internet access and hence library facilities failed to live up to the expectations of the information users at all times [9]. Unreliable Internet services and low bandwidth was a barrier for instructors to adopt open educational resources in HLIs [2]. Slow Internet was also among the factors limiting access to the Internet by students while utilizing e-learning in learning at Tanzania HLIs [6]. Further, inadequate computers and lack of Internet infrastructure were among the barriers to the adoption of e-government in Tanzania [10]. It can be concluded that in Tanzania HLIs, computers are inadequate and Internet is slow due to low bandwidth compared to the user base.

Employees in different organizations have been handling the problems of shortage of computers and low bandwidth by using their personally owned devices to perform work-related tasks inside or outside of the workplace. They even access the organization's network and information systems using their own devices. The same, employees in HLIs perform University works and even access the University networks and information systems using personal ICT devices. This gives rise to the concept of Bring Your Own Device (BYOD), which will be explored in this paper.

## 2. Objectives

The objectives of this research are:

1. To examine the use of ICT devices owned by HLIs' employees for performing and accomplishing University tasks and works; and
2. To examine control policies and practices that can be established by HLIs while adopting the use of employees' owned ICT device for University works.

## 3. Research Methodology

This study adopted interpretive case research to learn and understand social reality as shaped by human experiences (employees) in utilizing ICT devices for the employer's works. Interpretive researchers "interpret" the reality though a "sense-making" process rather than a hypothesis testing process. Interpretive research tends to rely heavily on qualitative data and considers respondents as active participants in the study, and their talks and responses are laden with preconceptions, assumptions and beliefs from their cultural settings - thus they create and shape their understanding of ICT usage based on their social context (or work environment). It is well-suited in studying ICT access and use in HLIs due to lack of associated theories and also helps to uncover relevant research questions and issues for research follow-ups.

This study was conducted at SUA, Tanzania. Both interviews and observations were used for data collection and respondents included some SUA staff (5 principals and directors, 23 heads of departments, and 30 normal staff) and students. Interview questions focused on issues related to the use of ICTs at HLIs, technological development, and adoption of ICTs in services delivery. Sample respondents were carefully selected and

involved staff with much information about their departments/units, in order to study the phenomena in depth and in details. Also, through observations, researchers had the opportunities to visit specific places, ask questions and get clarifications.

# 4. Results

## *4.1. Access to and Use of ICT facilities*

HLIs heavily depend on the use of computers for getting their work done (e.g. teaching activities, preparing reports and meeting documents, secretarial services, accounts and finance works etc.). Responses indicated office ICT devices to include desktop computers, laptops and telephones (mostly for internal communication within the University). Responses on ownership of smartphones, mobile phones or tablets at HLIs were not clear.

Responses indicated the ratio of computers to staff varied from one unit/office/department to another. Some administrative offices (human resources, principals, directors, accounts etc.) have a good ratio (see Table 1). However, in some administrative offices, one computer can be shared by more than two staff.

*Table 1 Computers in some Administrative offices*

| Office | Desktop Computers | Laptop | Staff | Ratio |
|---|---|---|---|---|
| CMP7 | 5 | 1 | 7 | 1:1 |
| CMP9 | 10 | 3 | 27 | 1:2 |
| CMP13 | 7 | 4 | 13 | 1:1 |
| CMP17 | 9 | 2 | 10 | 1:1 |
| CMP20 | 5 | 4 | 8 | 1:1 |
| CMP22 | 7 | 5 | 19 | 1:1 |
| CMP23 | 5 | 0 | 7 | 1:1 |

However, in academic departments, much deficit in computers was reported. Responses indicated that in most cases computers are provided to the offices of the heads and of the secretaries and where possible to few academic staff. Table 2 indicates some academic offices with a very low ratio as reported by the interview. Results revealed that most academic staff have no office computers. Responses from academic heads indicated that teaching aids like projectors are not adequate during the conduct of lectures.

Head of academic departments also indicated their concern on the inadequacy of computer laboratories to accommodate students during the specific sessions. A visit to computer laboratories revealed that their capacity could not accommodate students of some degree programs.

*Table 2 Computers in some Academic offices*

| Office | Desktop Computers | Laptop | Staff | Ratio |
|---|---|---|---|---|
| CMP1 | 3 | 0 | 17 | 1:5 |
| CMP2 | 7 | 0 | 16 | 1:3 |
| CMP4 | 9 | 0 | 18 | 1:2 |
| CMP27 | 5 | 0 | 23 | 1:5 |
| CMP28 | 3 | 0 | 10 | 1:3 |
| CMP38 | 6 | 0 | 40 | 1:7 |
| CMP39 | 10 | 4 | 22 | 1:2 |

Other issues that attracted the attention of many respondents were the quality of office computers and the associated installed software. Usually HLIs purchase computers using their funds and sometimes get a donation. Some donated computers are second-hand and after some time they start misbehaving and fail to operate. Responses also indicated that some computers are installed with pirated software and with no genuine anti-virus, making it impossible to update them. SUA is promoting the use of open-source software but interviews revealed that only lab computers are installed with such software. Respondents

also identified some specific software they wish their departments to have but are lacking. Responses and observations revealed that the maintenance and repair of office computers are met by office expenses.

