Investigating The Use Of Mobile Computing In Zimbabwe Polytechnics: Case Of A Polytechnic In Zimbabwe

Sibanda Mavellas, Musungwini Samuel

ABSTRACT: Mobile computing has become an invaluable and inevitable part of teaching and learning in educational institutions globally. Zimbabwean polytechnics are not spared and those institutions that have chosen to integrate mobile computing with existing teaching and learning applications stand to benefit more than their slow and stagnant counterparts. This paper is investigated whether mobile computing is being used in Zimbabwe Polytechnics. It is based mainly on primary research since no particular research has targeted Polytechnics in Zimbabwe and specifically the Polytechnic understudy in this area, thus a survey was conducted and the survey results were used as the main data source. However, secondary research was incorporated to see what other researchers have found in similar topics the world over. This paper identifies the mobile computing hardware technology, software and communication technologies used at the Polytechnic. It then outlines the achievements made in this area and the associated benefits of such achievements. Finally highlights the challenges currently being faced by the polytechnic in implementing mobile computing and the opportunities the institution can exploit by fully utilizing the technology. The main findings of this research were that Zimbabwe polytechnics in general and the polytechnic in particular have adopted usage of mobile computing to enhance their teaching and learning and administrative activities. There are visible and tangible achievements and benefits that have been realized. Opportunities have been identified which the polytechnic can exploit if it fully embraces mobile computing. However there are some challenges hindering the progress in this regard.

INDEX TERMS: Mobile computing, hardware, software, communication technologies, technology, achievements, benefits, opportunities

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1. INTRODUCTION
In the period prior to 2003 Polytechnics in Zimbabwe had a mix of Information Communication Technologies (ICTs), varying from one institution to the other. There was no uniformity as to what ICTs individual institutions invested in, so while some institutions had several computer laboratories of clone desktops, some did not have even a single lab. While some had connected to the internet through the dialup system which came through telephone lines, some had no idea what internet was.A breakthrough came in 2003 when a non-governmental organization called VVOB, a Belgian abbreviation which translates in English to Flemish for Technical Assistance, came in with a project called the College Information Technology Enhancement Programme (CITEP), which helped to finance, train personnel and equip polytechnics with standard computer and network infrastructure (VVOB project document, 2003). They conducted training workshops for personnel, procured standard desktops, and installed fibre internet connectivity and setup Ethernet networks in these institutions. This project became the basis for mobile computing in Polytechnics. When the project ended in 2008, the institutions were now coordinated and some managed to go a step further by installing wireless access points within institutions using the fibre backbone. This allowed staff and students who had WIFI enabled devices to be able to access internet and research

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outside staff and lecture rooms, send and receive emails and communicate on social networks. This Polytechnic in particular, was one of the first institutions to install the wireless access points that accessed internet through the main fibre backbone. In 2009 it went on to procure laptops for staff members, starting with senior management, the Heads of departments and finally lectures. Students were then allowed to bring their own devices which could be configured to be able to access institutional WIFI (The Polytechnic ICT policy document, 2010). This was the beginning of mobile computing at the Polytechnic. Since then further strides were made in such areas as installation of applications that run on mobile devices through wireless connections, increasing internet bandwidth to improve speed as demand for internet went up, upgrading wireless access points to improve strength of connectivity, upgrading of servers to handle the demand and volumes and expansion of campus area network to cover the whole Polytechnic, procurement of more mobile devices. And the institution now boasts of such things as e-learning, m-learning, m-education, among other technologies that are giving it a competitive advantage over sister Polytechnics.

2. RESEARCH OBJECTIVES
Research objectives are the evidence of a researcher's clear sense of purpose. They lead to greater specificity (Saunders et al, 2009). The following are the objectives of this research: -
1. To determine the hardware technology, software and communication systems used by the polytechnic community.
2. To determine the purpose for which mobile technology is being used.
3. To identify achievements and associated benefits of using such mobile technology at the institution.
4. To identify the challenges the Polytechnic is facing in trying to fully utilise mobile computing and ways of mitigating them.
5. To identify opportunities the institution can exploit if it fully embraces mobile computing in teaching and learning.

