

A TECHNOLOGY PERSPECTIVE OF HEALTHCARE SERVICES MANAGEMENT

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Purpose: The purpose of this paper is to analyse the concept and role of technology within the context of healthcare services management

Problem investigated: The South African government is in the process of implementing a multi-billion rand National Healthcare Insurance (NHI) initiative that will entail an extensive review and revitalisation of healthcare services and its supporting infrastructure. Although technology plays a very fundamental and critical role in healthcare services management it would appear that the concept is not all that clearly articulated, both within the literature and in practice, within the field concerned.

Methodology: A multidisciplinary literature study and analysis was undertaken to gain an understanding of the concept technology and its application within a healthcare services management context. A review of contemporary IEEE, technology and healthcare technology management literature formed a key strategy in conducting the research study.

Findings: An important conclusion drawn from the study is that diverse interpretations exist as to the concept "technology" and its utilization as a support system within a healthcare services management context. Seen in the context of the development and roll-out of the NHI initiative this could be problematic. The people or human component of the technology concept in particular would appear to act as a constraint in the utilization of technology to support healthcare services delivery.

Value of the research: Increasingly healthcare professionals are confronted with limited resources and an increasing demand for efficient, cost effective, sustainable and patient centred services. The use of appropriate healthcare technology support systems could serve as a means for addressing some of these issues. The findings associated with this research study could serve as a source of information and reference for both researchers and practitioners involved in the strategic alignment of healthcare services and technology, particularly if seen within the context of the roll-out of the NHI initiative

Conclusion: A primary conclusion drawn from the study is that the concept of technology and its use within the healthcare services sector is rather pervasive, complex in nature and not all that effectively utilised to support service delivery in practice. The human or people aspect of healthcare technology management would seem to feature as being the most difficult to deal with in implementing an e-health strategy.

Key words and phrases: e-Health; Healthcare service science; Healthcare technology management; Organisational culture; Technology skills development; Telemedicine; National Health Insurance.

INTRODUCTION

"The appropriate deployment of technology contributes to the improvement in the quality of healthcare delivered, the containment of cost, and to increased access to services offered by the healthcare system. Over the past one-hundred years, the dependence of the healthcare system on medical technology for the delivery of its services has continuously grown."

Yadin and Jahnke 2004:73

The introductory statement by Yadin and Jahnke (2004:73) attest to the importance of the role played by technology as a support system in healthcare services delivery. Seen in the context of this statement it is important to note that Poluta (1996:1985) contends that:

"Sub-Saharan Africa has the symptoms of a crisis in healthcare technology management (HTM) which impacts adversely on healthcare delivery. The region is also at risk of becoming increasingly marginalised in terms of global developments. HTM interventions in the region will

continue to be sub-optimal unless HTM is recognised as a complex, dynamic, multi-level, multi-disciplinary process which can only be optimised through a holistic systems-based understanding of the technology intervention process”.

The researcher's contention certainly has relevance within a contemporary South African healthcare setting, where as stated by Bhagwandin (2011:91,93), e-health technology support systems form an important component of the healthcare services delivery system in dealing with the burden of disease. According to Bhagwandin (2011:92), South African research studies have shown that *“a significant percentage of equipment is not fully functional, that there are unacceptable levels of maintenance backlogs and that equipment is under-utilised due to a scarcity or lack of trained users”*. The researcher further claims that a fragmented approach to electronic healthcare technology planning, implementation and management, combined with a haphazard procurement process compound the problem of the effective use of technological systems (Bhagwandin, 2011:92). In this sense the researcher confirms the contention of Poluta (1996:1985) that the procurement, deployment, utilisation and maintenance of healthcare technologies require substantial financial, organisational and human resources. It is the contention in this paper that the effective utilization and management of healthcare technologies serves as a vital component of the healthcare service delivery process and in the roll-out of the government's envisaged multibillion rand National Healthcare Insurance (NHI) initiative a very definite and clearly articulated technology strategy will be required. By implication this will necessitate a very clear understanding of the concept “technology”, as a support system, within the context of healthcare services delivery.

