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Utilisation of Information and communication technologies in the health sector: A case of public hospitals in the Midlands region, Zimbabwe.

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Abstract

Information and communication technologies (ICTs) are becoming a part of every aspect of life and all industries including the health sector are embracing ICTs in order to improve efficiency and productivity in their day to day operations. The use of ICTs in the health sector has been seen to improve healthcare delivery. The purpose of this study is to investigate the extent of ICT utilisation in the health sector in Zimbabwe. The study further examines the benefits of using ICTs and the challenges faced in the usage of ICTs in the sector. The study followed an exploratory research design where a structured questionnaire was used as the main tool for collecting data. The questionnaire was administered to 80 healthcare professionals and the data that was collected was analysed in order to determine the extent of ICT usage. The study revealed that although there was some reasonable use of the available ICT technologies, the ICTs were used insufficiently to manage patients. The perceived benefits of using ICTs that were identified included improving patient management, enabling collaboration among health professionals, improving availability of clinicians during emergencies and improving efficiency and productivity. The strongest ICT usage barriers found were high cost of ICT facilities, lack of adequate ICT facilities, poor connectivity and inadequate access to ICT facilities.

Keywords: Information and communication technologies, Healthcare professionals, Healthcare sector, ICT utilisation, Zimbabwe

Introduction

Paul (2003) defines Information and Communication Technologies (ICTs) as a variety of technologies that allow users to get, produce and share ideas and resources. The technologies consist of computing technology which enables users to transmit, store, access and manipulate information, (Adeleke et al., 2015). The technologies make possible the managing of information and facilitate different forms of communication. ICTs allow people who are in different parts of the world to communicate instantaneously and people are able to gather and access information resources from databases anywhere in the world. ICTs encompass the wide range of technologies from radio, film, television, press, telephone, theatre and video, to electronic systems such as e-mail, e-commerce and the internet.

Information and communication technologies are becoming an important aspect of life. There is widespread use of ICTs in people's daily activities such as buying goods, services and even when socialising. These technologies are also being widely used in organisations and they have affected the way business is carried out and how different entities compete (Barnes and Hinton, 2007). Organisations that have embraced ICTs are moving away from the conventional manual ways of doing business and ICTs have enabled the efficient running of almost all industries in any economy of any country.

The health care delivery sector is one sector that has also been affected by the use of ICTs. The development, growth and use of ICT products has transformed the current healthcare systems in areas such as patient management, communication with colleagues and end users, training of healthcare providers and storage and retrieval of up-to-date health information (Bello et al., 2004). Gates (1999) indicated that American doctors were now able to collaborate with other doctors all over the world as often and as quickly as they wanted through the use of ICTs. Healthcare professionals can now get feedback on areas of interest from experts who are in remote locations within a few minutes. The availability of ICT has made possible the immediate and unprecedented access to the most recent and reliable results of clinical research and good healthcare information in everyday medical practice, (Adeleke et al., 2015).

The provision of quality health-care delivery in a country is guided by the level of the ICT infrastructure possessed and used by that country. A good ICT infrastructure, therefore, is a prerequisite for enhancing the well-being of a country (Hassan, Siyanbola & Oyebisi, 2011)). To ensure growth in the ICT sector, the Government of Zimbabwe and the private sector have made relevant investments. These include new fibre optic links being deployed to improve international connectivity via neighbouring countries with access to international submarine fibre optic cables (Kelly & Cook, 2011). The private sector has carried out similar projects where they linked major cities using optic fibre. These projects have facilitated reliable, high-speed, affordable networks, (Tsokota and Solms, 2013).
Despite the investments made to improve the ICT sector, the Government of Zimbabwe has not fully embraced ICTs in most of its operations since most processes are still being done manually. This shows that there is still a low uptake of ICTs by most government departments, (Tsokota and Solms, 2013). The government should adopt and use ICTs in its operations in order to encourage adoption by the domestic market. In other industries or sectors the usage levels are still very low and ICTs are currently being used for basic functions. Zanamwe et al. (2012) revealed low usage levels in the pharmaceutical sector and there are also low usage levels in agribusiness, (Mupemhi, Mupemhi, & Duve, 2011). The adoption and usage levels in Small and Medium-sized Enterprises (SMEs) is also still very low and the majority of SMEs are yet to adopt the technology (Mashanda, Cloete & Tanner, 2012). While most banks in Zimbabwe have adopted ICTs, usage levels have remained relatively low, (Dube, Chitura & Runyowa, 2009).