3. LITERATURE REVIEW

Zimmerman (1999) in his article titled "Mobile Computing: Characteristics, Benefits, and the Mobile framework" defined mobile computing as "the use of computing devices, which usually interact in some way with a centralised information system while away from the normal fixed workplace". He went on to say that, Mobile computing technology enables the mobile person to create, access, process, store and communicate information without being constrained to a single location. It is on the above basis that this researcher views mobile computing as embracing a host of portable technologies the can access internet using wireless fidelity (WIFI). These range from notebook computers to tablets, to smartphones and e-book readers. Such devices have brought about Mobile learning (m-Learning) in Zimbabwe Polytechnics, enabling staff and students to share academic resources, be able to research and develop applications from wherever they are. Zimmerman (1999) went on to identify mobile computing hardware, software and communications in use then. He identified hardware as palmtops, clamshells, handheld Pen Keys, pen slates, and laptops. The characteristics of such devices in terms of screen size was small, processing capability was limited and supported a few mobile applications. Over the years mobile devices have improved in such characteristics to make mobile computing easy, fast and user friendly. Great improvements also came with the associated systems software, with the modern devices now running on Android, Symbian and windows 8 mobile, as compared to then when MS DOS, Windows 3.1, Pen DOS were used. In communications Zimmerman talked of internet speeds in kilobytes per second (Kbps), while today's communications devices have speeds of gigabytes per second (Gbps). This shows that there has been upgrading and improvement in mobile computing device characteristics since Zimmerman's research up to now. Dahlstrom (2012), a senior research analyst at EDUCAUSE, in his article titled "Executive Summary: Student Mobile Computing Practices—lessons learned from Qatar" says that students find Mobile technology convenient and engaging and institutions need to invest more in mobile device use and support. In Qatar the Education City conducted a survey jointly with ECAR (Every Child a Reader) of United Kingdom (UK) on student mobile computing technology and the results were not only relevant to their student's experiences but also speaks to the global revolution of mobile technology in the academic environment. The findings revealed that, for students, technology plays an important role in productivity and communication, students want technology integrated into their academic experience and students want to better utilise mobile technology in their learning environments doing such things as creating content for course assignments, accessing course related material and pushing the limits of mobile device productivity. Kim et al (2006) identified the benefits of using mobile wireless phones as freedom of location and time, increasing speed in teaching and learning, enabling one-to-one learning based on individual educational histories or test results, better communication opportunities and better collaboration in group discussions. They also identified the specific benefits of using Personal Data Assistants in m-learning as mobility, information management capacity, beaming capability, ability to work in many places and replacement of pen and paper. A UK essays website argued that the major challenge for educators and trainers is how to develop learning materials for delivery on mobile devices. The site says the learning material must be manageable and make use of multimedia (UKessays, 2014). Earp(2011) in his article titled "Mobile computing in education" identified the following as student benefits from mobile computing: access to information whenever they want, improved productivity with smart applications, saving money and the environment, sharing of information with peers, collaboration with peers, harvesting information that helps to learn, having fun with learning. He further identified the following as benefits to Colleges: move from paper to digital system, better connection with alumni, organise events easily, improved reputation, production of industry ready students, recording events and share with students, improved evaluation system and database and better placement system. It is this researcher's view that the benefits identified by Earp are real since most of them are similar to the ones identified in this research.

