

The Influence of ICTs in Enhancing Health Service Delivery: Implications on the Millennium Development Goals in Tanzania

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Abstract

The appropriate use of Information and Communication Technologies (ICTs) has proven to be critical in socio-economic expansion regarding various aspects of health provision. ICTs provide cost effective means of enhancing people's living standards, particularly the disadvantaged and rural communities. This research articulates the contribution of ICTs in Tanzania's health sector since the nation's adoption of the Millennium Development Goals (MDGs) in 2000. N=132 personnel from the Ministry of Health participated in the study by means of a survey while 10 senior government officials participated through interviews. The data were analyzed quantitatively using SPSS version-20 and Cronbach's Alpha statistic was used to test for validity and reliability of the data, yielding results that were all >0.7. Results show that internet, computers, satellites, radios, mobile phones and Telemedicine were among the enabling ICTs in disseminating information on health services and in advancing the attainments of MDGs in the health sector. Based on Spearman's correlation, the ICTs such as VCR/TV reinforced the monitoring ability in incidences of public health threats and response resulting in health service delivery effectiveness. Additionally, local radio stations influenced public awareness in marketing health related programs. Conversely, the implementation stage of the ICTs was met with some issues including, inadequate infrastructure and an absence of clear ICT policy orientation to support the ICTs in the health sector. The study concludes by highlighting the future prospects for ICTs in enabling Tanzanian government to achieve the consequent 2030 sustainable development goals.

1. Introduction and problem statement

This study aims to articulate the contribution of the ICTs within Tanzania's health sector since the adoption of the Millennium Development Goals (MDGs) pertaining to health in 2000. It begins by describing why and how Tanzania adopted ICTs in the health service delivery. The study also explores whether Tanzania had any deliberate ICT policy on

health. Additionally, this research highlights some challenges faced and the prospects on the phenomenon under study; and concludes by offering some practical recommendations on how to mitigate those challenges and optimize of the use of ICTs in the health sector. The United Nations' Millennium Development Goals (UN MDGs) were declared and adopted in 2000 by the member states to represent commitment by all nations and institutions and their leaders to combat disease, poverty, hunger, illiteracy, environmental degradation, and discrimination against women by 2015 [1]. Accomplishing MDGs and targets required a multifaceted approach, strategies and devices such as Information and Communications Technologies (ICTs). ICTs refer to infrastructure and the configurations that enable contemporary computing. As perceived recently, the ITCs simply refer to "the convergence of computing, telecommunication and governance policies for how information should be accessed, secured, processed, transmitted and stored" [2].

It is worth noting that generally, the macro, meso and micro-level forces are influential in facilitating or jeopardizing any development process such that the MDGs. Within this context, the ICTs' resilience in nature, have been recognized to be among the key role players in a given country's economic development that may result in poverty reduction [3]. Precisely, ICTs plays a catalytic role within the complex task of poverty reduction by "leveraging effects on earnings opportunities, on educational and health services, good governance and promoting democracy" [4]. Consequently, the appropriate enactment of the ICTs could improve efficiency, provide access to new markets or services, create new opportunities for income generation and enhance people's standard of living [5]. Health service delivery is at the center of the MDGs given that three of the eight MDGs are directly related to health (Reduce child mortality -goal 4; Improving maternal health-goal 5; Combating HIV and AIDS, malaria and other diseases-goal 6). As such, the entire global community recognizes health to be very cardinal to the international agenda of reducing poverty and as an important measure of human

development. As a result, the use of ICTs in health sector is not limited to technology, but a means to reach a series of outcomes including: helping national and local information systems to support the development of effective, efficient and equitable health systems; increasing awareness of policy makers and public about health risks; providing citizens with improved access to information and knowledge they need for improved health [6,7] such that government can become more responsive to all health needs. Furthermore, ICTs have been used in various ways to contribute to achieving such outcomes. In principle, health systems rest on four basic pillars including information, surveillance and research; management of health services; human resources and financing such that it is optimistic to attempt to integrate ICTs into a country's health care policies and procedures in the hope that they will lead to a general improvement in the sector.

