STRATEGIC ISSUES IN E-HEALTH IMPLEMENTATION IN DEVELOPING COUNTRIES: THE KENYAN HEALTHCARE SECTOR

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ABSTRACT

Information and Communication Technology (ICT) has become a major strategic tool in delivery of health services and has had a revolutionary impact on how we live and perceive the world. ICT has given birth to the contemporary "Es" such as e-learning, e-commerce, e-governance, e-banking, e-shopping and e-health, the primary focus of this paper. The adoption of information technology (IT) and domain-specific e-health is, amongst other things, seen as potential leverage in responding to problems concerning the healthcare sector. Technological advancements have accelerated the deployment of e-health systems with the potential to enhance productivity, lower costs, reduce medication errors, and ease the manpower strain on the healthcare industry. Faced by a confluence of onerous challenges including escalating healthcare costs, ageing populations and the advance of technology as well as the need to provide effective and efficient healthcare services, developing countries today are turning to e-health as the silver bullet or panacea. However, despite the initial euphoria and notwithstanding the significant investments made, to date, many of these e-health solutions have yet to prove their success. Therefore this paper is out to evaluate the strategic issues that hinder implementation of e-health in Kenyan healthcare sector. Given the inherent complexities of healthcare operations, several theories were used to explain this phenomenon mainly TAM, TOE, and Actor network. The study used secondary data sources to evaluate the strategic issues that affect e-health implementation in developing countries with a focus of Kenyan healthcare sector. The study found out the following as some of the strategic issues that affect implementation of e-health in Kenya: e-Health standards; ICT and health policies and strategies; e-legislation; e-Health infrastructure; ICT competence
Key words: e-health implementation; e-Health standards; ICT and health policies and strategies; e-legislation; e-Health infrastructure; ICT competence

Introduction

In recent years, the proliferation of mobile computing devices has driven a revolutionary change in the computing world, where ICTs have been adopted for purposes of sharing healthcare expertise across the world. In the healthcare sector the implementation of ICT is perceived as the main driving force in the unfolding healthcare reforms in many developed and developing countries. The adoption of ICT in healthcare is often called e-health. The assumption behind these developmental policies is that investing in ICT is the path towards social and economic development. It is perhaps not an overstatement to state that among the most pressing problems confronting nations today such as poverty and climate change, the health and well-being of populations is of central importance and consumes significant national resources. Following the explosion of the internet in the 1990s and the emergence of words such as e-Business, e-Solutions and e-Commerce, the term e-health was introduced to represent the promise of ICT to improve healthcare services (Eysenbach, 2001). Despite the lack of consensus on a clear definition of e-health, there is a tacit understanding of its meaning and the term is widely used by industries, academic institutions, funding agencies, professional bodies and many individuals. E-health is an emerging field at the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies to improve health care. While definitions of what correctly falls within the scope of e-Health may vary, what is consistent is the excitement around perceived benefits and the rush to move forward with collaborative opportunities using advanced technologies to improve healthcare sector (Avgerou, 2008). The World Health Organization (WHO, 2013) has defined e-Health as the cost-effective and secure use of ICT in support of health and health-related fields, including health care services, health surveillance, health literature, and health education, knowledge and research. These technologies are applied in the healthcare field to improve the access, efficiency, effectiveness and quality of clinical care. Regardless of their definition and research perspective, virtually all authors emphasize that the main goal of e-Health should be the contribution to high-quality, efficient patient care and effective performance of the health care system. Further more Korpela (2013) notes that e-Health could empower patients and help in exceeding information asymmetry between main stakeholders while ensuring that reliable and timely health care information is available for operational and strategic decision making. Moreover e-Health systems combined with organizational changes and development of new skills can act as key enabling tools facilitating considerable enhancements in access to quality of care, as well as efficiency and productivity of the health care system. According to Bhatia (2014) the use of ICTs in the health sector tends to focus on three broad categories mainly: (i) improving the functioning of health care systems through improving information management and access; (ii) improving the delivery of health care through better diagnosis improved treatment; (iii) Improving communication about health, among health workers and the general public. Nevertheless e-Health systems are seen as an opportunity to improve efficiency, reduce administrative costs, facilitate communication, and enhance patient care (Mishra, 2007; Avgerou, 2008).

Research problem

The health care sector in Kenya is recognized as having lagged behind other industries, for example the financial sector, in the use and implementation of new information technologies. The sector is characterized by many and fragmented applications which lack data sharing mechanisms. Manual processes represent a significant part of the processes. These systems suffer from lack of data ownership, poor data quality, poor data security and backup procedures and therefore rarely used for decision-making. This poses challenges when reporting what is really happening in the health care to support disease surveillance, planning, clinician and strategic decision making. Thus there is need for a strategic approach towards implementation of e-health technologies in the healthcare sector.

Methodology

Literature review was employed in this study. Abstracts from research journals and health related databases (among others) were examined. Other research papers of some of these scientific publications were also examined to determine research directions. Other documents examined included the Kenya ICT policy (2006), Kenya Communications Act (2009), Standards and Guidelines for Electronic Medical

Records in Kenya(2010), Kenya e-Government Strategy Strategic Plan for Health Information Systems (2013-2017).