These responses imply that computers are inadequate at HLIs. Employees indicated that they use their personal ICT devices to perform office work. Students also revealed that they use their personal ICT devices for their academic work. So how do HLIs handle such problem? Section 5 will explore the strategy of handling shortage of computers in HLIs.

### *4.2. Internet Access and Communication*

HLIs provide Internet services (IS) and access to IS to users (employees, students) through the available networks. To provide more access points, wireless access points (WAPs) are provided at various places within the campuses where users are allowed to connect their ICT devices to access the Internet. For WAPs, passwords are provided to users to allow them connect ICT devices to the network and ultimately to the Internet.

The means available for HLIs to communicate with employees include sending letters and emails and even through word of mouth. Each institution has an email system and has all its employees registered. With shortage of office computers, one may read email after some time and thus delay in responding. In short, email communication may also not be effective in cases with shortage of computers. Some respondents e.g. CPM6, CPM29 and CPM17 indicated that they responded to some emails late, a day after coming back to the office.

Among the challenges of using the University Internet is the slow speed due to low bandwidth. This acts as a barrier to Internet access. The concerns of the respondents were that communication through the University network is not efficient and adequate. Respondents CPM2 and CPM30 revealed that they failed to make a video conferencing call through the University network. Respondents CPM36 and CPM40 said it was difficult to communicate through the Skype program.

Employees also indicated that they use their personal ICT devices for communicating official matters. Interestingly, employees narrated that customers prefer to call on personal mobile phones rather than office telephones on official matters. Sending and reading emails are also done on personal ICT devices. Due to slow Internet, employees also indicated that they pay for Internet access on their personal ICT devices (e.g. mobile phones) for performing official work.

With growing user base, the current network and the available bandwidth may introduce a considerable delay in communication through the University network. Financial constrain is among the barriers to expanding the University bandwidth. Thus, the next section will also try to explore how communication can be enhanced in HLIs.

## 5. Discussion

So how can HLIs handle the problem of inadequate computers? How can HLIs improve Internet communication? Responses on these questions are time-dependent and the situation is improving with time. However, with recent technological development employees own modern ICT devices like laptops, smartphones, mobile phones, iPhones and tablets and use them for communications and specific work. Responses indicated that both students and employees are using their personal ICT devices to access the institutional information and networks. Employees are even using their personal ICT devices for performing institutional work. Employees are not concerned about using their personal devices for the institutions' work and institutions are not concerned when employees use their personal devices for institutions' works. It is like HLIs have accepted employees to use their personal ICT devices for institutional works and thus silently adopted the concept of Bring Your Own Device (BYOD) in the work environment.

With the BYOD concept, employers allow and sometimes encourage, employees to use their personal ICT devices to engage in work tasks [11]. The BYOD intends to increase flexibility, convenience, and portability of devices that cater to the employee's workflow, which increases productivity and morale [12]. This concept is widely adopted in developed countries. In developing countries, like Tanzania, much are yet to be written with respect to this concept. In Tanzania, BYOD has been only explored while studying how it is practised in small and medium enterprises [13]. This research intends to add to this debate by exploring how BYOD is being silently practised in Tanzania HLIs.

The BYOD concept was first recognized by Intel in 2009 after the increasing demand of its employees to use their own mobile devices in the workplace [14]. After embracing the technology, Intel setup a policy for employee-owned devices, and it was reported that such adoption resulted into increased connectivity to Intel's network, greater employee productivity and improved security measures [14]. BYOD is described as a phenomenon in which employees are allowed to bring their own computing devices to work and incorporate them into the company network rather than using company-owned devices [11]. Other corporations in developed countries that have adopted BYOD include Citrix Systems, Unisys, the White House, Apple etc. [11]. Afreen [15] stated that Intel achieved better productivity and improved security and greater control and also it was expected that by 2014, 70% of the Intel's employees would have been using their own devices at workplace.

BYOD is cost-efficiency to organizations as responsibilities for hardware and software purchase, and maintenance are shifted to the employee, thus the organizations potentially save capital and operating expenses [16]. Also, the ability of workers to access corporate business applications outside official working hours enables them to do their job better. Drury & Absalom [17] agree that, in some countries, wherever there is a high level of BYOD, there is widespread agreement that "always-on" connectivity helps to do the job better. Also, with the recent development of mobile Internet, BYOD makes mobile offices become reality as mobile terminals can surf the Internet anytime and at anywhere [18].