Of particular importance to this study, is to determine the influence of ICTs on three MDGs (goal number 4,5, and 6) i.e “Reduce child mortality”; “Improve maternal health”, “Combat HIV/AIDS, malaria and other diseases”, respectively in Tanzania.

Researchers [8] infer that ICTs offer opportunities to stimulate growth and innovation in a given local setting thereby enabling individuals and institutions to interact more productively in the global economy. Nevertheless, there is a need to create an enabling environment that will result in harnessing and utilizing the ICTs to realize its full potential. However, the residual effects of colonialism, failing economies and subsequent poverty in the Global South have affected its human development in sectors such as health. Expectantly, a developing country like Tanzania is keen to embrace any technology that can potentially be a crucial agent for development. This has resulted into the adoption of ICTs as a cardinal tool for attaining social-economic development in sectors such as health and education. Hence, this is an essential step because without government's commitment, it is difficult to foster and create an enabling environment for ICTs to flourish. Of note is that, before the advent of MDGs in 2000, Tanzania had an estimated annual number of maternal deaths at 13,000 and infant mortality;157,000 under-fives mortality and 45, 000 newborn deaths. This situation was exacerbated by an outbreak of malaria, Tuberculosis (TB), and HIV and AIDS which affected Tanzanians in both health and economic facets. It is on this ground that the MDGs 4, 5 and 6 had been committed to health sector [9,10]. A Report by the World Health Organization [11] indicates that Tanzania approved to reduce the under-five mortality rate by two-thirds and the maternal mortality ration by three-quarters by 2015. Given these factors, the MOHSW through the national health policy placed a great emphasis on

a well-managed health sector through the proper utilization of ICTs and as such, government acknowledges that ICTs are capable of promoting efficiency in all aspects of the health service delivery system including:

- The supply of quality information on timely bases for different users
- Enhancing the whole process of strengthening HIS
- Improving the skills of the HIandR staff
- Enhancing good working relationship with different partners

The utilization of ICTs in the health sector is contingent upon radical reforms that focus on decentralization to allow health services to be managed more closely at the community level. This shift in functions between the central and peripheral levels of the health sector can generate the much-needed new information and called for a targeted deployment of ICTs to enable sharing of the health information, collecting, processing, analyzing health data and dissemination requirements of the findings.

2. Theoretical framework

The Unified Theory of Acceptance and Use of Technology

This study is guided by two theories—the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Diffusion of Innovation (DOI). Developed Theory. The UTAUT is one of the most established and widely accepted technological theories in recent times. The proponents posit that the acceptance of technology is determined by the effects of performance expectancy, effort expectancy, social influence and facilitating conditions [12]. Application of the UTAUT is suitable for this study because its mentioned four key variables can be used to examine and analyze ICTs and MDGs in various dimensions within the context of Tanzania. This model will be used to identify what influenced Tanzania to adopt ICTs as tools for meeting the MDGs, as well as the extent of effort invested in ICTs as tools for development.

Diffusion of Innovations Theory

Everett Rogers' Diffusion of Innovations-DI Theory claims that after a while, a product or an idea gains momentum and diffuses through a specific system or population [13]. Diffusion theory has only recently been applied to the understanding of technological innovation and the role of technology in bringing about social change. Using the ID's

theory, this study will determine and report the following: the nature of the MDGs in relation to ICT in Tanzania; understanding how the use of ICT can speed up the achievement of the MDGs; available ICT facilities in Tanzania; the availability of policies that guide the use of ICT in relation to MDGs; and the influences of ICT on the implementation of MDGs in Tanzania. The IT Rogers's Diffusion of Innovation is helpful for gaining insights into perceptions and decision making in both areas of discussion. Diffusion theory has only recently been applied to the understanding of technological innovation and the role of technology in bringing about social change.