Even a brief review of the literature reveals that diverse terms are used in relation to technology based support systems within the healthcare industry, namely healthcare informatics, telemedicine, m-health (mobile), e-health (electronic), and ICT-health (information and communication technology) systems to but cite a few such systems (Bateman, 2011:368; Connors, 2011:Internet; Intel, 2007:1; Mars & Jack, 2010:55; Stroetmann, Artmann, Stroetmann, Protti Dunmortier, Giest, Walossek & Whitehouse, 2011:vii,7; World Health Organization, 2011:6). In many instances the descriptions and definitions attributed to the concepts are very similar in nature or have nuance differences that are of a more specific descriptive orientation in terms of the actual systems concerned. The common denominator in most of the descriptions, however, relates to their support role in the delivery of healthcare services. A frequently encountered reference in relation to healthcare technology, within the literature, is that of “e- health” (Al-Shorbaji & Geissbuhler, 2012:322; Eysenbach, 2001:e20; Keeton, 2012:326). It is in fact claimed by Eysenbach (2001:e20) that nearly *“everybody talks about e-health these days, but few people have come up with a clear definition of this comparatively new term. Barely in use before 1999, this term now seems to serve as a general buzzword, used to characterize ... virtually everything related to computers and medicine”*.

The preceding contention by Eysenbach (2001:1) attests to a wide ranging interpretation and conceptualisation of what has become termed to be e-health technologies. In a sense the concept has become an overarching composite term for a number of related electronic healthcare technological systems. Research conducted by Oh, Rizo, Enkin and Jadad (2005:Internet) attests to the fact that *“the term ehealth encompasses a set of disparate concepts”*. It is further noted by the researchers that the variations among the definitions, reviewed by them, reflect various perspectives and contexts and collectively they *“enhance our understanding of the concept”* (Oh et al., 2005:Internet). The lack of clarity as to the concept technology within a healthcare environment implies a need for gaining an insight into the concept and its role as a support system in healthcare service delivery. With this in mind the ensuing section of this paper is directed at exploring the concept. Having gained clarity as to the concept the components thereof are then further analysed from a healthcare service systems management perspective.

The methodology adopted in conducting the research study essentially constitutes a multi-disciplinary review of the contemporary literature to gain an insight into the concept technology and its constituent components, as alluded to in the preceding discussion, from a healthcare services management perspective. The research strategy entailed a review of the contemporary IEEE, technology and

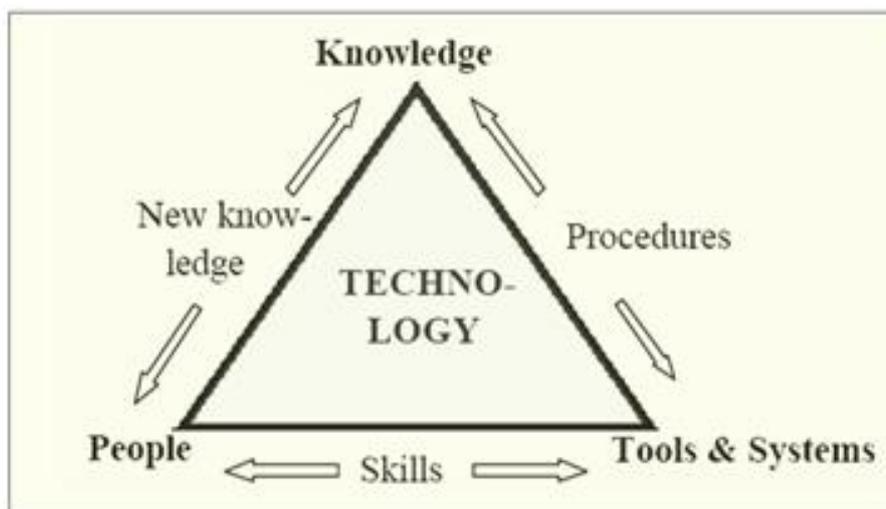
healthcare technology literature. As the research study unfolded references in the literature reviewed were followed-up thereby broadening the review to include literature within the South African e-publications and Ebsco Host data base.