Research has shown that regardless of the rapid increase in ICT investment and the benefits associated with adopting ICTs, uptake and acceptance has been slow. It is against this background that this study attempts to firstly determine the extent of ICT utilisation in public hospitals in Zimbabwe, determine the benefits of using ICTs and the barriers of using ICTs in the health sector. While similar researches have been carried out in both developing and developed countries, a study in the Zimbabwean context is imperative. Zimbabwe has got a unique environment as compared to other countries due to its unique economic and political background. Research results from other countries cannot therefore be directly transferrable to Zimbabwe.

Literature Review

ICTs in the health sector

Healthcare experts and healthcare consumers believe that ICTs play an important role in transforming healthcare services (Chaudhry et al., 2006). ICTs are making it possible for the health care sector to move away from the traditional, manual way of delivering health care. The technologies are now facilitating a variety of tasks which include researching, collecting information from patients, and cross-checking patients' histories. Health professionals are kept updated on knowledge concerning diseases, drugs and

new research findings. Basically the ICTs support information processing, record keeping, decision making and enables interactivity between or among users of the technology.

ICTs have not only proved successful in supporting health care processes but they have managed to make these processes easier and faster in spite of distance, location or time. Odousoro (2014) specified that ICTs enable simultaneous distribution, processing, retrieval and reception of information worldwide. ICTs enable Health care professionals to have access to up-to-date information from online databases and other health care experts. Doctors are able to collaborate with other doctors in other parts of the world and are able to share experiences with colleagues, (Gates, 1999). The doctors are able to make real-time decisions about life threatening cases because of the easy and fast access of relevant information.

Benefits of ICTs in the Healthcare sector

Various benefits of using ICTs in the healthcare sector have been cited by various researchers. Odousoro (2014) revealed that healthcare professionals are able to better diagnose diseases, and are able to use clinical decision support systems to make better decisions. He further indicated that ICTs have made available medical tools such as electronic health records and diagnostic tools that improve the management of patients and their records. Patients with chronic diseases like diabetes can be monitored and managed effectively through ICT based technologies. The ICTs will be used to monitor the trend in the clinical parameters and to quickly detect any deviations.

Health care providers that have adopted ICT technologies have disclosed that ICTs can improve the quality of service and efficiency in health care (Shekelle & Glodzweig, 2009). The researchers further revealed that quality of service is enhanced through improving the safety of patients by eliminating errors like inattentiveness, lack of knowledge and poor judgement. Health care professionals are able to execute their functions faster, therefore attending to a larger number of patients and initiating treatment without delay, (Chaudhry et al., 2006). The adoption of ICT technologies also enables the reduction of operating costs of clinical services through the efficient processing of data and documents.

In addition, medical practitioners have to carry out researches on the epidemiology of different diseases, disease detection and which treatment modalities have the best outcomes. These researches are carried out because medical knowledge evolves with time. Therefore, medical practitioners need to have access to a wide range of information in order to carry out the researches. These researches are made possible through access to ICT technologies like the Internet, (Odousoro, 2014). The Internet enables the health workers to have access to any information of interest relating to health care and they are able to identify current research issues, review previous researches, access clinical trials, drug databases, clinical decision support tools and published research findings. Godlee et al (2004) concluded that health professionals should have access to universal health care information so that they acquire up-to-date information which is essential to improve patient care.

The adoption of ICTs in the health sector enables interaction between patients and practitioners and interaction among practitioners. This could be through platforms like video conferencing, chats and many other ICT based platforms. The introduction of ICTs has encouraged the development of professional networks and on-line communities. Health workers are taking advantage of these networks to share information and to develop effective professional relationships. If there is a key public health concern, medical professionals use ICTs to discuss and exchange ideas on the issue thereby reinforcing new learning. Furthermore, healthcare professionals can also deliver health information and offer web-based therapies to patients and the public through the use of ICT technologies. Wantland (2004) revealed that there was evidence of improved knowledge and behaviour from the patients/public using web-based interventions. The health information delivered through websites includes raising awareness on pertinent health issues, encouraging good health-seeking behaviour in the community, and reminding patients of scheduled appointments.

