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ICTs and Public Healthcare Service Delivery in a Developing Country Context: Critical Factors towards Addressing the Health Divide

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Background and Purpose: Global references continue to suggest that, Information and Communication Technologies (ICTs) in healthcare service delivery has brought with it great advancements. In developing countries, various ICTs and healthcare initiatives/ policies have been put in place to address challenges of providing equitable health care and improving the quality of health care services in a cost efficient manner. Although in Africa the advent of e-health has offered an exciting opportunity to reduce or control the growing healthcare inequity, a lot still needs to be done in drawing up the appropriate strategies to narrow the disparities in the access to healthcare delivery information. South Africa has implemented initiatives addressing such disparities however; all has not been well with most of these initiatives as they have failed to achieve their anticipated objectives. This therefore, calls for effective e-health strategies to ensure the full exploitation of the benefits it brings towards narrowing of the health divide. This paper aims to identify those factors or variables imperative to drawing up strategies for narrowing the health divide using ICTs within the public healthcare sector in a developing country context, in this case South Africa
Methods: Data was gathered using literature analysis, key informant interviews and government websites on health. Data analysis methods used on survey data includes, descriptive statistics, and factor analysis. Data was drawn from two case sites making up the dichotomous (First and Second Economy) landscape of the South African demography
Results: Exhausting all the variables towards narrowing the health divide is very complex. Finding suggest that, the failure of the public sector to keep pace with the private sector technologically; poor funding towards effective health information access awareness programmes; lack of policy makers, poor infrastructure; and unskilled personnel amongst many other issues continue to be the crucial issues hampering the narrowing of the health divide
Conclusions: Proper planning for ICT deployment with the fundamental inclusion of healthcare stakeholders can bear tremendous results in narrowing the health divide. There is need to engage a diverse group of health professionals, policy makers and the public in the drafting of roadmaps for narrowing the health divide.

Keywords: E-Health, Health divide, Health Information, Information and Communication Technologies

1 Introduction

The health sector is currently the prime growth sector of most economies. Advancement of Information and Communication Technologies (ICTs) and demand for health information to inform policies, research, resource allocation, monitoring and evaluation of healthcare programmes has brought huge advantages within the health sector in most developing countries [1][2]. Global references suggest that new ICTs and information systems have commanded a powerful potential to improve the operational activities of most healthcare organisations [3]-[9]. This has led to the emergence of the term 'ehealth' which according to

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[10], refers to health services and information being delivered or enhanced through the Internet and related technologies.

It is however imperative to note that despite the hype and embracing of such technologies, a lot still needs to be done in addressing health inequalities still hampering development in most developing countries [11][12]. This continued rise in inequalities within healthcare service delivery has undermined the development of a healthy society in developing countries. Logic prevailing, this entails that employing ICTs in healthcare delivery at a distance would be important in addressing some of the inequalities in developing countries.

In Africa the advent of e-health has offered an exciting opportunity to reduce or control the growing healthcare inequalities; however a lot still needs to be done in drawing up the appropriate strategies to narrow the disparities in the access to healthcare delivery information [13]-[15]. These disparities have led to the coinage of the term "health divide", meaning the gap existing in the access to healthcare information using ICTs between those who have access to healthcare and those who do not have" [16]. This paper therefore outlines the research question as: What are those factors critical to narrowing the health divide in developing countries? This paper aims to identify those factors instrumental to drawing up or formulating strategies for narrowing the health divide in a developing country context. The context of interest in this paper is South Africa.

1.1 Demography and Healthcare in South Africa

The South African demography is characterized by two distinct economies, namely, the first and the second economies. The first economy is characterised by a well-structured environment catering for the affluent segment of the population, while the second economy is characterised by underdevelopment, operating in the midst of poverty.

The country's population stands at 50 586 757, of which 26 071 721 (52%) were female and 24 515 036 (48%) were male. Africans are in the majority at 40.2-million, making up 79.5% of the total population. The white population and the coloured population are both estimated at 4.5-million (9.0%) and the Indian/Asian population at 1.3-million (2.5%) [17].

Of note is that, key challenges include health issues; with a high prevalence of HIV/Aids and TB infections and other drug related deaths in most of the poorest communities of blacks and coloureds [18]. With the population of South Africa having increased significantly it still exerts pressure on the health budget for the country [19][20]. About 80% of South Africans live in the rural areas and the rest in urban areas.

1.2 Healthcare System in South Africa

South Africa presents a dichotomous healthcare system from the most basic primary health care, offered free by the state, to highly specialised, hi-tech health services available in the both the public and private sector.