THE CONCEPT TECHNOLOGY: A HEALTHCARE SERVICES MANAGEMENT PERSPECTIVE

In analysing the concept “technology”, Burgelman, Christensen and Wheelwright (2006:2) conclude that it refers to the “theoretical and practical knowledge, skills, and artefacts that can be used to develop products and services as well as their production and delivery systems”. Inherent in the description of the concept is the human aspect, namely the cognitive element embodied in knowledge and skills associated with production and the rendering of services. Pretorius (2000:2) also brings the human aspect into consideration in defining technology as: “*the integration of people, knowledge, tools and systems with the objective to improve peoples lives*”. The author, however, also adds the aspect of tools and systems as constituting a distinct component of the concept “technology”, while stressing the objective thereof as being to engender enhanced quality of life. The latter it could be argued will have a very distinct resonance within the context of healthcare. Khalil (2000:1) in defining the concept technology as “*all the knowledge, products, processes, tools, methods and systems employed in the creation of goods or in providing services*”, in very similar sense identifies systems and people as important components of the concept. It is suggested in this paper that a third defining element of technology needs to be considered, namely that of context. Differing contexts would seem to suggest the need for a unique set of systems and human attributes for effective service delivery. Within the context of healthcare this is reflected by the diverse systems cited, namely electronic medical records (Hersh, 2002:1955), telemedicine (Jack & Mars 2008:80; Muller, Bezuidenhout & Jooste, 2006:154), informatics (Al-Shorbaji, 2001:3), and mobile health systems (World Health Organization, 2011:9).

A diagrammatic presentation of the concept technology, as depicted by Pretorius (2000:2), is presented in figure 1. It captures the people and systems aspects discussed, as well as the knowledge and skills elements, which it could be argued forms an inherent component of the people aspect identified. Within the context of this paper, it is suggested that the knowledge and skills elements should in effect be seen as being encapsulated within the people component of the model. Not reflected in figure 1, however, are the context and quality of life attributes referred to in the discussion. The healthcare context and quality of life it is suggested are inextricably intertwined.

Figure 1: Diagrammatic conceptualisation of the concept “technology”