Telemedicine is a technology that has been used to improve health care delivery in remote areas. (Bashshur, 2009) have shown that telemedicine is useful in addressing shortages of manpower as well as unequal distribution of clinicians, in particular specialists, between urban and rural health settings. In

developing countries, most people are based in rural areas and telemedicine has made it possible for this population to be diagnosed and treated closer to where they live in an effective manner and also to improve maternal health, (Martinez, 2005).

With ICTs, patients have the capacity to self-monitor the progression of their conditions, for example, a hypertensive patient can use an electronic blood pressure machine to monitor his/her blood pressure levels at home. Patients can also have access to medical databases, medical expert systems, clinical guidelines and medical personnel using the Internet and other communication media. The web-based services facilitate self-care practices like self-diagnosis and self-monitoring. They can also provide tutorials by experienced clinicians.

Health care facilities that have implemented ICTs are now using information systems which enable automated data collection, processing and analysis of patient information over a period of time. The analysed data provides information on how the health system is performing and decisions can then be made on areas which need improvement, professionals needing training in specified areas and how best resources can be allocated in order to achieve set objectives. Comparisons with other well-performing systems can then be made and organisations will be able to detect quality improvement opportunities, (Kukafka et al., 2007).

Barriers of ICT usage in the health sector

Regardless of the potential benefits associated with the implementation of ICTs by health facilities, some barriers exist that prevent their widespread utilization. Some of the barriers include limited access to ICTs, the high cost of providing access to ICTs, and inadequate ICT infrastructure. Jensen (2001) identified the cost of internet services, computer hardware and the lack of organisational structures to support ICTs as some of the major barriers to ICT adoption in developing countries. The researcher further cited lack of capital to acquire facilities as another factor that hinders the successful implementation of ICTs.

Olatokun & Adeboyejo (2009) identified erratic power supply as a major challenge that prevented the full utilisation of ICTs in the health sector in Nigeria. They also identified other challenges that included lack of ICT facilities, inadequate knowledge on use of ICTs, insufficient access to ICT facilities, high cost of ICT facilities & services, and constant breakdown of equipment. Smith et al. (2007) also noted that health professionals, especially those working at primary and district levels had insufficient knowledge on how to use electronic devices, including computers, due to lack of exposure. High telecommunications tariffs and inappropriate or weak policies were also identified as major barriers to using ICTs in health facilities. Asemahagn (2015) also identified several challenges which included poor infrastructure, management problems, educational status, computer illiteracy, and resource shortage.

Usage level of ICTs in the health sector

Taylor and Lee (2005) conducted a study on the use of ICTs by occupational therapists in Western Australia. Their study revealed that the most commonly used ICT based services were personal computers, the Internet and e-mailing. The competency of the therapists in the use of ICTs was checked and it was noted that most of the therapists rated their competency level as good or better, although competence was rated lower for Web searching. The therapists that were based in the rural areas had less access to computers in their work places as compared to their counterparts in cities. However, they used videoconferencing, e-mailing and teleconferencing more frequently than their counterparts in cities. The study further noted that around one third of respondents were disappointed with the level of technical support offered to them, and only a third had participated in basic computer training provided by the company.

In a research done by Idowu, Ogunbodede & Idewo (2003), their findings revealed that personal computers and mobile phones were available and used in Nigerian teaching hospitals. However, internet services were not available in the hospitals. Health workers who needed internet connectivity would use external internet cafés. They further indicated that only 21.4% of the medical staff did not use the Internet in any way, while the majority of 70.7% who used the Internet, used it for e-mails. On the contrary,

Olatokun & Adeboyejo (2009) revealed that reproductive health workers in Nigeria used ICTs in their day to day operations.