3. Methodology

Study population and sampling

The data were collected by means of a quantitative survey and semi-structured interviews from the Ministry of Health and Social Welfare (MoHSW) which was later merged into the Ministry of Health, Community Development, Gender, Elders and Children in 2015. The target population for the survey was, N=200 officers out of whom 132 consented and participated in the study. These were sampled purposely because they were familiar with the work of the MoHSW and ICT related information the researchers sought to collect. No sampling was performed among the top management officials because the number was too small (N=10) and as a result, they all participated in the study through semi structured interviews. This enabled the researchers to collect in-depth data from senior government officials including permanent secretary and the deputy permanent secretary; directors and different heads of sections in the Ministry.

Measures and procedures

The data collection tools were pretested before the actual data collection. The questionnaire consisted mostly closed questions and some open-ended questions. Most of the questions bordered on the participants' broader perspective of ICT facilities in Tanzania and in particular the ministry of health; the usefulness and utilization of the ICT facilities for development; their understanding of the MDGs; the significance of the ICTs improving in implementing the MDGs in health provision; challenges of the ICTs facilities. On the other hand, the interviews examined the significance of ICTs in achieving the MDGs in the health sector, whereby the issues of ICT policies were discussed. The interview schedule consisted some questions pertaining to: general understanding of the MDGs; perceptions of ICT facilities as a tool for economic development; barriers to effective utilization of the ICTs to

facilitate the achievement of the MDGs, ICT and health policy; national strategy to achieving the ICT. All interviews were audio recorded which allowed the capturing of every detail to produce a complete flow of the conversation. A digital recorder, mobile phone, and camera were used for the recording during the 10 interviews that lasted between 30-45 minutes. The key informants' involvement was discretionally. Informed consent was given to all the participants as evidence of their voluntary participation. All study participants were informed about the purpose of the study and the reasons for which they were selected.

Data analysis

Data from the interviews were coded and transcribed such that qualitative themes were converted into counts and captured quantitatively through SPSS. Therefore, both quantitative and qualitative data were analyzed using the IBM SPSS 20® (version 20) an analysis software for statistical data management. As a result, Cronbach's alpha was used to measure the reliability of data; for which Cronbach's Alpha statistic was >0.7 (0.731). During the analysis, quantitative data and qualitative data were separated and integrated at a later stage. This was due to the nature of data, [14]. The overall analysis was characterized by frequency distributions to summarize the relationship between the responses and the research questions that addressed the research objectives. Relationships and associations between dependent and independent variables were assessed through Chi-square tests, regression analyses and Spearman's correlations. Data output were presented descriptively in frequency Tables, Graphs and/or Figures.

Results

Out of the N=200 targeted participants from the MoHSW, the response rate from the questionnaire was n=132 representing 66% participation rate. Of note is that any response rate >65% is sufficient for the purpose of research and analysis. The data from the interviews included 10 senior officials including the head of ICT section from the MoHSW.

Table 1. Gender and Educational qualifications of respondents

Gender		Highest qualification	
Male	Female		
		Certificate	3
		Diploma	3
		Bachelor	48
64%	36%	Postgraduate	0
(n=9)	(n=51)	Masters	70
		PhD	2
		Total	126

Results in Table 1 shows that, majority (64%; n=91) of the participants were male while 36% (n=51) were female. In terms of educational qualifications, three quarters of the participants (n=70) had a Master degree followed by n=48 of them who had a Bachelor’s degree while Certificate and Diploma holders were three each (n=6) and only two participants had a PhD qualification. No participant had a postgraduate diploma qualification. Table 1 also shows that the participants had reasonable knowledge level of formal and higher education, majority (95%; n=120) of whom had acquired at least a bachelor’s degree. This demonstrates that they also had reasonable knowledge about the implication of the ICTs on the MDGs in Tanzania and society in general.

Gender is an imperative factor as it has potential to influence the perception of an individual on the role the ICTS can play in achieving the MDGs. This is because the different genders may have different varied levels of appreciation to issues pertaining to ICTs and MDGs. The findings revealed that majority of the respondents were males (64%) an indication that more males were employed in the Ministry whereby they were exposed to ICTs compared to women counterparts (see Table 1). These findings resonate with earlier studies published in 2007 and 2010, which suggested that there were clear gender differences in access to and use of ICTs such that, globally, more male (53%) than women (47%) used the internet [15,16].