Employers and workers have different expectations of BYOD. Most young professionals expect to be able to access whatever they need from wherever they are in order to do their jobs and Cisco [19] reported that 81% of college students believe they should be able to choose the devices they need to do their job. Schmidt [20] indicated that 84% of IT decision makers believe companies allowing employees to use personal devices for work enjoy a competitive advantage. A survey by Good Technology revealed that more than 76% of companies with 2,000 or more employees were already formally supporting BYOD programs [21]. Due to relative newness of this concept, statistics are not widely available.

Ownership and use of modern ICT devices by employees in Tanzania HLIs provide the opportunity to adopt BYOD concept as a strategy to handle shortage of ICT devices and bridge the communication gap. As no empirical research has been done in Tanzania HLIs, this study seeks to explore policies, procedure and guidelines that can aid in adoption of BYOD by HLIs.

### *5.1. BYOD in HLIs*

Though it is silently practiced, BYOD provides some opportunities to HLIs, which can be regarded as benefits. BYOD enables employees to utilize their ICT devices to fulfil the employer's work thereby covering the shortage of ICT devices at the HLIs. Such usage allows good progress of work conduct and activities. A good example is that most academic staff have their laptops and projectors, which they use for teaching and research activities. The devices are modern and are of good quality and thus operate better with quality performance.

BYOD facilitates communication among staff on matters related to works, while HLIs benefit a lot in such communications. Discussions that are conducted through WhatsApp groups in smartphones and mobile phones, communications through calling and sending messages all help HLIs to accomplish their works and mission. Also, employees access the University Internet through their ICT devices and sometimes pay for Internet access on their ICT devices.

BYOD does not overburden HLIs with the purchase of ICT devices and software license. Employees are responsible for purchasing ICT devices, software licenses relevant to them and for the maintenance of the ICT devices.

Interestingly, BYOD makes employees feel more productive while using their quality personal devices. Having all of their data and work accessible on one device allows employees to access them at any time and place. This results in time reduction needed to complete tasks, which in turn increases flexibility and productivity.

However, BYOD is risky to an employee when a device with employer's work or data is lost or even when such data or work is exposed to an unintended or unauthorized person. If the work is confidential or attracts the attention of the mass, such exposure may help in its rapid spread and transmission.

### *5.2. Adopting BYOD*

To adopt BYOD and improve its management and security, HLIs must rely on written procedures, policies and guidelines that stipulate requirements that employees must follow. These give employees more flexibility to use their preferred ICT devices and applications at work. Policies can stipulate how data and work can be protected, including exit strategies when an employee ceases to work with the institution. Policies define the rights and duties between employees and the institutions, including the institution's right to access the employee's device for security reasons. The policy also outlines the procedure during termination of employment, as well as disciplinary consequences for violations.

The HLIs ICT policies [22-24] do not currently address the use of employees' ICT devices for office work. However, in its ICT regulations, SUA allows users to only connect their personal laptops, desktop computers and mobile phones to the University network. Thus, the regulations are also silent about the use of personal ICT device for office work. As BYOD is silently adopted within HLIs, the following sections will discuss policies and procedures that can guide in its adoption.

### *5.3. BYOD Policies*

A BYOD Policy covers an employee's acceptable use of personal ICT devices on institution networks, defines security controls, and describes supported devices and applications. It also outlines the institution's position and governance on the use of such devices and ensures that the institution's data and works are protected and the network security is not compromised.

Results in sections 4.1 and 4.2 show that BYOD spans many functional areas within a HLI, involving academics, human resources, legal, accounts, finance and library. As some units address confidential and secret data (e.g. academic, legal, accounts human resources), BYOD needs to be approached from multiple perspectives while providing controls relating to data, access, networks, managing devices, while creating explicit policies and procedures [25]. Thus, BYOD control policies and procedures can be established by considering the following:

1. Compliance to BYOD ICT policy
   It is expected that users of personal devices for office works should comply with ICT policies stipulated within the University ICT policy documents. These policies guide on access to data and applications at the University, security mechanism for

protecting data and devices, users' behaviour while accessing the Internet, disaster recovery mechanism and adherence to appropriate ICT standards. Compliance means acceptance to the BYOD policies. Compliance will also help to establish a policy that helps to know who owns what ICT device(s). Exit Strategy should also be set for employees who stop working with HLIs or who stop using his/her device for office works.