4. METHODOLOGY/ RESEARCH STRATEGY

This research is based mainly on the case study research strategy, using the polytechnic as a case. This researcher developed a survey questionnaire which was used as the main data source. A sample of four hundred respondents (N= 400) filled and returned the questionnaires. One hundred of the participants (N=100) were staff members and three hundred (N=300) participants were fulltime students. The survey explored the characteristics of mobile devices being used in the form of hardware technology, software and communication systems, achievements made and benefits to the polytechnic, challenges the institution is facing in this regard and opportunities it can exploit by fully utilising mobile computing. The questionnaire included both closed and open-ended questions. General observation of what type of mobile devices the Poly family uses, for what purpose and using what technology was also done to corroborate the data obtained through questionnaires. Secondary research was done to analyse what other researchers found out in similar researches. Little of this was used in this research since most were not applicable to this Poly scenario, but they served a great purpose of indicating the mobile computing usage and trends in institutions of higher learning globally.

5. FINDINGS/ RESULTS

i. MOBILE COMPUTING HARDWARE TECHNOLOGY AND OWNERSHIP

A. STAFF

This research revealed that 20% of staff members use tablets, while 50% use smartphones and 80% use laptops. No staff members were found to be using e-book readers and palmtops. It should be noted that among the respondents there are some who own and use more than one device hence the percentages adding up to more than 100%. Figure 1 below summarises the above information.

FIGURE 1
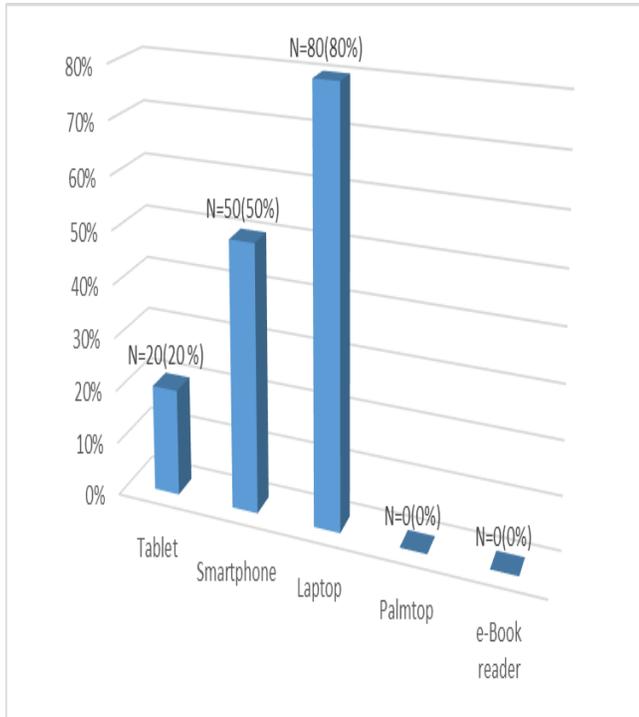
ANALYSIS OF FINDINGS ON HARDWARE TECHNOLOGY AND OWNERSHIP

The fact that no one owns and e-book reader or palmtop for both staff and students is not weird. The coming in of smartphones with QWERTY keypad style and touch screens and ever improving processing capabilities has pushed standard palmtops off the market, hence they are no longer available in ICT shops across the country. The Polytechnic community does not have e-book readers because the institution has installed an eGranary system that enable access to eResources via wireless local area network (LAN). This is also because of the fact that eBooks are not available for sell off –the-shelve here in Zimbabwe, they are available in online shops which are international and require credit card payment system to buy them, a method that is not widely used in this country. The high usage of laptops shows that the polytechnic community is still limited in terms of its mobile teaching and learning given that laptops have low battery life, hence the user is forced to go where there is electrical power thereby reducing mobility.

ii. MOBILE DEVICE OPERATING SYSTEM IN USE
A. STAFF

It was discovered that 80% of mobile devices used by staff run on Windows, while 50% are on Android and 20% on Symbian. There were no devices used by staff running on MacOS or Linux. Figure 3 below illustrate this information