Table 2. Designation of the participants

MoHSW: Designation of respondent	Number of respondents
Administration and human resource management officers	5
Environmental health and sanitation officers	5
M&E officers	3
Networking administrators	5
Heads of water, food & sanitation	5
Environmental health officers	4
Statisticians	2
Hospital region advisers	3
Senior medical officers	7
Preventive Services officer	2
Principal nursing officers	5
Systems analyst	1
Medical consultants	2
National coordinator patient affairs	1
Legal officer	1
Accountants main accounts	3
Assistant director pharmaceutical service	1
Policy analysts	4
Dental specialists	1
Advocates	.3
Principal nursing officers	4
Procurement managing officers	4
Internal auditors	3
Government Communications officers	5
ICT specialists	4
Total	83

Note: some respondents from the MoHSW did not indicate their designation

Results in Table 2 shows that participants had different designations most of which appeared to handle ICTs or MDGs directly or indirectly. This also implies that, due to their daily responsibilities,

the selected employees and officials had the ability to respond to research objectives of this study. In other words, they were the most appropriate key informants for this research.

Table 3. Perceptions of the MDGs in Tanzania

Q5: I have adequate knowledge of my work objectives and their contribution to the MDGs	Total (N)	SD	D	N	A	SA	A%
	Frequency	1	10	30	37	61	
	%	0.72	7.19	21.58	26.62	43.88	70.5

*SD=strong, D=Disagree, N= Neutral, A= Agree, SA= Strongly Agree, %A= percent Agree

Table 3 shows that nearly three quarters of the respondents (70.5%) agreed that they adequately understood their work objectives in the manner they relate with the MDGs; nearly one third of them (29.5%) either disagreed or were neutral to the statement.

Table 4. Awareness of the MDGs in Tanzania

Categorical questions	Total (N)	Yes	No
Q4 Have you ever heard about MDGs?	Frequency	109	22
	131		
	%	83.21	16.71
Q6 Are you aware when the MDGs were officially introduced in the country?	Frequency	103	28
	131		
	%	78.63	21.37

Table 4 show that a large majority (83%; 78%) of the participants were aware about the MDGs and when they are introduced in Tanzania, respectively. To understand how the nature of ICTs can achieve the MDGs in Tanzanian health service delivery, it was necessary to ascertain both the nature of ICTs available in the country and the existing policies. Tables 5, 6, 7 and 8 shows the results.

Table 5. Available ICTs in achieving the MDGs

Listed ICTs facilities in MDGs achievement	Useful (mentioned)
Desktop PC	106
Satellite TV/DStv	87
Internet & email	89
Radio	76
VCR connection to TV	54
Laptops	36
Mobile phone	57
iPad	5
Fax	71

Table 5 shows that several ICT’s facilities including computers, satellite TV/DStv, Internet and Email, Rdio, VCR connection to TV, Mobile phones and Fax machines, were mentioned by the majority of participants to be useful tools in positively influencing the achievement of the MDGs in the health sector.

Table 6. Government officials views on available ICTs and the influence in improving health service delivery

Q: Available ICT infrastructure	Mentioned	Did not mention	Mentioned (%)	Rank
Campus	10	0	100	1
Radio	9	1	90	2
Telemedicine	7	3	70	3
Internet	7	4	60	3
E-health	6	4	60	4
Television (TV)	6	4	60	4
Mobile phone/ Mobile Technology	5	4	50	5
Connectivity	5	5	50	5
National ICT	3	7	30	7
Back bone (NITCBB)				
Health website	3	7	30	7
Telephone	3	7	30	7
Fax machine	2	8	20	8

Table 7. Government officials views on promotion of national development policy

Q: Promotion of national development policy	Mentioned	Did not mention	% Mentioned
Tanzania Development Vision 2015 Sector and subsector programs	9	1	90
ICT Policy	7	3	70
E-Government	7	3	70
NCGRP	6	4	60

Table 8. A significant influence over the respondents' awareness of specific ministerial ICT policy

Statement	Response	Q: there is a specific ministerial ICT policy		Chi-square	Df	p-value
		Yes	No			
ICT has strengthened the ability to monitor incidences of public health threats and respond to a more timely and effective manner	Strongly disagree	0	0	11.244	3	0.010**
	Disagree	1	3			
	Neutral	2	20			
	Agree	33	35			
	Strongly agree	13	19			

** correlation is significant at 0.01 level (2 tailed)

Results show that the ministry directors and the heads of sections had a significant influence over the respondents' awareness regarding when the MGDs were officially introduced in Tanzania.