Satellife (2005) determined the extent of use of HealthNet by health workers. The study revealed that HealthNet was used by 1,950 health-care workers in more than 150 countries worldwide and that it has made major contributions in Africa towards enabling connectivity between rural and urban societies. The study revealed that health workers in Zambia who used to travel long distances each week to collect data for clinical trials now used HealthNet to send the information. Surgeons from Mozambique, Tanzania, and Uganda used HealthNet to learn new reconstructive surgery techniques while physicians in Ethiopia used HealthNet to schedule consultations. In the Democratic Republic of Congo it was used to report progress on treating trypanosomiasis to public health organizations in the north of the country while, in Gambia, malaria researchers used HealthNet to submit data to European medical schools for clinical trials. The study further indicated that many physicians in developing countries used HealthNet as a source of information on important drugs, public health promotion and the management of AIDS and tropical diseases.

A review of literature shows that ICT related technologies are yet to be fully utilised in health care facilities in developing countries. Medical doctors in these countries were found to use ICTs mainly for research and the use in medical diagnosis, communication, collaboration, doctors' training and patient management was low, (Shittu, Ajayi and Garba, 2008; Olatokun and Adeboyejo, 2011). It is against this background that the researchers would want to find out the usage levels of ICTs in public hospitals in Zimbabwe.

Research Methodology

The study was carried out at three public hospitals in the Midlands region to determine the usage levels of ICTs. An exploratory research design was used and it was considered the most suitable approach in this study. This research design was adopted given the nature of the problem to be explored in this study. A questionnaire was used as the main instrument of collecting data to make an assessment on the usage of ICTs in health care facilities. It included both structured and semi-structured questions. The questionnaire was validated by pre-testing it with a sample of six respondents and was then modified in order to improve its clarity.

The questionnaire was divided into four sections. The first section determined the basic demographic information of the respondents. The second part of the questionnaire sought to determine the level of ICT usage in public hospitals. The third section dealt with the nature of the challenges faced by healthcare professionals in the implementation of ICTs in healthcare facilities and the fourth section sought to determine the benefits associated with using ICTs in the health sector. The questionnaire was developed by referring to different related studies, (Asemahagn MA., 2015; Olatokun WM, Adeboyejo OC., 2009)

The questionnaires were distributed to nurses, doctors, medical laboratory scientists, pharmacists and the administrative staff. The respondents were randomly selected from the hospitals and their responses were used to assess the usage of ICTs in healthcare facilities. The sample size for each hospital was determined proportionally based on the total number of health professionals in each hospital. A sample of the study of 90 respondents was drawn from health professionals as follows: - 22% was from the administrative staff, 8% medical laboratory scientists, 6% pharmacists, 14% doctors and 50% nurses. From the 90 questionnaires that were distributed to the selected respondents, a total of 80 were returned giving a response rate of 88.9%.

Presentation and discussion of results

Socio-demographic characteristics of study participants

Table 1 below, shows the profile of the respondents in terms of those characteristics that impact on the usage of ICTs in health facilities. Two-thirds of health professionals were female and 70.1% had ages

ranging from 26years to 35years. Of the 80 respondents, more than half (51.3%) were nurses, a fifth (20%) were administrative staff, 15% were doctors, 7.5% were medical laboratory scientists and 6.2% were pharmacists. Majority (57.5%) of health professionals had greater than 5years of work experience and more than three-quarters (83.8%) had ICT awareness.

Table 1: Profile of respondents

Survey Question	Response category	Frequency (N)	Percentage (%)	Cumulative frequency (%)
Age	20 – 25	13	16.3	16.3
	26 – 30	31	38.8	55.1
	31 -35	25	31.3	86.4
	>35	11	13.6	100
Gender	Male	27	33.8	33.8
	Female	53	66.2	100
Professional category	Administrative staff	16	20	20
	Medical lab. Scientist			
	Pharmacist	6	7.5	27.5
	Doctor			
	Nurse	5	6.2	33.7
		12	15	48.7
		41	51.3	100
Working experience	≤5 years	34	42.5	42.5
	6-10 years	28	35	77.5
	11-15 years	11	13.8	91.3
	≥16 years	7	8.7	100
ICT awareness	Yes	67	83.8	83.8
	No	13	16.2	100

ICT access and utilization among the healthcare professionals

Table 2 below illustrates how ICTs are utilised among the various professional participants.