Forms of e-health

E-Health consists of various applications that support patient management and care. These applications include electronic Medical Records (EMRs), Telemedicine, Health Knowledge Management, Consumer Health Informatics (CHI), M-Health and Healthcare Information Systems (HIS). Telemedicine is the exchange of medical information between two parties located at different geographical sites via a telecommunication link (WHO, 2012). Telemedicine at the high end encompasses videoconferencing, where information exchange between health workers and/or patients is done via a video link (Berler, 2006). Similarly Bhatia, (2014) refers to telemedicine as the use of information technologies to exchange health information and provide health care services across geographical, time, social, and cultural barriers to improve diagnosis and treatment of specific conditions dramatically. Mbarika (2012) asserts that used wisely, telemedicine can be a cost-effective method that richer countries can employ to aid capacity building in the health care systems of poorer countries. Health Information systems or health management information systems on the other hand are systems used to collect, analyze, retain, retrieve and evaluate health information (Alvarez, 2003). The WHO, (2011) adds that a health management information system incorporates all the data needed by policy makers, clinicians and health service users to improve and protect population health. According to Lazaro, (2013) the goal of a Health Management Information System is to check quality by comparing perceptions of services delivered with the expected standards and to provide timely and accurate information leading to better health care planning and improved diagnosis and more patients getting access to health services for an entire country. Avgerou, (2008) defines Mobile health as the use of mobile communications in order to enhance healthcare service delivery. Mishra, (2007) suggests that the use of the Internet and mobile devices has opened new avenues for health promotion and management. These technologies may be used to improve access to sources of knowledge for patients, health care providers, and the general population.

Electronic Medical Records (EMR) are applications that are used to keep patient's clinical history and support clinical actions by health professionals. They include information such as test results, medication and general clinical history. Electronic health records enable the storage, and communication of patient data between different healthcare professionals, they can be made rapidly available through the system to authorized personnel providing patient care (Anwar, 2012). Eysenbach, (2007) defines Consumer Health Informatics (CHI) as a medical informatics that analyzes consumer's needs for information, studies and implements methods of making information accessible to consumers, and models and integrates consumer's preferences into medical information systems. Consumer Health Informatics (CHI) plays a major role in providing information to patients and the public, which facilities the promotion of self-care, enabling informed decision-making, promoting healthy behaviors and peer information exchange (Kimaro, 2007). Health Knowledge Management tools provide great support to exploit the huge health knowledge and information resources while assisting today's healthcare organizations to strengthen healthcare service effectiveness. They provide an overview of latest medical journals, best practice guidelines or epidemiological tracking of trends and management of diseases; examples include physician resources such as Medscape and MDLine (Juma, 2012). These applications are intended to improve the patient's diagnosis and treatment while increasing organizational productivity at minimal costs (Murray, 2010).

Theoretical review

In order to ground further understanding of e-health implementation and sustainability in a developing country context, this study examined information systems theories used in implementation and sustainability of technology, including the Actor network (Aarts et al 2004), Technology Acceptance Model (Davis et al. 1989), Technology Organisation and Environment Framework theory (Tornatzky and Fleischer 1990).

Actor-Network Theory (ANT)
ANT's main feature is its focus on inanimate entities and their effect on social processes. An actor is thus referred to as the source of an action regardless of its status as a human or non-human; this is a radical notion in that it contests that inanimate things (e.g. such as technology) can also have agency. An actor can however only act in combination with other actors and in constellations that give the actor the possibility to act - this is because reality is assumed to be actively performed by various actors in a particular time and place (Aarts et al 2004). Thus inherent to ANT is a move away from the idea that technology impacts on humans as an external force, to the view that technology emerged from social interests (e.g. economic, professional) and that it thus has the potential to shape social interactions. In addition ANT assumes that if any actor, irrespective of its position, is removed from or added to the network, as is the case if technology is introduced into an organisation, then the functioning of the whole network will be affected. However, networks are constantly evolving as social reality is assumed to be both complex and fluid (Cresswell et al., 2010).

ANT has its own epistemological and ontological position, in essence considering the world as consisting of networks. These networks can include humans, things, ideas, concepts - all of which are referred to as "actors" in the network (Cresswell et al., 2010). Tracing of associations or relationships between network components (or actors) is a key activity in ANT. ANT assumes that the sum of non-social phenomena can account for something that is social as a result of constellations of human and non-human actors constituting the network. It follows then that the ANT approach is agnostic with respect to the debate which has divided many sociologists in that it neither asserts that everything is socially constructed (social constructionism) nor that everything is pre-existent (realism) . ANT can be applied in e-health adoption in at least two ways - conceptually and practically. Conceptually, ANT approach can be valuable in helping researchers to appreciate the complexity and fluidity of reality, which may be neglected by research approaches assuming a more linear and causal approach to studying IT adoption. As a result, ANT helps to conceptualise how different realities are experienced and enacted by different actors, resulting in a more nuanced picture of the dynamic relationships between different actors without neglecting their inter-relatedness. This is important when considering the fast-moving and ever-changing area of healthcare itself, and particularly so in relation to government-led change initiatives and resulting changes in power relationships. Aarts et al (2004) suggests that the active role of the technology in mediating social relationships has also been helpful in conceptualising this research. For example conventional paper systems are replaced by new e-health systems and this has radically changed the way the healthcare clinicians operate.