The Table 9 shows how the national development policy promotes utilization of ICTs to achieve health MDGs.

Q1=ICTs are enabling tools in the achievement of the MDGs in health sector

Q2=ICT has increased efficiency in health, research and dissemination of research findings, hence facilitating the achievement of the MDGs.

Q3=ICT strengthened the ability to monitor incidences of public health threats and respond in a more timely and effective manner

Q4=ICTs has improved dissemination of health information in Tanzania

Table 9. ICTs performance goals in the health sector

Spearman's Correlations (r)	ICT Facilities vs MDGs						
	Desktop	Satellite	Internet	Radio	VCR/TV	Laptops	Fax
Q1 R	0.236	0.056	-0.023	0.174	0.166	0.103	-0.023
Q1 p-value	0.012	0.559	0.802	0.061	0.104	0.626	0.799
Q1 N	114	113	123	117	97	25	127
Q2 R	0.073	0.184	0.19	0.234	0.281	0.329	0.099
Q2 p-value	0.437	0.049	0.034	0.011	0.005**	0.109	0.268
Q2 N	115	115	125	118	99	25	127
Q3 R	-0.11	0.21	0.107	-0.014	0.334**	-0.111	-0.079
Q3 p-value	0.244	0.025	0.236	0.879	0.001	0.606	0.375
Q3 N	115	115	124	118	99	24	127
Q4 R	0.019	0.118	0.213	0.028	0.195	0.035	-0.078
Q4 p-value	0.842	0.208	0.017	0.762	0.053	0.864	0.381
Q4 N	115	115	125	118	99	26	129

**Correlation is significant at the 0.01 level (2-tailed)

Chi-Square (Spearman's Correlations) has been used to measure the relationship between usefulness of the following ICTs facilities (desktop, satellite, internet, radio, VCR, laptop, fax) as being enabling tools (Q1), increased efficiency in the health sector (Q2), strengthening of the monitoring ability in the health sector (Q3) and improving the dissemination of health information(Q4).

It appears that there is a strong significant relationship between increased efficiency and strengthened monitoring ability in health provision and the usefulness of VCR/TV since the p-value is (r=0.281, p=0.005). There is also a significant relationship between VCR/TV and ICT which strengthened the ability to monitor incidences of public health threats and respond in a more timely and effective manner (r=0.334, p=0.001). On the other hand, no significant relationship is noted between the usefulness of the respective ICT facilities and improved dissemination of information and ICTs being enabling tools to achieve MDGs in health sector.

Based on Spearman's correlation, such improvement and efficiency were evident where VCR/TV proved to be playing a significant role (see Table 9). The implication is that with the use of ICT tools such as VCR/TV Tanzania was able to increase its ability to monitor health incidences within the country (see Table 10).

Table 10. Government officials' perceptions of ICT challenges in MDGs advancement

Challenges for using ICT to achieve the MDGs	Mentioned	Did not mention	% Mentioned
Insufficient resources	9	1	90
Inadequate manpower	9	1	90
Shortage of health personnel	7	3	70
Lack of qualified health staff	7	3	70
Lack of ICT professionals	6	4	60
Capacity in the ministry i.e issues of infrastructure but it hasn't been so for a long time no technical people to support us	5	5	50
Finance	4	6	40
Virus	4	6	40
Trained technicians	4	6	40
Training materials are more of Western culture we haven't introduced our own materials	2	6	20
Technology system is well managed to make sure that we have full support. We need to change our mindset due to the fact that some people do refuse to accept some technologies.	2	8	20
Problem of connectivity			