B. STUDENTS

This research revealed that 25 % of the sample students own and use Tablets, while 35% use smartphones and 50% use laptops. This information is summarized in figure 2 below:-
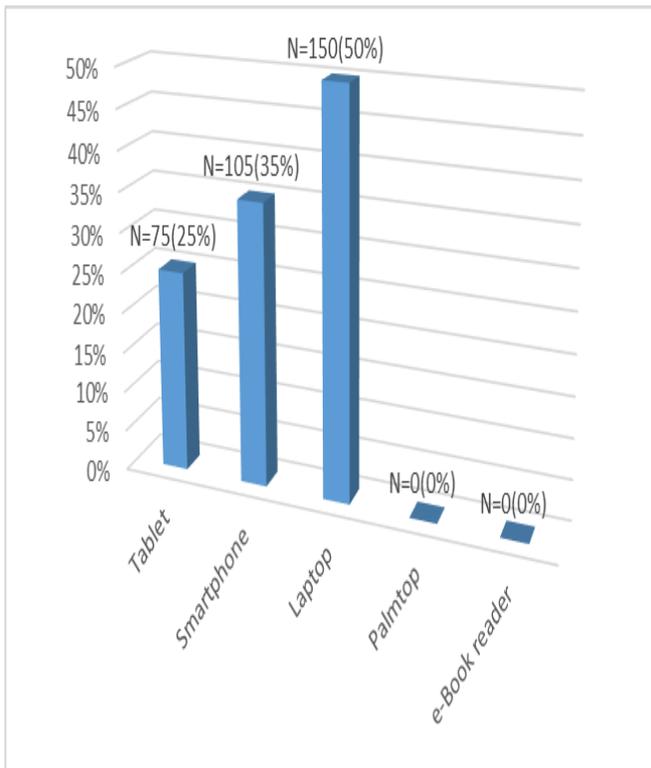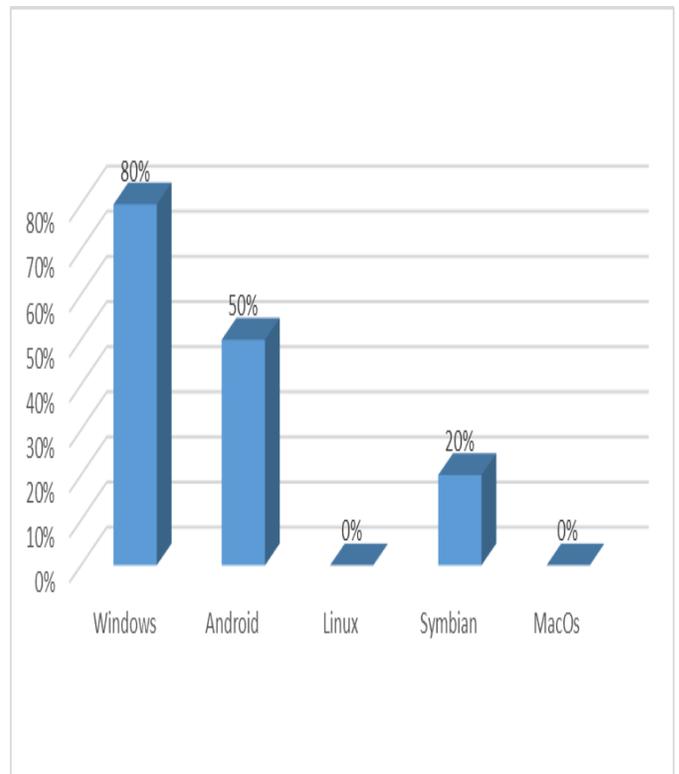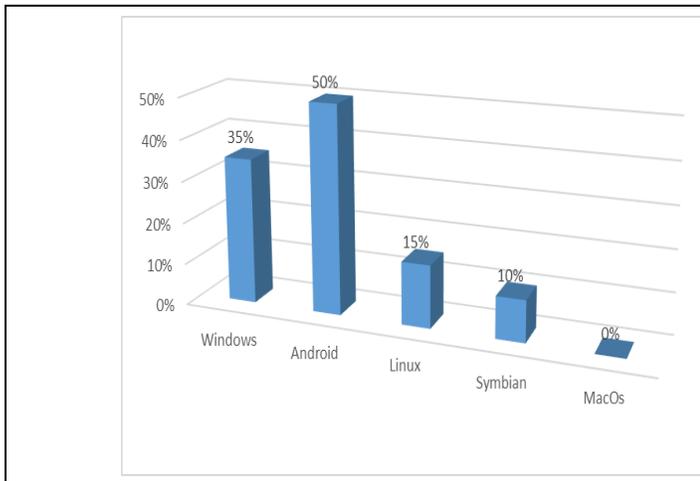
FIGURE 3