From a micro perspective, healthcare technology may be viewed as a new component added to an established network consisting of healthcare staff (clinicians) and existing objects (e.g. paper, medical instruments, other information systems). For example the integration of the new e-health system requires the formation of new connections and other more established network components to re-organise around this new actor and ANT can help to gain a deeper insight into the processes involved (Aarts et al., 2004). This can then result in recommendations of how to make the new network - i.e. one now including both humans and technology - more stable and in so doing facilitate the effective integration of the technology into the healthcare environment. Thus this may then help to explain why an adoption of e-health was slower than expected or came to be labelled as a "failure" by some researchers. However as with all other approaches to social theory, in attempting to answer the question of how social orders are created and maintained ANT faces epistemological, ontological and methodological challenges. ANT's practical applicability has led to conclude that "ANT's main shortcoming is its being everything but a theory", a criticism which has been partly attributed to its (allegedly inappropriate) naming. Wickramasinghe & Schaffer, (2010) suggests that the essence of this criticism is that the approach is too descriptive and failing to come up with any detailed suggestions of how actors should be seen, and their actions analysed and interpreted. Furthermore given the complexity of the healthcare industry it has therefore been

proposed that ANT may be best used in a combination with other theoretical approaches, especially in relation to analysis and interpretation.

The Technology Acceptance Model

TAM appears to be particularly applicable in the healthcare information technology field because it focuses on two specific constructs believed to influence the use of information technology. According to Hung et al. (2005) Perceived usefulness is the factor that indicates the degree that the person believes the information system will assist them in the performance of their job. Perceived ease of use is the second factor, which is used to indicate how difficult the person believes the proposed system would be to use. These constructs are based in the theory of reasoned action Fishbein & Ajzen (1975)'s, which noted that a person's behavioral intention is determined by the person's attitude as well as a subjective norm as estimated by regression. Indeed the TAM was derived in part from the Theory of Planned Behavior. Advocates of the Theory of Planned Behavior suggest that all behavior is motivated by individual decisions that are based on an individual's intention to perform that behavior. Estrad (2003) suggests that Intention to perform a behavior, in turn, is influenced by the individual's perceived control over the performance of that behavior, his or her attitude toward performing the behavior and his or her perception of social norms (pressure or approval from important referent individuals to perform a behavior. Theory of Planned Behavior asserts that behavioral control reflects an individual's belief regarding the ease of performing or completing a task. Behavior control is similar to the Technology Acceptance Model's perceived ease of use construct.

Within the healthcare sector a few studies examine user acceptance of technology, such as TAM or its extended models to investigate physician technology acceptance, for example (Chau and Hu 2001; Kifle, *et al*., 2005b). Hu *et al*. (1999), using data from Hong Kong physicians to examine the acceptance of e-health technology, find that perceived usefulness is a significant determinant of attitude and intention, while ease of use is not. A subsequent study by Chau and Hu (2001, 2002a and 2002b), using a similar sample (Hu *et al*., 1999) article, utilized three models (TAM, TPB and an integrated model derived from TAM and TPB) to evaluate technology use and acceptance decisions based on the technology's compatibility. The outcomes indicate that TAM is an appropriate model to explain individual physicians' technology acceptance decisions. Kifle *et al*. (2005b) proposes a model that combines Technology Acceptance Model (TAM) originally proposed by Davis (1989), Diffusion Innovation Theory (IDT) by Rogers (1976), and Theory of Planed Behavior (TPB) by Ajzen (1991), and addresses factors influencing physicians' intentions to adopt e-health. In their study, TAM was modified to indicate additional constructs, namely Image and perceived voluntariness of use, taken from the Innovations Diffusion Theory (Rogers, 1983), in addition to situation support and perceived effort and persistence. Their findings show that perceived compatibility is positively related to perceptions of the ease of use of e-health systems.

However, many of the studies utilizing the TAM or some variation of the TAM have focused on general user populations working in varying occupational settings, and utilizing a wide spectrum of information technology solutions. Hung et al. (2005) states that TAM contains two main factors: perceived usefulness and perceived ease of use. According to Chao *et al*., 2007; Morton 2008; Ma & Liu 2005; Ilie et al. 2009 TAM effectively explains why an individual accepts information technology, and how the intended use of this technology and its perceived usefulness and ease of use will significantly affect a medical worker's continued use of the system. On the other hand Chao *et al*., (2007) says that TAM has been widely criticized, despite its frequent use, leading the original proposers to attempt to redefine it several times. Criticisms of TAM as a "theory" include its questionable heuristic value, limited explanatory and predictive power, triviality, and lack of any practical value. Kifle *et al*. (2005b) suggests that TAM "has diverted researchers' attention away from other important research issues and has created an illusion of progress in knowledge accumulation. Furthermore independent attempts by several researchers to expand TAM in order to adapt it to the constantly changing IT environments has led to a state of theoretical chaos and confusion. In general TAM focuses on the individual 'user' of a computer,

with the concept of 'perceived usefulness', with extension to bring in more and more factors to explain how a user 'perceives' 'usefulness', and ignores the essentially social processes of Information System development and implementation, without question where more technology is actually better, and the social consequences of Information System use.

Technology Organisation and Environment Framework theory

The Technology Organisation and Environment (TOE) framework was developed by Tornatzky and Fleischer (1990). The framework identifies three aspects that influence the process of organisation adoption of technological innovation: technological context, organizational context, and environmental context Technological context describes both the internal and external technologies relevant to the firm. These include existing technologies and current practices inside the firm, as well as the pool of available technologies in the market. Organizational context refers to descriptive measures about the organization such as scope, size, and managerial structure and internal resources, availability of slack resources. Environmental context is the arena in which a firm conducts its business—its industry, competitors, and dealings with the government (Tornatzky and Fleischer, 1990). This framework is consistent with the DOI theory, in which Rogers (1995) emphasized individual characteristics, and both the internal and external characteristics of the organization, as drivers for organizational innovativeness. These are identical to the technology and organization context of the TOE framework, but the TOE framework also includes a new and important component, environment context (Hsu *et al.* 2006). According to Tornatsky and Fleischer (1990), TOE contexts of a firm can influence the diffusion process. Therefore, Rogers's theory of DOI coupled with TOE framework would provide a useful theoretical framework to explain the organizations adoption of IS.