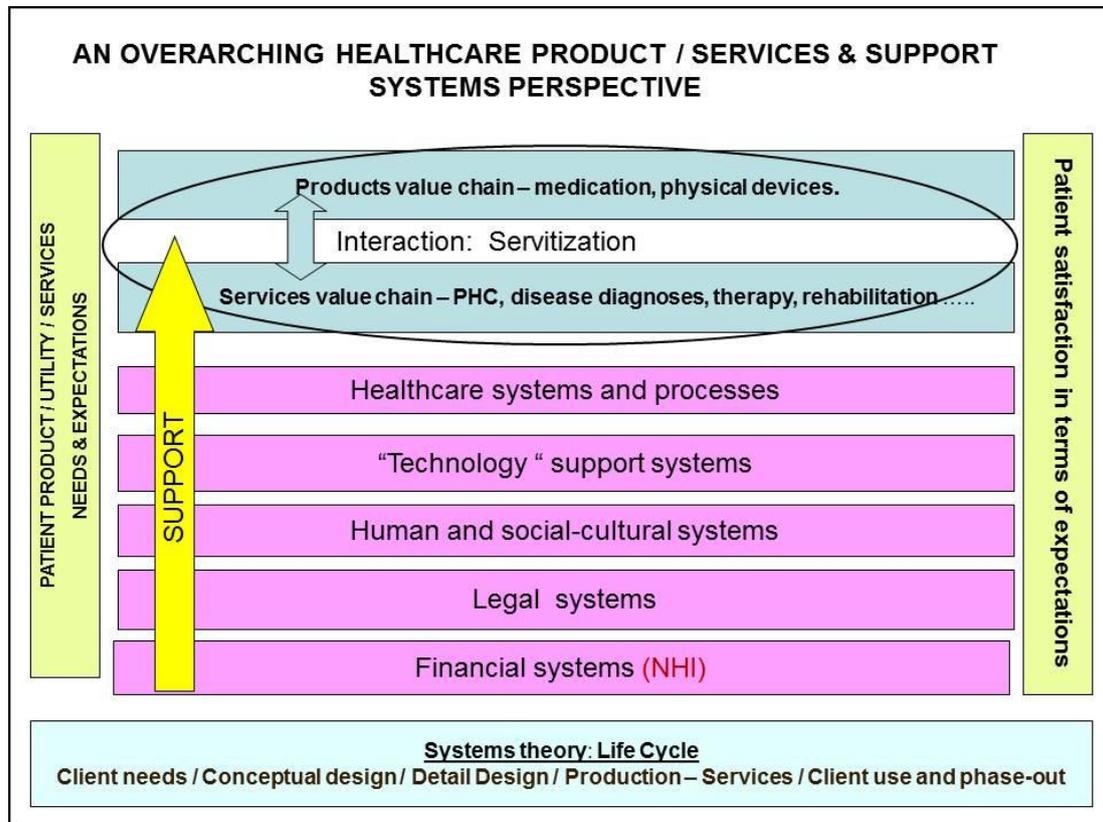


Source: Pretorius, 2000:2

The launching of the South African government's NHI initiative it is contended will undoubtedly necessitate the establishment of an effective healthcare technology support infrastructure, which in terms of the model presented in figure 1 could be expected to incorporate both a healthcare systems and a people component. The model presented in figure 2 is an adaptation of the model developed by Weeks and Benade (2011:18-3), which reflects a systems perspective of healthcare services delivery and the respective support systems involved.

Healthcare technology, defined as embodying three key components, namely context (healthcare), systems and people, would clearly form interrelated elements of the support systems presented in figure 2. It is suggested that this could be expected as the support systems concerned are in fact multidisciplinary and interacting in nature. So for instance a convergence of medical healthcare and technological systems, according to Cohen (2004:59), require both clinical and computer technology knowledgeable professionals. The researcher cites the use of personal computers as medical devices currently in use within a wide variety of healthcare settings as typical support for this contention (Cohen, 2004:59). It is therefore contended in this paper that the composite services delivery model, reflected in figure 2, needs to be managed as an integrated entity of interacting systems, one where technology systems have a very pertinent role to play. Also advocated is the adaptation of the model presented by Pretorius (2000:2) to reflect three core technology defining components, namely context, systems and people. The healthcare context component will significantly impact on the typical technological systems involved, as well as the people knowledge, skills and culture elements required. These three core defining determinants of technology within a healthcare context will be briefly addressed in the ensuing discussion.

Figure 2: A systems perspective of healthcare service delivery model.



Source: Adapted from Weeks and Benade, 2011:18-3.

TECHNOLOGICAL CONTEXT AND SYSTEMS: A HEALTHCARE PERSPECTIVE

Context provides the framework within which systems assume relevance. More specifically from a healthcare technology perspective context acts as a determinant in terms of the systems, skills, knowledge and culture required for effective healthcare services delivery. Figure 2 depicts the primary healthcare value chains extending from primary healthcare to disease diagnoses, therapy and rehabilitation. The nature of this primary services value chain serves to provide context for the support services required. Cullinan (2006:3) confirms that that the transformation of the South African healthcare system is both a complex and massive endeavour. Bailey, Maphumulo and Govender (2012:Internet) provide a sense of perspective and urgency to this contention in claiming that *"Gauteng's hospitals are under siege as doctors, nurses and patients battle with broken equipment, shortages of linen, medicine and food, flooded theatres and no telephone lines"*. It would appear from the statement that the technology and related support infrastructure deemed essential for healthcare services delivery, will need to be dramatically transformed, as suggested by Cullinan (2006:3) to give meaning to the objective of the NHI initiative, which according to the Department of Health (undated:4) is to enable all South Africans to receive good quality healthcare.

The first point of entry for South African health services is envisaged to take place at a primary level through local clinics and community health centres (Cullinan, 2006:5). If a more specialised level of healthcare is needed, patients will be referred to secondary level hospitals by clinical staff (Cullinan, 2006:5). Implied therefore is that appropriate technology support systems required at these clinics and hospitals will need to be in place. The technology systems required can be categorised as constituting three key support areas, that of governance, clinical services and education. Not quite factoring into these categories, but from a technology based infrastructure support perspective deemed to be vital to healthcare services delivery, are the availability of electricity, clean water, waste disposal and communication systems (Cullinan, 2006:6).