FIGURE 2

B. STUDENTS

35% of student devices were found to be running on Windows, while 50% run on android, 10% on Symbian and 15% on Linux. Figure 4 below illustrates this information.

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FIGURE 4

ANALYSIS OF FINDINGS ON DEVICE OPERATING SYSTEM

The high usage of windows as an operating system is because the polytechnic community uses laptops which usually come laden with windows. Android is second because most smart phones and tablets run on the operating system (OS). There were no devices running on MacOS because there are no users of Apple products that is the IPad and IPhone, which are generally regarded as classy and expensive, hence beyond the reach of many. The few with Linux run devices were laptops for Information communications technology (ICT) students who realise the benefits of such an OS. However all the OSs in use support WIFI and internet connectivity and use of any would not stop or slow down mobile computing.

iii.   COMMUNICATION TECHNOLOGIES IN USE

100% staff and 100% students confirmed usage of the wireless LAN and the internet for communications and research. Some 50% however indicated usage of Bluetooth as a third communications technology. No one uses radio and satellite as means of communication. This is illustrated by figure 5 below:

FIGURE 5
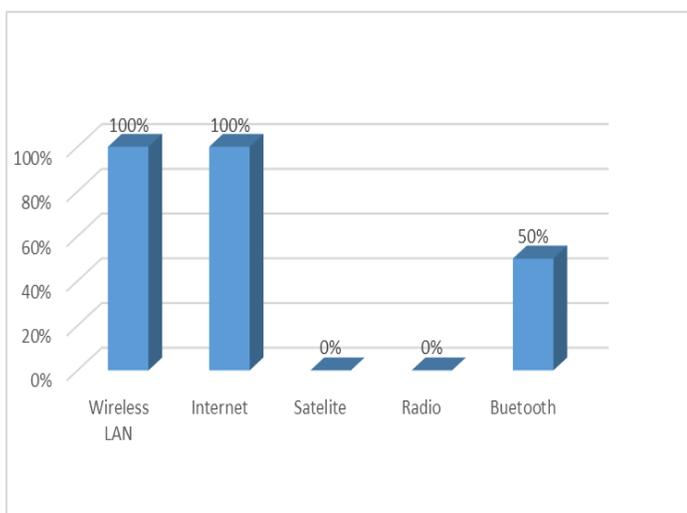
ANALYSIS OF FINDINGS ON COMMUNICATION TECHNOLOGIES

The polytechnic community uses wireless LAN and Internet because the Institution has LAN infrastructure through which all its applications run. Such applications are accessed by mobile devices through wireless connectivity to the LAN, while some are available over the internet that is accessible by WIFI enabled devices. For small scale transfer of files some use Bluetooth. There is no infrastructure for satellite and radio connectivity; hence they are not in use.

iv.   PURPOSE FOR WHICH MOBILE DEVICES ARE BEING USED

This research has revealed that, at the Polytechnic, mobile devices are being used mainly to access the following Applications:-

A.   eGRANARY

This network based system in which a server that stores over 30 million eResources is used as an eLibrary. The server is accessible by mobile devices via the wireless LAN. It reduces internet consumption and its contents can be changed or upgraded after two to three years. Staff and students are using this system for research and can be accessed from anywhere within the campus via mobile devices.