In the healthcare setting as per TOE, the technological context of an organization is important in influencing the adoption and implementation of e-health (Chau, 2001). Expertise on the use of existing technologies can be leveraged to support the introduction of innovations and knowledge of new technology can highlight the opportunities available for the organization to innovate. Further, researchers have combined aspects of DOI with TOE to increase understanding of organizational IT adoption (Iacovou et al., 1995). Specifically; they suggested that the technological context in TOE includes the knowledge of innovation characteristics from DOI. Factors such as technology readiness are associated with the adoption decision of e-health. When organizations have previous experience with initiating and implementing e-health, they can draw on their higher level of technological readiness to support the adoption of new technology. For example, (Chau, 2001).found that hospitals with lower technological readiness had poorer odds of health information exchange systems adoption. Additionally, technology readiness is found to be related to receptivity of the management to novel technology. For example, Hung et al. (2005) noted that hospital management's readiness to change influenced their willingness to adopt e-health systems.

 In addressing organizational factors in healthcare, TOE has emphasized the important role of organizational resources and capabilities in influencing e-health adoption decisions. For example, Iacovou et al., (1995) noted that having adequate resources (human, financial, and technical) is a significant determinant for hospitals' adoption of electronic signatures. This also includes possessing sufficient technological knowledge. Besides having a pool of resources, organizational capabilities such as knowledge management capability and project team capability may be influential in the adoption decision of e-health (Zhu et al., 2003; Oliveira and Martins, 2010. Environmental factors Especially salient for the healthcare sector, government involvement through policies and support can influence the decision to adopt new systems to a large extent External vendor partnership is also crucial for implementation of healthcare IT innovations, especially when the organization is unfamiliar with the technology (Iacovou et al., 1995; Kuan and Chau, 2001, Chong et al.2009). Besides, business competition is also found to stimulate IT innovation adoption as healthcare organizations strive to attract more customers and earn increased revenues by improving efficiency. Thus TOE alone is not sufficient to study the drivers of e-health implementation but has to be combined with other theories.

Discussions
Strategic issues in e-health implementation
According to Gichioya (2005) barriers to ICT implementation include lack of infrastructure, inadequate funding, poor data systems and lack of compatibility coupled with lack of skilled personnel. In addition leadership styles, culture, and bureaucratic procedures are a major hindrance. In Kenya for instance these barriers among others include inadequate funding and poor leadership style. The healthcare environment is complex and multifaceted thus to fully understand it conceptually required grappling with many interweaved and overlapping strategic issues. Literature review on e-health implementation is quite broad but the most strategic issues addressed in the articles are identified as falling into five priority areas. They include namely: e-Health standards; ICT and health policies; e-legislation; e-Health infrastructure; ICT competence.

ICT and Health Policies
The literature on e-health policy and strategies, in general, is fairly current, and remarkably scarce. The few existing articles mainly focus on the need to address the e-health policy issue at both national and international levels. However, most governments in both developed and developing countries have made an initiative of establishing ICT policies for healthcare (WHO, 2011). The objectives and goals of the various governments are rather alike. Nevertheless, the level of defining the policies and transforming them into projects and programs differs from country to country (Oladosu, 2009 & Mbarika, 2012). Murray (2010, p.2) defined "e-health policy as a set of statements, directives, regulations, laws and judicial interpretations that direct and manage the life cycle of e-health". According to the WHO, (2011) policies in an organization help in developing a vision for the future. Equally act as reference for short, medium and long-term objectives. In addition they assist when setting out priorities, delegating roles and defining action to be taken and institution arrangements. Indeed policy and decision producers in the larger health system must see e-health as a key player in provision of improved health service. In that regard ITU (2014) encourages ministries of health to work together to develop a unified e-health policy that is standardised across all countries.

In addition, Korpela (2012) recommends that e-health be integrated into the existing health system in a policy, not only a practicable way, and this is accomplished with an overall viewpoint. All things considered, numerous e-health assignments in developing nations, especially in less developed nations, are implemented and assessed as stand-alone (pilot) initiatives. Murray (2010) attests that a significant part of the supplication of e-health stays intuitive, and is based on fragmented rather than experimental research. A few papers talk about the real requirement for a policy in e-health (Lazaro, 2013; Mbarika, 2011; Oladosu, 2009 and Murray, 2010). Privacy, confidentiality and payment of services have appeared as significant policy issues for e-health execution. Nevertheless, policy development severely slows e-health enhancement. Thus Korpela (2013) stresses that setting up a policy or an approach in developing e-health projects is the answer to the realization. The WHO contends vivaciously for informatics rules that are, in a national setting, carefully built in across all sectors, institutionalized, and thoughtful to local and regional interests (WHO, 2013). In Kenya, the government in partnership with the private sector has made important strides towards creating policies and strategies for the uptake of e-health. For example, Strategic Plan for Health Information Systems (HIS) (2009-2014) and the Kenya ICT policy (2006). The Kenya Health Policy, (2012 – 2030) gives directions to ensure significant improvement in overall status health in Kenya is in line with the country's long term development agenda, Vision 2030, the Constitution of Kenya 2010. There is also a National e-Health Strategy. This strategy presents a set of interventions that the health sector plans to use to facilitate the efficient and effective delivery of services. Therefore one major challenge to the effective implementation of e-Health in Kenya is the lack of an e-Health Policy in place (Ministry of Health, 2013).