Table 2: ICT access and utilization among health professionals

ICT variable	Response	Frequency(N)	Percentage(%)
Computer access	Yes	33	41.3
	No	47	58.7
Purpose of computer access	Storage	23	69.7
	Report writing	29	87.9
	Internet access	20	60.6
Access to mobile devices	Yes	80	100
	No	0	0
Purpose of mobile device access	Communication	80	100
	Internet access	67	83.8
	Drug database	17	21.3
	Chats	80	100
Internet access at work	Yes	34	42.5
	No	46	57.5
Medical diagnosis	Yes	50	62.5
	No	30	37.5
Diagnostic technologies accessed	x-ray imaging	12	15
	ultrasonography	12	15
Research and publication	Yes	15	18.8
	No	65	81.2
Use of fax services	Yes	25	31.3
	No	55	68.7
Use of printer/photocopy services	Yes	39	48.8
	No	41	51.2

All study participants had access to a mobile device but more than half (58.7%) did not have access to computers at the workplace. Of those that had computer access, 87.9% used them for report writing, whilst 69.7% used them for storage and only 60.6% had internet access. This tallied with Asemahagn (2015), whose study also showed that the majority of healthcare professionals did not have computer access and those that did mainly used them for writing reports, storing documents and access to the internet. Our study also showed that, workplace telephones were universally used for communication purposes. Mobile internet access (83.8%), use of drug databases (21.3%) and chats (100%) were only done through personal mobile devices. 62.5% of health professionals used ICTs for medical diagnosis but only 15% had access to X-ray imaging and ultrasonography mainly because only doctors and clinical officers could order these investigations.

Out of all the study participants, only 31.3% and 48.8% of professionals had access to fax and printer/photocopy services respectively and the majority of professionals (57.5%) had no access to the internet at work. These results are in contrast to Asemahagn (2015) where the majority of participants had access to fax, photocopying and printing services. This was attributed to the fact that, in the health facilities where our study was carried out, clinicians had access to diagnostic and therapeutic technologies whilst the administrative staff had greater access to information technologies and the internet. Patient data collected by clinicians was recorded manually and would only be uploaded onto computers by the administrative staff for scheduled reports or when clinicians were no longer using it.

ICT usage barriers

To determine ICT usage barriers, respondents were asked to rate the barriers on a five point Likert scale ranging from 1 (not important) to 5 (very important). In order to establish the rank order for ICT usage barriers, the mean rating of each statement was calculated. A barrier with a mean score larger than three was considered as important. The results are summarised in table 3 below.

Table 3: Rank order of ICT usage barriers

Rank	ICT usage challenge	Freq(N)	Mean	Std. Deviation	Variance
1	Erratic power supply	80	2.40	0.927	1.026
2	Inadequate access to ICT facilities	80	3.55	1.376	1.528
3	High cost of ICT facilities	80	3.72	1.181	1.277
4	Constant breakdown of equipment	80	2.24	1.146	1.318
5	Poor connectivity	80	3.10	1.212	1.016
6	Computer illiteracy	80	2.47	1.497	1.651
7	Security and privacy issues	80	2.09	1.021	1.249
8	Lack of adequate ICT facilities	80	3.21	1.279	1.307

The results show that high costs of ICT facilities, inadequate access to ICT facilities, lack of adequate ICT facilities and poor connectivity had means that were greater than three, hence these barriers were considered strong inhibiting factors to ICT usage (see table 3 above). Olatokun W.M. and Adeboyejo O.C., (2009) and Asemahagn MA., (2015) also identified inadequate ICT facilities as a major barrier. Most respondents did not have access to computers in these studies. However, Olatokun W.M. and Adeboyejo O.C., (2009) also found erratic power supply as a major barrier. This is contrary to our findings which made this factor a weak inhibitor as the health facilities had standby generators in case of power failures. Security and privacy issues and constant breakdown of equipment were the least perceived barriers in this study.