B.   eLEARNING (MOODLE)

The polytechnic is using a learning management system called Modular Object Oriented Dynamic Learning Environment (MOODLE). This platform is accessible over the internet through the institutional website. Staff are able to load notes, assignments, hand-outs and any other learning material on the platform from wherever they are and students are able to respond to assignments, ask lecturers some questions anytime from anywhere as long as they have a mobile device with wireless internet connectivity.

C.   E-MAIL

The Polytechnic has a registered domain (www. *******.ac.zw). Staff and students have email addresses based on the domain which they access as web based mail through the website. So from anywhere staff and students are able to access, send and receive emails and the platform is used for teaching and learning purposes. As long as one has a mobile device with internet access they can use this facility to effectively communicate.

D.   PASTEL ACCOUNTING

This is mostly used by accounts and administration staff for their financial administration. With relevant credentials users can access this system via the wireless LAN from anywhere within the institution.

E.   GENERIC APPLICATIONS

There are several other generic applications which staff and students are utilising through possession of mobile devices and internet connectivity. They are using the office suite, mostly the presentation and word processing applications. They are also using such Apps as google talk, WhatsApp, Facebook, twitter, skype. General internet browsing for purposes of news, entertainment and research using search engines like Google and Bing also make a big part of mobile device usage.

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ANALYSIS OF FINDINGS ON PURPOSE FOR WHICH DEVICES ARE USED

The polytechnic has some centralised systems that run through the LAN. Such systems cannot be accessed outside campus. This limits mobility of their users. The institution must make all its centralised systems accessible from outside the institution to enhance mobility and flexibility of its users. The use of extranet based systems coupled with those that are currently running on internet would go a long way in improving mobile computing. There is also need to increase the number of tailor-made centralised systems for purposes of teaching and learning, which should be accessible via mobile devices.

v. ACHIEVEMENTS

The following were identified as achievements made by the institution in trying to promote mobile computing:-

- The installation of wireless access points to enable access to LAN and internet through mobile devices.
- Procurement of laptops for staff.
- Increasing internet bandwidth from 2Mbps to 10Mbps.
- Engaging in public private partnerships with a mobile operator to provide additional wireless inter connectivity.
- ICT skills upgrading for staff.
- Installation of the eGranary, pastel accounting, webmail and eLearning software.

vi. BENEFITS

The following were identified as benefits of embracing mobile computing for both staff and students:-

- Wider access to teaching and learning material
- Effective communication amongst staff and students
- Improved research through the use of internet and eGranary
- Ability to work from anywhere and anytime
- Ability to share existing resources
- Reduced physical interaction between students and lecturers

vii. CHALLENGES

This research revealed the following as challenges the institution is facing in trying to improve mobile computing:-

- Limited financial resources to move with mobile technology trends
- Inconsistent internet connectivity, low bandwidth and congestion
- Electricity outages, since low battery life devices are used by majority, which require constant battery recharge.

viii. OPPORTUNITIES

The following were identified as opportunities the polytechnic would exploit if it fully embraces mobile computing: -

- Improved research and development which would benefit the polytechnic in particular and the nation at large.
- Reduced student –lecturer contact hours, thereby giving students more time to work on their own and fully utilise their potential without the inevitable control that comes with lectures.
- Wider access to teaching and learning resources improving institutional sources of knowledge.
- Improved pass rate and productivity as staff will not be constrained by physical location for them to work.
- Decongestion of Desktop computer laboratories.

6. CONCLUSION

This research investigated the use of mobile computing in Zimbabwe polytechnics, using the polytechnic as a case. A survey coupled with observations have confirmed usage of mobile computing technology at the polytechnic for purposes of accessing centralised information systems and other generic applications that support teaching and learning. The achievements made to date, benefits and challenges facing the institution are similar to what similar institutions are facing globally. The development of mobile technology is increasing and advancing and the polytechnic is failing to cope with the pace in terms of mobile devices and centralised systems. However quite a number of opportunities awaits the institution if it fully embraces mobile computing and move with the times.

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