E-legislation

The use of ICT networks techniques is the primary difference between e-health and traditional face-to-face care delivery; therefore, privacy, confidentiality and standards are key issues associated with care delivery and the use of Internet for care delivery. Hence, privacy, confidentiality and security issues emerge when care is delivered across a distance or *via* Internet (Mugo, 2014; Xiangzhu *et al.,* 2013). Furthermore the utilization of web for transmitting patient's information online is an issue of disquiet. Subsequently protection, discretion and security issues arise when patient care is passed over a distance or by means of Internet (Mugo, 2014). In that regard the web is considered to likely assume a critical part in e-health administration. Thus Xiangzhu et al., (2013) highlights protection, security and discretion as key issues influencing the execution of e-health in the sector.

Without a doubt many less empowered nations are inadequately prepared to keep up sufficient levels of patient data protection. It is very much acknowledged that the act of e-health is to a great degree data sensitive. For most clinicians the necessity that patient related data ought to be kept private, is a center component of guaranteeing that the trust the patient places in the clinician by sharing personal data is not damaged (Mugo et al. 2014). Many e-health publications address the need to develop security and standards polices, but very little literature about privacy, confidentiality, standards, and security is actually to be found in developing countries. Standards and security policies are new and relatively few in developing countries (Mbarika, 2010), so most of the existing literature have drawn from focuses on the ICT in general, and the experiences of the USA and the EU in particular. The ITU and WHO have produced the few studies that examine the effects of security and standards issues in developing countries. In developed countries, e-health technology brings with it concerns about privacy, security, and confidentiality for a long period, more than security issues in other sectors (Murray, 2010 & Xiangzhu *et al.,* 2013). These issues necessitate initiating a process to address risks specifically associated with their application to Information Systems. Thus, the key issues of information systems security are related to the preservation of confidentiality, integrity, availability, and accountability of the Information Systems. Indeed, security and confidentiality of electronic medical transactions over networks are major concerns for all e-health providers, patients, and other stakeholders (WHO, 2013). Inadequate electronic legislation for instance has negatively affected e-Health implementation in Kenya. The ICT regulatory environment in Kenya is governed by various legal instruments including the National ICT policy 2005, the Kenya Communications Act 1998; the Kenya Communications Regulations 2001 and Kenya Communications Amendment Act (KCAA, 2009). The Kenya Communications (Amendment) Act, 2009 however, does not address all aspects of e- transactions, e.g confidentiality of data and ethics. Users of e-Health want to be sure that their confidentiality is protected. Currently the Health bill 2015 is currently undergoing review. The bill is an ACT of Parliament to establish a unified health system, to coordinate the inter-relationship between the national government and county government health systems, to provide for regulation of health care service and health care service providers, health products and health technologies and for connected purposes (Health Bill, 2015).

E-Health Standards

A major barrier to e-health implementation is the inability of healthcare information systems (HISs) to interoperate in order to share information. Standardization is seen as the key to achieving interoperability. However, the e-health standardization arena is fraught with many challenges, the chief of which is the huge number of available standards, with many of them competing and overlapping, and some even contradicting one another (Braa, 2007 & Juma, 2012). A standard is an agreed-upon, repeatable way of doing something; it is seen as the key to achieving interoperability of healthcare systems. A standard could be formal, proprietary or open (Braa, 2007 & Fanta et *al,* 2015). Standardization is one of the most important issues for the successful development and deployment of e-health systems, since many standards are developed independently of the organization originally preparing the standard. Moreover many issues concerning policy forming and decision making about the implementation of e-health systems are related with the construction of an open standardized environment.

The role of standards in e-health must be viewed in the context of healthcare organizations, the technology drive, and the different interests of the different actors. Any individual organization or project involved in e-health applications has to make its own decisions concerning official standards, *de facto* standards, and proprietary solutions (Korpela, 2014 & Juma 2012). For all information system users, the Open Systems Interconnection (OSI) standards address many functions, such as capacity, transmission rates, protocols, and security. Additionally, healthcare information systems security standards are critical for ensuring the confidentiality and integrity of health information. However, e-health is different from other technologies in terms of both continuity and standards. Considering the wide range of technologies and applications used, standards need to be developed for the management of setting up a national committee for e-health (Braa, 2007 & Murray, 2010). Continuity is needed for the delivery of a reliable, efficient, safe and quality level of healthcare, as well as a reliable telephone and electrical power system. Existing literature on the adoption of e-health standards revealed that the slow pace of the adoption of standards (both by developed and developing nations) is due to several factors. The factors include the large number of standards that are being developed by the various countries, the fact that e-health standards do not address one unified area of technology, the existence of conflicting and overlapping standards, the difficulty of combining standards from different countries and the high cost of converting to new standard-based solutions (Braa, 2007 & Korpela, 2013). Furthermore, sufficient standards for medical imaging, interoperability, software, transmission, infrastructure, architecture, medical informatics, and bioinformatics are yet to be formulated in developing countries (Juma *et al*., 2012). However, Kenya has made great strides towards developing e-health standards with the release of the Standards and Guidelines for Electronic Medical Records (EMR) in Kenya (2010). The standards do not address Medical record portability, privacy and ownership which are major concerns for e-health implementation (Juma *et al*., 2012). The ISO27001 standard -ISMS (Information Security Management System)   does not address the e-health privacy related issues.