Central to the governance consideration from a technology perspective is a well-established electronic medical records (EMR) system that will enable interoperability at a clinic and hospital level. Fraser, Biondich, Moodley, Choi, Mamlin and Szolovits (2005:84) in this regard stress that individual patient data collected and accessible at the point of care can significantly support clinical management as well. The researchers specifically make note of the fact that the EMR system will allow laboratory data to be entered from distant sites, assisting prompt and effective patient management (Fraser et al., 2005:85). EMR systems can also be used to track patient outcomes, compliance with therapy and record surgical procedures undertaken at a hospital level (Fraser et al., 2005:85). It is suggested by Fraser et al. (2005:85) that incorporating multiple functions into the same information system allows reuse of data and should help to justify the basic costs of set-up and technical support; e-prescriptions would be a typical case in point in this regard. Decision support systems, particularly for drug order entry, according to Fraser et al. (2005:85) are becoming important tools in reducing medical errors. As noted by Rau, Lee, Chen, Jian and Hsu (2010:1) the value of EMR systems is vested in their ability to integrate patient information from diverse sources.

Despite the potential benefits that may be derived from the deployment and use of EMR systems it is claimed by Hillestad, Bigelow, Bower, Giroso, Meili, Scoville and Taylor (2005:1103) that within the United States most medical records are still stored on paper, which means that they cannot be used to integrate and coordinate healthcare service delivery. A research study undertaken by Laerum, Ellingsen and Faxvaag (2001:1346) revealed a similar trend of a low level of use of EMR systems by doctors in Norwegian hospitals, with paper file systems still in practice frequently being used. According to the researchers among these unused functions were repetitive tasks such as the writing of prescriptions (Laerum et al., 2001:1346). El Din (2007:348) in researching physicians' attitudes to the use of EMR systems also concludes that *"despite the potential benefits of EMR systems, many attempts at implementing them have failed or met with high levels of user resistance"*. The picture that emerges from the literature is that doctors tend to prefer the use of paper-based records for capturing patient information, notwithstanding the healthcare governance advantages associated with EMS systems. It is therefore hardly surprising to find that Laerum et al. (2001:1346) contend that the

implementation of EMR technology on its own does not translate into a success story, the related people and operational aspects of the technology also needed to be taken into consideration. This finding from the literature would appear to have very important significance when seen in the South African healthcare context. It is a conclusion that would seem to resonate with and provide evidence for the key components previously alluded to as forming the core of the concept “technology”.

Healthcare information systems, of which EMR systems forms an important integral component, has a very definite role to play both from a governance and patient clinical service delivery perspective. English, Masilela, Barron and Schöfeldt (2011:81) stress that a robust, integrated information system forms the foundation for building a national healthcare delivery system. The healthcare information system (HIS) integrates the collection, processing, reporting and use of information required for improving effectiveness and efficiency of healthcare services through the enhancement of management decision making at all levels within the healthcare system (English et al., 2011:81). This is reflected in figure 2, as the HIS encompass both aspects of the healthcare and technology systems that in turn support the primary service delivery value chain. English et al. (2011:82) state that in 2010 the South African government identified twelve priority areas and strengthening the HIS featured quite pertinently in this regard. The development of common norms, standards, and systems with an emphasis on improving data collection was envisaged as being essential at national, provincial and district levels (English et al., 2011:83). An important aspect of any information system is the ability to integrate the various systems involved at an operational level, which implies a need for a set of common standards. It constitutes a management aspect that has been addressed, according to English et al. (2011:83), in the release of the South African district health management information policy, which envisions the development of an integrated district health information management system that will provide reliable evidence for tracking and improving service delivery.

Within the context of the World Health Organisation's health systems framework, information management assumes an important constituent element, its goal being to “produce relevant information that health system stakeholders can use for making transparent evidence-based decisions for health system interventions” (Department of Health 2011a:9-10). With the NHI initiative in mind the Department of Health (2011a:10) contends that a need exists in South Africa for a comprehensive National Health Information System (NHIMS), which would consist of at least five components, namely:

- population-based information,
- health services based information,
- health resources records,
- vital registration data, and
- transversal government-wide support systems.