However, the public sector is strained and under-resourced. Whilst the state contributes about 40% of all expenditure on health, the public health sector is under pressure to deliver services to about 80% of the population [21]. The private sector, on the other hand, is run largely on commercial lines and caters for the working class who tend to be members of medical schemes. It attracts most of the country's health professionals [22]. Such a system is deemed inequitable and inaccessible to a large portion of South Africans as institutions in the public sector have for long been faced with perennial challenges like poor management, underfunding, deteriorating infrastructure also compounded the burden of diseases such as HIV and tuberculosis (TB), and a shortage of key skilled medical personnel. While access has improved, the quality of health care has been on an all-time low.

1.3 Health Care Expenditure in South Africa

The bulk of health-sector funding comes from the South Africa's National Treasury. The health budget for 2012/13 was R121-billion, which was aimed at improving hospitals and strengthening public health ahead of the National Health Insurance scheme. In 2011, total spend on health was R248.6-billion – or around 8.3% of GDP, way above the 5% recommended by the World Health Organisation [20]. Despite this high

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expenditure, health outcomes remain poor when compared to similar middle-income countries. The health system is still struggling to cope with the collision of four excessive health burdens, that is; communicable disease (especially HIV/AIDS), non-communicable disease, maternal, neonatal and child deaths, and deaths from injury and violence [23]. South Africa spends more on healthcare than many other countries but patient care continues to decline [11]. This can largely be attributed to the inequities between the public and private sector.

2 Method

This study employed an interpretive approach to case study for the research presented [24][25]. The interpretive approach has proven to be a suitable methodology to study IS as social systems, where the aim is to investigate the complexities of social and technical aspects of IS development [26].

A comparative study from respondents representing both the First and the Second economy of South Africa was conducted in the Western Cape City of Cape Town. A total of two randomly selected healthcare centres and 180 respondents participated in the survey. Healthcare centres where the research surveys were conducted wanted to remain anonymous. The healthcare centres represented the first and second economy and were from the suburbs of Tableview and Gugulethu respectively. The study design was oriented to both the qualitative and quantitative paradigms validity and reliability.

2.1 Data Collection

Ethical Clearance

Ethical clearance was obtained from the Ministry of Health and the University Ethical Clearance (Cape Peninsula University of Technology) committee. Letters of consent were also issued to participants to confirm the confidentiality and purpose of the study.

Selecting the Study Cases

The study was conducted in the City of Cape Town, which falls under the Metropolitan Province of Western Cape. The City of Cape Town as one of South Africa's five metropolitan municipalities has a relatively simple legislative structure and is classified as a category A municipality. Focus on the research area of study was given to two suburbs (Table View and Gugulethu) representing the two economies in the City, that is, the first economy (characterised by a well-structured environment catering for the affluent segment of the population) and the second economy (characterised by underdevelopment, operating in the midst of poverty).

2.2 Research Findings and Data Analysis

Empirical results of the findings and the analysis of data that was collected from surveys conducted in the Tableview Area and Gugulethu Area both representing the first and the second economy respectively. This study was limited to descriptive statistics, correlation analysis and factor analysis. Correlation analysis section was used to determine the relationship between socio-economic issues (Gender, Age, Education, Employment and Income) and perceptions on ICT adoption in the selected economies. The statistical analysis package SPSS complemented by Microsoft Excel was used for the most part of data analysis in this study. From the study, information gathered pertained to the general demography of the two economies, user ICT access perceptions and attitudes, ICT access, general ICT awareness and general perception and attitudes towards ICT utilization. Key informants in the form of managerial and supervisory staff at Clinics from the areas of study provided crucial and complementary information through interviews for the research study.

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3 Results

3.1 ICTs User Access: Perceptions and Attitudes

This section provides analysed data on general information and communicating technologies that are being used by respondents in the first and second economies. Information is most notably multi-response data as respondents were found to be using more than one technology in communication.

Table 1. General ICTs used in communicating information in the first and second economies

		Economy			
		First Economy		Second Economy	
		Count	Column Responses %	Count	Column Responses %
Which ICT have you used in communicating information?	PCs - Communicate Information	78	17.9%	0	.0%
	Mobile Phones - Communicate Information	90	20.6%	93	33.3%
	Telephones/ Faxes - Communicate Information	86	19.7%	93	33.3%
	Internet - Communicate Information	89	20.4%	0	.0%
	Radio/TV - Communicate Information	93	21.3%	93	33.3%

3.2 ICTs used in communicating information

Table 1 shows data on ICTs used in communicating general information. The majority of respondents in the first economy use all of the ICTs at hand (that is PCs, mobile phones, telephones, Internet, Radio/TVs all at rates of 17.9%, 20.6%, 19.7%, 20.4 and 21.3% respectively) whilst a majority of respondents in the second economy use mobile phones, telephones and radio/televisions (all at 33.3% column responses that is, 100% response rate) in communicating information.