E-Health Infrastructure

Typically a country needs a solid ICT infrastructure to provide a platform for e-health systems (Mbarika, 2004). The ICT infrastructure typically includes phone lines, fiber trunks, submarine cables, T1, T3, OC-xx, ISDN (integrated services digital network), DSL (digital subscriber line), and other high-speed services used by businesses, as well as satellites, earth stations, and teleports. A well-defined infrastructure is an essential ingredient for any country to realize the success e-health frameworks. Such frameworks ought to likewise incorporate broadcast communications, power, access to PCs, Internet, ISPs (Internet specialist co-ops), and accessible data transfer capacity and broadband access (Qureshi et al., 2013). Indeed to offer good multimedia content and thus provide a rich e-health experience, one would require high bandwidth. Subsequently ICT infrastructure is without a doubt a significant requirement in e-health implementation. Equally networks are now a critical component for healthcare institutions to share and exchange health information. Thus the internet is one of the convenient and cheapest sources that save time for searching information by the healthcare professionals (Anwar, 2012).

Internet refers to the interconnection of computer networks using a standard packet switching protocol for communications (Mbarika et al., 2012, Korpela 2013). Although the internet has significantly affected the processes of healthcare delivery, it is only one of the tools used in "digitizing" and improving the management of healthcare information. Generally much of the research about e-health technologies has taken place in developed countries than developing countries. Furthermore these countries have a relatively appropriate infrastructure already in place, and extending and expanding the existing health and telecommunications infrastructure have facilitated rollout (Odedra et al., 1993 & Korpela et al., 2014). Hence for developing countries without a developed telecommunication infrastructure, the transfer of e-health presents specific problems. Moreover in many of these developing countries, implementers of healthcare applications based solutions are faced with intricate challenges such as inadequate funding, insufficient resources and fragile healthcare infrastructure. In addition, some countries may have just a rudimentary application level of healthcare technology (Qureshi et al., 2013).

In the last decade, Kenya has experienced significant improvement in ICT infrastructure (National Broadband Strategy, 2013). Since 2000, the sector has outperformed all other in the Kenyan economy, growing on average by approximately 20% annually (World Bank Economic Update, 2014). This has been largely due to the major advancements in infrastructure, favourable government policy, as well as an active and innovative private sector. Many Kenyans are now interacting actively with technology in terms of creation and development of the technology. According to Kenya's communications regulator in their Quarterly Sector Statistics Report (June 2016-2017), Kenya has a mobile penetration of 86% (ITU, 2016). This figure is significantly higher than the African average of 80.8%. Noticeably Kenya has also increased its internet usage with 82 out of every 100 persons having access to the net (ITU, 2016).Currently several telecommunication companies are competing in laying out the fiber optic cable to interconnect all major towns in the country. The government has played a major role in this improvement by lowering import taxes on ICT equipment and liberalizing the telecommunication sector. The Kenya Government Communication Act (1998) was a precursor for opening up competition in the ICT industry. To ensure equity in access to broadband, the Kenya government has formulated a strategy to ensure that all Kenyans have access to broadband by year 2017 (The National Broadband strategy for Kenya, 2013). The main objective of the National Broadband Strategy (2013) is to provide quality broadband services to all citizens. In regards to the benefits of broadband, the National Broadband Strategy cites e-health as one of the benefits of broadband. This kind of connectivity would create an enabling environment for the uptake of e-health.

ICT Competence
Training on use of technologies among healthcare workers is cited as a critical contributing factor to success of e-health implementation (Mbarika, 2011). According to Mishra (2007) training staff on use of technologies is a necessity in fostering positive attitudes about electronic patient data management which translate to greater acceptance and implementation of e-health. Kiura (2012) attributes low implementation of e-Health among developing countries to lack of computer skills amongst the healthcare workers. In countries that have espoused training on use of technologies for healthcare workers, acceptance of e-Health and actual use is relatively high (Korpela, 2012 & Mbarika, 2012). This is because training increases awareness and raises confidence level as users are able to overcome technophobia while relating usage to expected benefits (Kimaro, 2005). Likewise Lazaro et al. (2013) add their voice by arguing that optimal use of IT towards the improvement of healthcare requires IT know-how across the healthcare field.

The association between training on technologies and execution of e-Health is also discussed by Juma et al. (2012) who points out that inadequate computer skills in the health sector in Kenya explains the low implementation of e-Health. Qureshi et al. (2013) and Murray, (2010) are of the opinion that those healthcare professionals who lack the computer skills of processing the online health data end up spending too much time on the same. Furthermore without adequate computer skills, user involvement in selection and development of technologies becomes difficult which might lead to having e-Health technologies that are not widely accepted or used adequately (Murray, 2010 & Kaye, 2010). Additionally there is a chronic shortage of medical personnel in developing countries. Indeed, Kenya is one of the countries identified by the WHO as having a "critical shortage" of healthcare workers. Undeniably Kenya's healthcare infrastructure suffers from inadequate clinical personnel. Namely Doctors 1:26,438 Dentists 1:236,686 Pharmacists 1:141,343 Clinical Officers 1:19,011 Nurses 1:2,465 Other Health Personnel 1:4,115 Non Health Personnel 1:7,124 (Ministry of Health, 2013). Moreover Kenya's low physician density demands new solutions for improving doctor communication and maximizing available human resource capacity. Thus e-health would be the solution to this problem as many elements of medical practice can today be accomplished even when the patient and health care provider are geographically separated (Ministry of Health, 2013). In addition there is lack of computer training in health professionals curricula and e-health leadership. In today's highly dynamic environments, organizational leaders need to quickly adapt existing approaches to digital transformation. Furthermore,

without a shared mindset between information system and institution leaders, it is difficult to adopt new approaches in response to changes in the competitive technology landscape. E-health leadership would give guidance in the design, selection, implementation and sustainability of e-health systems (Qureshi et al., 2013; Ronen et al., 2011 & Juma et al., 2012).