The systems interoperability and integration clearly extends beyond that of the healthcare governance system and as noted by the Department of Health (2011a:10) the healthcare sector would need to collaborate with other government departments in putting the systems into place. Currently the district health information system constitutes the national standard system used, but it has significant inherent weaknesses, according to the Department of Health (2011a:12), that need to be addressed. Of these a lack of standardisation, a shortage of skilled and experienced information professionals, and inadequate communication technology infrastructure represent key governance challenges (Department of Health, 2011a:12). Al-Shorbaji (2001:3) is another researcher who asserts that information management has become one of the foundational components of a national healthcare system, such as that envisaged by the South African government in its DHMIS policy document. Al-Shorbaji (2001:3) concludes that “medical informatics” and “health informatics” are in fact best understood as the understanding, skills and systems that enable the sharing and use of information to promote and deliver healthcare. From a governance perspective healthcare informatics in effect assumes a pervasive element in all healthcare activities (Al-Shorbaji, 2001:3). Information and computing technology has advanced in line with the information system needs of a modern-day healthcare context in terms of high performance computing, communication, image processing, database technology decision support and computer-aided instruction systems, which by implication

necessitates healthcare practitioners and technologists to remain conversant with their use and the functionality they offer (Al-Shorbaji, 2001:4). Seen in a South African healthcare context, technology development and advances taking place need to be factored into the national, provincial and district e-health strategy.

E-health, according to the Department of Health (2011c:5), as an overarching term includes EMRs, m-health, telemedicine, routine health management information and consumer health informatics. It is seen as constituting an integral part of the transformation of healthcare services in South Africa (Department of Health 2011c:5). It is, however, also acknowledged by the Department of Health (2011c:9) that currently significant challenges are experienced in developing, implementing and managing the systems concerned. So for instance it is contended that limited capacity exists within the public sector to implement a national e-health strategy, a significant number of disparate systems with little or no inter-operability are in existence in the various provinces, and broadband connectivity is limited and expensive (Department of Health, 2011c:10). Bhagwandin (2011:92) further claims that South African studies reveal that a significant percentage of the installed infrastructure is not fully functional and in many instances are under-utilised due to a scarcity or lack of trained users. The current South African scenario needs to be seen in the context that globally e-health systems are being deployed and becoming an integral element of national health system objectives (European Commission, 2007:11). Notably in this regard the European Commission, (2007:13) stresses that a fully operational telecommunications infrastructure is deemed to be a precondition for regional and national e-health solutions for healthcare service delivery. It is further indicated that EMRs as well as national health information systems constitutes the most common fields of current effort (European Commission, 2007:16).

It may be concluded from the discussion that information technology has evolved from primary business-related applications such as financial systems to embody clinical relevant information systems, in the form of EMRs, digital image records and e-prescriptions, that support the rendering of healthcare services (Cohen, 2004:59). In the ensuing section the people related aspect of the concept "technology" and its management, as it relates to the systems concerned will be explored.

TECHNOLOGY: THE PEOPLE DIMENSION OF MANAGEMENT WITHIN A HEALTHCARE CONTEXT

A number of pertinent aspects need to be considered in analysing the people or human dimension of healthcare service delivery from a technology perspective, namely the nature of the knowledge and skills required, availability of these skills in relation to demand, the culture required in relation to the existing culture and the aspect of change management. If technology is therefore deemed to play a very fundamental and key role in healthcare service delivery it needs to be questioned whether healthcare professionals and technologists have the requisite skills and knowledge required and if the capacity exists for the development, implementation, management and utilisation of the diverse technology systems concerned. Adopting a service systems orientation in analysing healthcare services also brings the role of the client or patient into consideration in the service delivery process (Gill, White & Cameron, 2011:152). This assumes specific relevance in terms of the client or patient's ability to gain access to and interpret healthcare information. Edwards (2009:4) concurs as to the need for empowering people to access detailed health information on the Internet, coupled with the emergence of online message boards, self-help groups and chat rooms enables them to learn about their health, treatment and technologies available. Edwards (2009:4) also draws attention to the fact that technology advances, such as those enabling diabetics to monitor their blood glucose at home, personalise medicine and enable them to play a role in monitoring and complying with prescribed treatment. In this regard Gill et al. (2011:154) specifically contend that healthcare professionals are increasingly being encouraged to involve clients in treatment decisions.