3.3 ICTs used in communicating health information

Results gathered show that respondents in the first economy use all general ICTs to communicate health information whilst in the second economy they use only radios/televisions to communicate health information. The reason for all this is that radios/televisions are affordable and simple to use for respondents in the second economy. In the first economy they use all the ICTs from PCs to radios/televisions because they can afford most of them and also because they understand how to use them. Use of PCs and the Internet in this economy is high as the health institution they visit which also uses these ICTs in communicating health information complements it. This is unlike in the second economy where the health institution still uses the traditional ways (that is, paper charts and community gathering) of communicating information to its patients. Radios/televisions are still the only medium of communicating health related information in these communities. **Fig. 1** shows the responses to general ICTs used in communicating health information from both the first and the second economies.

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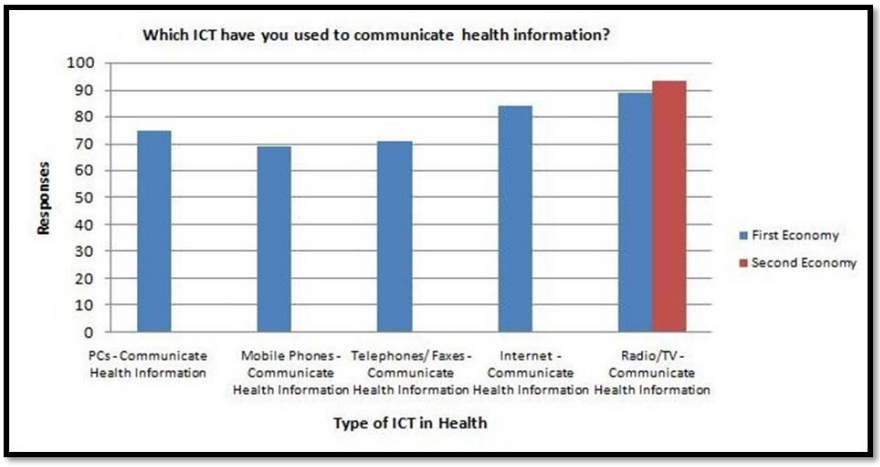

Fig. 1. Graphical representation of general ICTs used in communicating health information in the first and second economies

3.4 Frequency of ICTs used in communicating both general and health information

The frequency of use of ICTs in the two economies depended on the accessibility of the ICTs by the respondents. From the findings, respondents in the first economy used a varied type of ICTs as compared to the second economy with respondents using only, mobile phones, telephone and radios for communication. The use of mobile phones, radios/televisions and telephones in the second economy can be attributed to the affordability, simplicity and easy availability for purchase to the majority of these respondents [27]. **Fig. 2** shows graphically represented data on these frequencies.

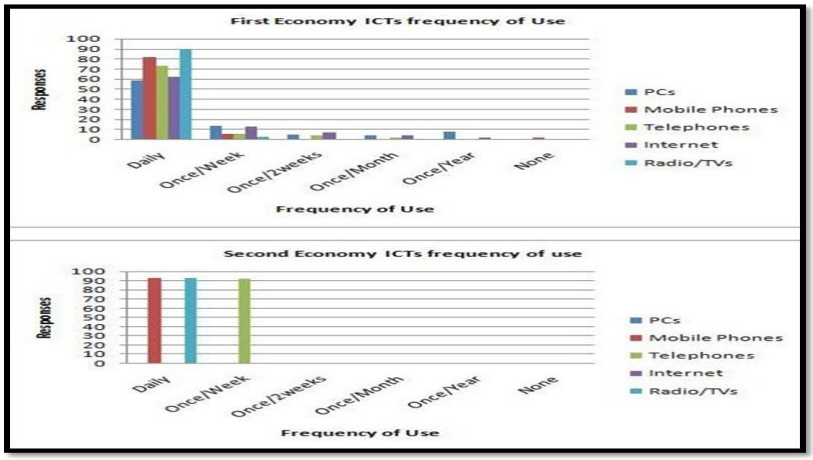

Fig. 2. Graphical representation on first and second economies ICTs frequencies of use

3.5 Special purpose ICTs in communicating health information

Special purposes ICTs in communicating health information are prevalent in the first economy whilst in the second economy they do not use any special purpose ICTs. Whilst the second economy has a column response rate of 0% in all categories, the first economy sees its respondents using telemedicine, e-prescription, webcasting facilities, online health awareness applications and consumer health interactive websites (all at the rates of 30.6%, 7.3%, 14.5%, 35.8% and 11.9% respectively) as their modes of communication for most health related information. Table 3 shows the first and second economies' special ICTs responses.