Conclusion

The theoretical models basically do not give a clear picture of what affects e-healthcare research thus there is need to adopt a different methodology to understand this issue deeper. Methodologies such as grounded theory approach would provide rich data on the issue and generate a data driven model. Such a model would be more context specific and relate to the real problem on the ground other than testing existing theories that force a certain preconceptions unlike grounded theory that allows generation of a theory grounded on data (Charmaz, 2014).

Future research

This study used secondary data sources to evaluate the issues that underlie Information System implementation in the healthcare sector. The five issues discussed above may not be exhaustive in unearthing the phenomenon of e-health implementation in developing countries. Many of them are not context specific and exhaustive thus there is need for further research to explore other variables in detail by carrying out a research in the specific context.

References

Aarts, D. and Berg, M. A (2004) tale of two hospitals: a socio technical appraisal of the introduction
          of computerized physician order entry in two Dutch hospitals, *Medinfo; 11(2):999-1002.*

Anwar, F., Shamim, A., & Khan S. (2012). Barriers in implementation of health information
          technology   in developing societies. *International Journal of Advanced Computer Science*,2(1).

Avgerou C. (2001) The significance of context in information systems and organizational change:
          Information systems journal. Volume 11, Issue 1Pages43–63

Avgerou C. (2008). Information systems in developing countries: a critical research review. *J Inf
          technol* ;23:133_46.

Alvarez RC. (2003) The promise of e-Health - a Canadian perspective. *e-Health Int*. Sep 17;1(1)

Ajzen I. (1985) 'From Intention to Actions: A Theory of planned Behavior, *In: J. Kuhl, J. Bechmand
          (Eds.), Action Control: From Cognition to Behavior, Springer, New York*

Ajzen, I. (1989) 'Attitudes, Personality and Behavior', *Open University Press, Chicago*
          Anwar, F., Shamim, A., & Khan S. (2012). Barriers in implementation of health information
          technology in developing societies. *International Journal of Advanced Computer Science,2(1).*

Berler, A., Tagaris, A., Angelidis, P. And Koutsouris D. (2006) 'A Roadmap towards Healthcare

          Information Systems Interoperability in Greece', *Proceedings of 2006 6*th *Nordic Conference on
          e-Health and Telemedicine, Helsinki, Finland*

Bhatia, J S (2014). Adoption of Telemedicine in India– An Exploratory Study. *International Journal of
          Emerging Technology and Advanced Engineering* Volume 4, Issue 10.

Berler, A., Tagaris, A., Angelidis, P. & Koutsouris D. (2006). 'A Roadmap towards Healthcare
           Systems Interoperability in Greece', Proceedings of 2006 6th Nordic Conference on e-Health
          and Telemedicine, Helsinki, Finland.

Braa, J., Monteiro, E., and Sahay, S. (2004) "Networks of Action: Sustainable Health   Information
          Systems Across Developing Countries,"*MIS Quarterly* (28:3), pp. 337-362.

Braa, J (2007) developing health information systems in developing countries: the flexible standards
           strategy. *MIS Quarterly* Vol. 31 Special Issue pp. 1.

Chau, P. Y. K., and Hu, P. J. (2001, (2002b). Information technology acceptance by individual
          professionals: A model comparison approach. *Decision Sciences, 32(4), 699-719.*

Charmaz, K. (2014). Constructing grounded theory. Sage.

Cresswell, K.M., (2010) "Actor-Network Theory and Its Role in Understanding the Implementation of
          Information Technology Developments in Healthcare", *BMC Medical Informatics & Decision
          Making,* 10(67), pp. 1-11.

Eysenbach, G. (2007). Editorial: Poverty, Human Development, and the Role of e-Health. *Journal of Medical Internet Research, 4, 34.*

Eysenbach G.(2001.) What is e-health? *Journal of Medical Internet Research, Jun 18;3(2)*

Ekeland, A. G., Bowes, A., & Flottorp, S. (2010). Effectiveness of e-health A systematic review of reviews. *International Journal of Medical Informatics, 79(11), 736-771.*

Fanta   et al. (2015) An evaluation of ehealth systems implementation frameworks for sustainability in resource constrained environments; *International Association for Management of Technology* IAMOT 2015 Conference Proceedings.

Fishbein, M. and Ajzen, I. (1975) 'Belief Attitude Intentions and Behavior: An Introduction to Theory and Research', *Addison-Wesley, Boston, MA,*

Gichioya. D.(2005) Factors Affecting the Successful Implementation of ICT Projects in Government Electronic *Journal of e-Government* Volume 3 Issue 4 (175-184).