4. Discussions

Tanzania government and ICTs: policy responses to health problems in post 2000

Since the dawn of 21 century, Tanzanian government mandated all public and private sectors to operate within the framework of the National Development Vision 2025, as a result, all policies would be aligned and implemented towards the realization of this objective. Government correspondingly recognized the need ICT in fulfilling its vision by formulating policies that guide deployment of ICTs to improve health service delivery. For instance, the central objective of Tanzania eHealth policy established in 2009 aims at developing and deploying a nationwide eHealth system that supports medical facilities in the under-served areas. Coupled with the objective is the policy statement which postulates that "Government will promote the use of ICTs to enhance efficiency, effectiveness and sustainability in the provision of services and basic utilities by supporting the development and deployment of nationwide e-health [...] transactions." Furthermore, the policy articulates and classifies eHealth into three categories:

- i. Health informatics which deals with health data gathered routinely from the day-to-day administrative, diagnostic and therapeutic processes of the health facilities. eLearning or blended learning which has to do with using ICTs for learning and knowledge exchange.
- ii. Telemedicine (i.e., 'care at distance') which enables medical consultations to take place by using ICT facilities to interconnect either the remote and local practitioners among themselves, or to engage directly between remote practitioners and their local

patients.

iii. Effective deployment of eHealth, using efficient network infrastructure and services such as fiber optic, wireless solutions and satellite communication connecting a number of health facilities; and the need to roll-out and accelerate existing ICT applications, while assuring that the health workers, especially in the field, are confident and proud to improve their work by using ICTs tools [17], [18].

Furthermore, Tanzania's ICT policy response to health problems is also evident in the 'Development Vision 2015' as projected by the respondents in Table 7. The promotion health and ICTs policy enabled the general public to become increasingly aware of health risks; and gave them an opportunity to take precautionary measures. It is evident from the findings of this study that the largely, available ICTs in Tanzania contributed towards the advancements of the health MDGs in various ways as projected in Table 8 where the ICTs appeared to have strengthened the ability to monitor incidences of public health threats and in responding to the threats in a more timely and effective manner. These findings also resonate with the Unified Theory of Acceptance and Use of Technology as projected in the findings which revealed that ICTs tools such as computers, radio, televisions, and the Digital Satellite Television (DSTV), internet and E-mail played a big role in enhancing service delivery efficiency in the MoHSW (see Tables 5, 6, 7, 8, and 9). Medical institutions were also using these ICT facilities to translate and adapt health information and provide health workforce with what they needed to circulate and store information about health.

Research by Dubow, on ICTs influence on health sector suggests that if utilized appropriately, ICT facilities are capable of supporting effective health research and dissemination while allowing access to research findings [19]. The implication is that ICTs were very influential in enhancing information flow and dissemination of scientific evidence-based knowledge which could result in empowering citizens in issues pertaining to health service delivery. For example, the implementation of a District Health Management Information System (DHMIS) in Tanzania improved the ability to collect, store and analyze accurate health data at district level to increase service delivery efficiency, increase data accuracy and effectiveness of intervention, increase accountability and learning about health trends at district level [20]. Previous research on ICTs influence [21], [22], [6], [23] also echoed that through ICTs, large amount of data regarding patients' admission records could be managed in different ways, for instance using HTML format, DVDs, CDs, CD-ROM, Cassette and that the use of ICTs in the health sector improved the National

Health Management Information System, the Ministry of Health and Social Welfare's National HIV database, health information resource centers 'Connect and Learn', Telecentres in Sengerema and the Health online database.

Furthermore, previous research [6,7] determined that providing citizens with better access to information and knowledge they need for better health, is one of the practical benefits of using ICTs in service delivery. A study, on seeking to find out how ICTs contribute to the health sector, found that, ICTs facilitates remote consultation, issues of diagnosis and operation especially through telemedicine [19]. More so, in Tanzania, research [24] showed similar results when it was stated that appropriate use of ICTs contributed profoundly to the malaria control program because people became aware of malaria symptoms and planned to promptly access health facilities. Another study [25] revealed that through the use of ICTs, rural care-givers have had a greater access to specialists' support and remote diagnosis of diseases while increasing monitoring and information-sharing on disease and famine incidences. This is an indication that in post 2000, ICTs also contributed to improving education among health workers who were in-service and in recruiting new health personnel within the MoHSW. Accumulatively, it is suggested that if used appropriately and in different ways, ICTs plays an enabling role towards the advancement of the MDGs in the health sector.