2. BYOD acceptable activities for office work
   Responses on whether all activities can be done in personal ICT devices have some implications. Some responses were:
   -- secret documents should only be done on office computers and should not be taken home
   -- confidential work are done by specific employees and should not be disclosed to unauthorized employees. It is best if such work is done on office computers.
   This implies that with BYOD, some identified work can only be done on office computers. Thus, policies should stipulate which work should only be done on office computers.
3. BYOD with Information security standards and procedures
   Among the risk of BYOD is exposure of data and works to unauthorized persons. Policies should set sufficient level of security standards and best security practices to help HLIs implement effective security control mechanisms and integrity of information. Best security practices may include use of up-to-date software, installation of security software, immediate report lost or stolen devices, discourage employees from downloading unverified and untrusted applications and ensure employees activate lock screens [26].
4. BYOD with principles of Information privacy
   Information privacy or data privacy is the ability of the individual to personally control information about one's self and has been called one of the most important "ethical" issues of the information age [27]. Guidelines and procedures on how to protect private and confidential information can be stipulated by policies dealing with Information privacy. Thus, HLIs need effective methods to preserve the confidentiality, integrity and availability of information accessed by personal devices [28], whilst preserving employee's privacy rights because in most cases, HLIs privacy concerns of BYOD are also linked with legal concerns [29]. Among the internally recognized information privacy principles were provided by the Organization for Economic Co-operation and Development (OECD) privacy principles [30]. Among the principles which can be adopted by HLIs include lawful collection of data, relevance of data, purpose of data, use of data for specified task, safeguarding of data, consent of individual to provide data, and accountability principle.
5. BYOD Liabilities
   Once adopted, BYOD becomes a University issue guided by laws and regulations. The Legal units need to ensure that both the HLI and BYOD employee's liability risks are well managed and contained. When either HLI data/work or employee's data is exposed, either intentionally or not, neither the employee nor the HLI will accept to be liable. Therefore, when setting policies, employees' liability must be assessed for HLI's data, legal ramifications of damages must be considered, and HLIs liability must also be assessed for BYOD employees' personal data [31]. HLIs should therefore proactively devise and manage effective BYOD policies so that both employers and employees can reap the benefits of leveraging BYOD in the workplace.

6. BYOD Awareness
   Various issues pertaining to BYOD need attention and awareness of employees. BYOD Issues like security of data, data privacy and legal liabilities need to be known to employees. Thus, awareness through training, seminars or workshop can serve to acquaint employees with BYOD issues. Awareness activities help employees to become aware that there are concerns for issue related to BYOD and that they should respond accordingly. Security awareness and training for most employees would involve awareness of the security problem and training to create competent security skills [32].
7. BYOD with established common storage facilities
   Data and work done on employees' devices need to be accessed even when his/her employment contract ends or even when such devices are lost or fail to function. Policy and procedures can be established that require works done on individual devices be later transferred to a common storage device. Such storage device owned and maintained by HLI, may assure the availability and security of such data and works done on individual devices whenever required.

## 6. Conclusion and Recommendations

This study has explored how the BYOD concept is silently adopted within HLIs. As a fact, and as stated in the National ICT Policy, many large organizations and institutions in Tanzania are making extensive use of networked computers with Internet access and are embracing the use of ICT in their daily operations [33]. However, such policy also acknowledges shortage of ICT devices, inadequate human resources, and shortage of sectors-specific ICT solutions. BYOD as a practice is seen significant in this situation of limited resources to allow for smooth conduct of organization's businesses.

With adoption of BYOD, institutions can concentrate on developing ICT solutions relevant in their business functioning and on providing training on developing skills of employees on specific technology use. Users can practice BYOD in performing their assigned functionalities due to varieties of ICT devices.

Due to potential benefits of adopting BYOD by institutions, this study recommends institutions to explore how best such a concept can be adopted. Based on the findings and employing existing IS frameworks such as Technology, organization, and environment (TOE) framework, one can study the adoption and assimilation of different types of IT innovation within an organization. Characteristics of the available technology used by employees within an organization, characteristics of an organization and external environment characteristics (e.g. national ICT policy, national Internet backbone, GDP etc.) can all be studied, thus facilitating BYOD adoption and its practices within an organization. The ultimate is to formulate policies and set regulations that can guide BYOD adoption and practices.

This research has contributed to BYOD knowledge by examining it in the context of HILs and proposing policies to guide its adoption. Based on the TOE framework, further studies can research the characteristics (organizational and external environment) that can facilitate adoption of BYOD within different organizations. Since this study has concentrated on users' perspective of BYOD but not on the characteristics that can facilitate its adoption, further researches therefore should draw attention to users' characteristics that can motivate adoption of BYOD and its ultimate satisfaction. Lastly, as BYOD pushes much costs to employees, research can be conducted that can measure the cost expenditure of employees using their personal devices for office work.

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