Iacovou, C., Benbasat, I., and Dexter, A. (1995) 'Electronic Data Interchange and Small Organizations: Implementation and Impact of Technology', *MIS Quarterly, Vol. 19, No. 4, pp. 465 – 485.*

Jennett, P.A., and Siedlecki B. (2001) 'e-health Policy: Building a Functional System' *E-health Law, Vol.1, pp. 53-58.*

ITU (2001), African telecommunication Indicators. *Geneva, International Telecommunication Union*

ITU (2015), African telecommunication Indicators. Geneva, International Telecommunication Union

Juma K et al.(2012). Current Status of E-Health in Kenya and Emerging Global Research Trends. *international Journal of Information and Communication Technology Research*; Volume 2 No. 1

Kaye (2010). Barriers and success factors in health information technology: A practitioner's perspective. *Journal of Management & Marketing in Healthcare*. VOL. 3 NO. 2. PP 163–175.

Korpela M et al. (2014). Good Practices to Enhance the Perceived Usefulness of Computerized Hospital Information Systems – Case Study in Nigeria. *Journal of health information in Africa*; vol 2 No 2.

Korpela M et al. (2013).How to develop services work and information system in healthcare. *CSCW Journal:* 2nd revised version

Kimaro, H.G., & Nhampossa, J.L. (2007). The challenges of sustainability of health information systems in developing countries: Comparative case studies of Mozambique and Tanzania. *Journal of Health Informatics in Developing Countries*, 1(1).

Kiura S. M. & Ontunya P. (2012). Embracing e-Health: Free and Open source(FLOSS) Opportunities in Kenya; International Society for Telemedicine & eHealth, Vol. 5.

Lazaro (2013). Underlying Challenges of E-Health Adoption in Tanzania; *International Journal of Information and Communication Technology Research*; Volume 3 No. 1.

Latour, B.2005, Reassembling the Social: An Introduction to Actor-Network Theory, Oxford University Press, Oxford.

Mbarika, V, Okoli, C., Byrd, T., & Datta, P. (2005). 'The Neglected Continent of IS Research: A Research Agenda for Sub-Saharan Africa.' *Journal of the Association for Information Systems* (JAIS), Vol. 6, No. 5, pp. 130-170.

Mbarika, V (2004). 'Telemedicine in Africa -- A Possible Panacea for Sub-Saharan Africa's Medical Nightmare.' *Communications of the ACM*, Vol. 47, No. 7, pp. 21–24.

Mbarika, V et al.(2011). Factors Affecting Implementation and Sustainability of e-Health Information Systems in Uganda. *Journal of Health Informatics in Developing Countries*.

Mbarika V,Kituyi, M., Rwashana, A and Isabalija, R. (2012). A Framework for Designing SustainableTelemedicine Information Systems in Developing Countries. *Emerald Journal of Systems and Information Technology*. Issue 3.

Ministry of Health, (2011). Strategic Plan 2011-2017, Government Printer, Nairobi.

Ministry of Health, (2011). Kenya National e-health Strategy 2011-2017:;pp.11-17

Ministry of health, (2013). Kenya health sector strategic and investment plan 2013-2017, Government Printer, Nairobi.

Mishra S.K., (2007), "'E' for Excellence; 'e' for Health", *eHealth Vol. 2 No.1, pp. 36-37, January 2007*

Mugo et al. (2014). Determinants of Electronic Health in Developing Countries*; International Journal of Arts and Commerce* Vol. 3 No. 3.

Murray L et al. (2010). E-health in developing countries*". Journal of Information technology*, Vol. 5, pp. 55-58.

Musa, P. F., Meso, P., & Mbarika, V., (2005a). "Toward Sustainable Implementation of Technologies for Human Development in Sub-Saharan Africa: Precursors, Diagnostics, and prescriptions", *Communications of the Association for Information* Systems (CAIS), April Vol. 15, No. 33, pp. 592-608.

Oladosu J. B., Ajala A. F., & Popoola O.O. (2009). On The Use of Web Services Technology In E-Health Applications, *Journal of Theoretical and Applied Information Technology*.

Omary Z et al (2009).challenges to eheathcare adoption in developing countries;a case study of Tanzania. First international conference on networked digital technology . Ostrava.

Qureshi et al. (2013). Infrastructural Barriers to e-Health Implementation in Developing Countries: *European Journal of Sustainable Development*, 2, 1, PP;163-170.

Sood, S. P. (2004). Implementing telemedicine technology: Lessons from India. *World Hospital and Health Services(International Hospital Federation), 40 (3) 29-31.*

Ronen R et al. (2011). A qualitative study of Canada's experience with the implementation of electronic health information technology. *www.cmaj.ca on February 22.*

Tornatzky, L. and Fleischer, M. (1990) 'The Process of Technological Innovation', *Lexington, MA: Lexington Books*

Venkatesh, V., Morris, M.G. *et al.* (2003) 'User Acceptance of Information Technology: Toward A Unified View', *MIS Quarterly, Vol. 27, No. 3, pp. 425-478*

WHO, (2011). eHealth for Health-care Delivery, World Health Organization, Geneva

WHO, (2012). eHealth for Health-care Delivery, World Health Organization, Geneva

WHO, (2013). eHealth for Health-care Delivery, World Health Organization, Geneva.

Wickramasinghe, N., Fadalla, A. M. A., Geisler, E., Schaffer, J. L. (2005). A framework for assessing e-health preparedness. *International Journal of Electronic Healthcare, 1 (3) 316-334.*

Xiangzhu et al. (2013). Implementation of E-health Record Systems in Australia. *International Technology Management Review*, Vol. 3, No. 2, 92-104.

Yarbrough A., Smith, T. and Musa, P. F., (2005), "Technology Acceptance among Physicians: A New Take on TAM", *Presented and published in the proceedings of the Southern Management Association held in Charleston, SC – Nov. 2005.*