MDGs were dependent on ICT facilities such as radio broadcasting and internet. Questions asked regarding the participants' knowledge of MDGs were regressed on the ICTs variables to determine whether the level of knowledge of MDGs depended on the ICTs facilities. The findings revealed that facilities such a radio, had a positive significant relationship with the MDGs, implying that the radio device has a possibility of making officials at the Ministry and even some members of the public aware about the MDGs in Tanzania. The availability of local radio stations was advantageous as a means of communication particularly for awareness building on health-related programs. This is because the radio was used by ordinary citizens to advertise community programs related to health awareness and education. In 2007, research by Kaul et al. [26] found similar results which revealed that public radio can communicate for the underrepresented, challenge and eventually provide a practical alternative to mainstream media's monopolistic and inconsequential interpretation of news. In this view, the need for community radio is necessitated by citizens who want to create their own content and to air their concern. This is also important because the health-related programs that are in the mainstream media and broadcasted in urban areas and appear irrelevant to them ordinary citizens.

In 2012, a study [27] on 'Citizen Access to Information' on African countries such as Zambia, Ghana, and Kenya determined that the radio was predominately a basic source for sharing information at national and regional level, regarding the treatment of diseases such as HIV/AIDS, malaria and Tuberculosis. In the context of the current study, radio communication was cheaper and easily accessible than most ICTs facilities such as computers. As a result, any health-related information delivered through radio could conveniently reach a wider population using local and official languages (Kiswahili and English). Additionally, the findings suggest that radio communication and fax machines, increased the participants' knowledge of the MDGs in Tanzania particularly if they were used for intended purposes. Other ICT facilities such as, internet and emails as shown in Table 10 appeared to enable government officials in MoHSW to work towards achieving the MDGs within the prescribed timeframe. Under DOI theory, relative advantage construct was used to explore the expected advantages of using ICT for achieving the MDGs. Results suggest that using ICTs increased awareness on MDGs, and contributed to enhanced knowledge construction and information. Within the context of the UTAUT, the findings show that Tanzania was expecting to achieve relevant MDGs when it adopted policies to guide deployment of ICTs to improve health service delivery by (for instance) targeting to build 50% of health centers, 70% dispensaries for basic emergency by 2015. However, such an ambitious target could not be without challenges such as insufficient funding. UTAUT model fit in this context because the sustained efforts enabled Tanzania to achieve a significant rate of expected outcome such that between 1990 and 2012, the country recorded a 47% reduction of maternal mortality ratio 870 and 232 deaths per 100,000 live births respectively [28].

From the interviews, one of the participants explained that the use of ICT facilities enabled them to send disease diagnosis images digitally using computers such that one department could work closely with other departments to ensure that patient results were retrieved as soon as they were requested. In particular, ICTs enabled remote consultation, treatment through telemedicine, and also facilitated collaboration and cooperation among health workers, especially in learning and training approaches that resulted in improved flow of public health information and facilitated public discourse and dialogue around major public health threats.

Awareness about MDGs introduction in the Tanzania and the influence on Health service delivery

Results also show that in terms of the official

introduction of MDGs in Tanzania, internet and email had a significant consequence on the MDGs awareness. Previous research (Jones et al., 2008) shows that email had become an important source of contact between work related interactions. In the current study, >50% of the participants suggested that ICT had a positive impact on achieving MDGs. This is despite the fact that by 2015, only about 34% used internet facilities in Tanzania [29]. To determine the influence of the identified ICT facilities on the MDG variables, multiple linear regression was used. The results show some significant relationships. In this regard, some officials indicated that Satellite TV/DStv was one of the ICT facilities which influenced the achievement of the MDGs. Previous research shows that some African countries such as South Africa, Ethiopia, Botswana have used the same media for the delivery of content in health and education sector [30]. While satellite TV/DStv is an expensive facility to the many Tanzanians (27.6 million) living below poverty line and in rural areas where there is no access to electricity [31], ICTs should user friendly and have a direct impact on the individual and organizational performance. This is based on the reality that ICTs are enabling tools for national development.