The current study revealed high cost of ICT facilities as a major barrier. This corresponds to the findings by Zanamwe et al. (2012) who found cost as a significant barrier to adoption of ICTs in the pharmaceutical sector but in their study complexity of technology and privacy related issues were also among significant barriers, which was not the case in this study. In the current study we found computer illiteracy as a weak barrier to ICT usage. This is not in line with the widely held view that computer literacy is a backbone for ICT utilisation. However, Asemahagn MA., (2015) found computer illiteracy of health professionals to be 55% and identified this factor as one of the factors that affected ICT usage in Ethiopian hospitals.

Benefits of using ICTs in healthcare facilities

In an attempt to establish whether the health professionals were aware of the benefits of using ICTs in the health sector, respondents were asked to rate the importance of perceived benefits in influencing their decision to use ICT-based technologies on a five point Likert scale ranging from 1 (not important) to 5 (very important). To establish the rank order for perceived benefits of using ICTs, the mean rating of each statement was calculated. A benefit with a mean score larger than three was considered as important. The results are summarized in table 4 below.

Table 4: Rank order of perceived benefits of using ICTs in healthcare facilities

Rank	ICT benefit	Freq(N)	Mean	Std. Deviation	Variance
1	Improves patient management	80	3.96	1.091	1.547
2	Access to up-to-date information	80	2.11	1.264	1.298
3	Aids in research and publication	80	2.01	1.193	1.497
4	Improves efficiency and productivity	80	3.12	1.072	1.352
5	Enables collaboration among health care professionals	80	3.08	0.981	0.937
6	Improves availability of clinicians during emergencies	80	3.20	0.804	0.972

The factors that were considered as the most important benefits included improved patient management, enabling collaboration among health professionals, availability of clinicians during emergencies and improved efficiency and productivity which had means greater than three. Results also indicated that access to up-to-date information was regarded as a weak benefit. Assistance in research and publication was seen as the least beneficial and this could have been due to the fact that medical research was mostly done by health professionals who are affiliated with teaching hospitals and teaching hospitals were not part of the study in this case.

The research finding regarding improving efficiency and productivity was also regarded as a significant benefit to ICT usage by Shekelle & Glodzweig (2009) and Chaudhry et al. (2006). The researchers revealed that health professionals were able to perform their duties faster, see more patients and make diagnoses more quickly. Improved availability of clinicians during emergencies and improved patient management were also considered as important benefits of ICTs by health professionals. This correlates with Udousoro (2014) who found the most important perceived benefits to be quick assembly of health professionals in emergencies, access to updated information and improved patient management.

In our study, we also rated collaboration among health workers as an important benefit of using ICTs in the health sector. Similar studies by Simon et al. (2004) and Gates (1999) found collaboration among health workers as a major benefit since ICTs enabled the development of professional networks which could be used for sharing information on areas of interest. The networks enable health professionals to get information from counterparts.

Conclusion

The study sought a) to explore the extent of ICT utilisation and b) to investigate the benefits and barriers of ICT usage in the health sector in Zimbabwe. Research findings suggested that there was some reasonable use of the available ICT technologies although the degree of access varied with the different professions. Health professionals, however, used ICTs insufficiently to manage their patients. The perceived benefits of using ICTs were improving patient management, enabling collaboration among health professionals, improving availability of clinicians during emergencies and improving efficiency and productivity. The Zimbabwean health sector is still behind in the management of hospital systems using ICTs because of challenges such as high cost of ICT facilities, lack of adequate ICT facilities, poor connectivity and inadequate access to ICT facilities.

Recommendations

In order for the health sector to ensure better utilization of ICTs and enjoy the innumerable benefits offered by ICTs, the following recommendations were made:-

- The government must foster an environment which facilitates development, distribution and use of ICTs in the daily activities of health professionals.
- The government must invest in acquiring and upgrading the ICT infrastructure and provision of ICT services which are applicable to the health sector. It must acquire ICTs in sufficient numbers in order to improve ICTs utilisation among the health professionals.
- Health care professionals must be educated on potential benefits of ICTs so they can embrace them and improve workplace efficiency.

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