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Table 2. First and second economy special purpose ICTs responses

Type of Special ICTs		Economy			
		First Economy		Second Economy	
		Responses	Column Responses %	Responses	Column Responses %
Which Special ICT have you used in e-health?	Health Information Systems(DSS/ES)	0	.0%	0	.0%
	Telemedicine	59	30.6%	0	.0%
	E-prescription	14	7.3%	0	.0%
	Clinical Support Systems	0	.0%	0	.0%
	Web Casting /Video conferencing facilities	28	14.5%	0	.0%
	Online health awareness applications	69	35.8%	0	.0%
	Consumer health interactive websites	23	11.9%	0	.0%

3.6 ICTs meeting information needs

In the first economy ICTs such as PCs, mobile phones, telephones, radios, and Internet are viewed as meeting the information needs of most users whilst in the second economy it was only mobile phones, telephones and radios/televisions which are viewed as meeting most of the users' information needs. The degree of these technologies meeting the users' information needs in these two economies depends on accessibility, availability, affordability and ease of use of these technologies. Because respondents in the second economy use mobile phones and radios/televisions most they however find these technologies as meeting their everyday information needs. This was also the same scenario with users in the first economy.

3.7 Legislative and regulatory issues complementing ICTs utilization in healthcare

Legislative and regulatory issues in e-health are of concern especially in developing countries. Key points from interviews highlighted the need for government laws and policies upholding ICTs in healthcare. Positive responses from both the first and the second economies in support of a national awareness policy to promote ICTs diffusion and adoption in healthcare were noted. In the second economy 93 responses support this initiative and in the second economy 92 responses support this issue. This was also complemented by the key informants' responses in support of a strong framework contributing to ICTs diffusion and adoption in the healthcare sector.

3.8 Correlations

Several correlation analyses at 0.5% significance test level were performed. In summary, there was some complementarity in the relationship between, education, employment, income and the rate of ICTs use in the two economies. Thus education, employment and income impact positively on the use of ICT. Research complementing this finding suggests that, the most successful efforts to incorporate information and communication technologies have occurred in countries with determined government and academic institutions committed to invest in education [28]. Other correlations included the following:

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- There is no relationship between income and special purpose ICTs, thus the use of special purpose ICTs depends on the knowledge on operation of these ICTs and not affordability
- There is a relationship between income and the ICTs access points. It can be deduced that as individual have access to more income, the ability to access ICTs increases due to higher spending power

It is also important to note that there were quite a number of correlation tests that were carried but had invalid or inconclusive results due to lots of missing values from both the first and second economies responses.

3.9 Factor Analysis

Factor analysis was carried based on the survey data computed by SPSS and the results were inconclusive. The reason for this despite having survey information of up to 186 respondents was that, there were a number of missing values especially from the second economy respondents. This caused the results to be invalid as they surpassed the 0.5% significance test levels.

4 Conclusions, Recommendations and Limitations

It can be concluded that citizens residing in well up areas (first economy) of South Africa have better access to healthcare information as compared to those in the disadvantaged areas (second economy). There are several variables that need to be addressed so that those citizens in the underserved areas have better access like those citizens in the well-served areas. Such variables include the following:

- Government taking embracing the ICTs in healthcare roll-out model used in the private sector to strengthen the way public sector healthcare services.
- Creating of healthcare information awareness through the use of cellphone applications, which are mostly affordable to the poor, for example, Whats app, Mixit and many other applications.
- Full completion and implementation of the District Health Information System can play a role in the provision of relevant health information to the public.
- An intensive human resource capacity framework needs to be drafted to ensure the empowerment of public healthcare workers with the necessary ICTs skills as we are now in a dynamic information age. Investment within the public healthcare sector needs not only focus on the technology aspect but also the users and manipulators of such technology.
- The curriculum structure for healthcare students need to emphasise on instilling ICTs skills so that all healthcare sectors (private and public) are even in providing better healthcare services.
- The public needs to be constantly educated and made aware of the benefits of e-health so that they will more receptive to e-health initiatives. If they are aware of the benefits they can also push policy makers to invest in e-health.

Given the aforementioned challenges, contributions and recommendations, the following questions should therefore be addressed in the future: What technologies are most suitable for e-health adoption in developing countries? Which of the available ICTs in the developing country context would best promote health information access in order to narrow the health divide?

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