Challenges of ICTs in Tanzania health sector

Inadequate ICT infrastructure, financial resources, and technophobia - The findings of the study also show that despite some success made by ICTs in influencing health service delivery, inadequate ICTs were reported by the participants. The most notable ones included the following: insufficient resources such as infrastructure and finances; shortage of skilled labor particularly health personnel and ICT professionals; and an absence of capacity in the MoHSW regarding infrastructure maintenance. This prevented the effective utilization of ICTs in many health centers. Expectantly, the available ICT facilities were also insufficient to fulfil the needs of the Ministry such that even the few available were inadequate. The study also identified that even where ICTs were available, the health sector was challenged with underutilization of technological development such as computers and the internet. Another challenge identified was the fear of technology effect on job security as articulated during the interview with some senior government officials of Tanzania. The participants echoed that the technophobia hindered adequate utilization of the ICTs and this affected the attainment of the MDGs. They explained that mostly elderly staff in the Ministry were reluctant to learn and use modern technology [32] which they deemed as an unnecessary luxury or a form of redundancy which leads to job loss. Some participants felt that technophobia was a source of division between the

people who able to utilize technology and those who cannot hence causing a division in society.

The findings also show that there was low usage of computer, internet and email due to an absence of skills, knowledge and poor infrastructure which hampered the internet connectivity while who had access were either not involved directly in implementing the MDGs or were not encouraged by government to do so. Another problem related to poor infrastructure is the problem of power outage. A 2007 report by Tanzania Communications Regulatory Authority-TCRA [33] indicates that very few households in Tanzania have access to electricity supply which prevented them from using internet and email. These highlighted problems could also be attributed to an absence of specific MoHSW ICT policies by government. Instead of formulating specific policies, the Ministry depended the national ICT policy to implement its goals. For example, both specific and general policies were integrated into health MDGs strategies involving various relevant stakeholders from the Ministry, hence making the process a participatory one.

Despite the highlighted challenges, the ICT will play a critical role in enhancing the lives of people in Tanzania and in creating job opportunities. Additionally, there are numerous initiatives throughout the country benefiting from ICTs. The major goal is to build a highly skilled and educated workforce with aptitude and skills in the application of ICT in everyday life at work places such as healthcare practices which will result in improved dissemination of information and in effective delivery of much needed healthcare services.

5. Conclusions

The main contribution of ICTs in influencing the health sector in Tanzania offers a number of lessons for other developing countries especially in sub-Saharan Africa. The ICTs have made contribution in improving health care service delivery in Tanzania. Key to such contribution is improved dissemination of public health information and facilitating public dialogue around major public health threats while enabling remote consultation and treatment through telemedicine. However, there are challenges to which the Tanzania government needs to pay a particular attention. These include insufficient resources to increase investment in ICTs facilities, uneven distribution of ICT facilities development and inadequate skills and knowledge at the community level on the use of ICT facilities. Use of solar energy instead of electricity especially in rural areas will make ICTs more accessible. The use of biogas as a source of power for ICTs should be encouraged. More emphasis should be placed on ICTs that are readily available to the majority of people in the rural areas such as community radios

and mobile phones. Training on the effective use of the ICTs is important with respect to maximize their use in disease control.

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Acknowledgements

This study is part of the unpublished PhD research by Mushi (2016). The Protocol Reference Number HSS/0075/0120 was granted Full Approval by Humanities and Social Sciences Research Ethics Committee of the University of KwaZulu-Natal, South Africa. The study also received permission [Clearance Reg. No. GD.306/671/01B/41] from Tanzania's Ministry of Health and Social Welfare.