Stroetmann et al. (2011:x) state that the complexity of e-health as a management challenge is vastly underestimated and go on to suggest that qualified human resources are a key ingredient for success. The researchers further claim that e-health skills and knowledge of healthcare staff and ICT suppliers

needs to in particular be expanded (Stroetmann et al., 2011:x). Mars (2012:32) would seem to concur with the sentiment expressed in claiming that while government's initiatives directed at the implementation of health informatics are on the increase, their sustainability will largely depend on a skilled workforce to implement, use support, and maintain these systems. Mars (2012:32) is of the view that currently there are insufficiently trained people to ensure effective technology utilisation and support within the healthcare context. The existing healthcare services delivery situation within South Africa is further compromised in that a critical shortage of healthcare professionals exists in the first instance (Bateman, 2010:791; George, Quinlan & Reardon, 2009:7). In support of this contention it may be noted that the Department of Health (2011b:9) itself concluded that "*South Africa does have considerably less doctors, pharmacists and oral health practitioners per 10,000 population than the other comparable countries*". Even before the technology related skills of these healthcare professionals are considered it is therefore evident that a definite human sources capacity problem exists in order to render effective healthcare services to the community. At the intersection between healthcare and technology systems the skills deficit becomes even more apparent. It is contended by Yap (2011:Internet) that a lack of an appropriate blend of clinical and technology skills can in fact inhibit the roll-out of the technology support systems required for effective service delivery. Yap (2011:Internet) specifically argues that clinical analytical skills are deemed essential when it comes to the design, implementation and management of e-health systems.

In presenting an overview to the Department of Communication's (2011:7) strategic plan Dr Wesso asserts that "ICT is ultimately about people and skills" and studies he claims in this regard reflect a rather dismal picture of a critical shortage of ICT skills in South Africa. It can be expected that this will have a definite impact on the establishment of a e-health infrastructure in the first instance and add to this the blend of healthcare and ICT skills deficit the challenge confronting the Department of Health to establish technology systems to support healthcare service provision becomes quite evident. Loveday, Smith and Monticelli (2006:4) conducted an audit to assess if there are sufficiently well-trained personnel in the health information sector. Their findings revealed that less than half of the healthcare information staff members at a national level had received sufficient training to carry out their functions (Loveday et al., 2006:4). Nationally 35% of the staff had received no training in DHIS systems and a further 20% had received training of less than a week, which was deemed to be inadequate. (Loveday et al., 2006:4). Even more revealing was the fact that in four of the nine provinces 50% of the staff concerned did not even have access to the Intranet (Loveday et al., 2006:30). The researchers concluded that a national policy document on human resources requirements for an effective healthcare information system was considered to be urgently required (Loveday et al., 2011:30). The importance of this conclusion may be determined from another study undertaken by Gatero (2011:60) in Kenya where it was found that "medical professionals needed information continuously in the course of clinical work". The researcher further confirms that within the Kenyan situation, which would to an extent seem to correlate with that in South Africa, critical information needs of medical professionals are often not being adequately met. Gatero (2011:60) in particular deemed the training of clinicians in ICT skills to be of critical importance. Gatero's (2011:60) Kenyan findings are from a South African perspective confirmed by Mars (2012:32) who similarly claims that there are insufficiently trained people to support and implement an e-health solution.

Of concern in the draft South African e-health strategy is that while the need for developing a strategy for capacity building and resourcing of the required professional skills is acknowledged no current strategy appears to have been yet clearly articulated (Department of Health, 2011c:27). As may be determined from the preceding discussion the blend of clinical and ICT skills, however, seems to be in short supply both in South Africa and globally. If the skills situation is not adequately addressed in time as part of the NHI plan, an orderly transition process from the current fragmented health information system to an integrated and well managed system that supports service delivery, as envisaged in the NHI policy document (Department of Health, 2011c:46), will be extremely difficult to realise.

Any analysis of the people aspect of healthcare technology in rolling out a support infrastructure for the South African NHI initiative would not be complete without considering the "culture" implications involved. Culture in this sense relates the values, beliefs, assumptions, norms and ways of doing

things within a healthcare technology environmental context that may need to change so as to implement contemporary healthcare technology systems. Bennet and Bennet (2004:11) for instance contend that before an institution can adopt new practices, which will be the case in implementing EMR, telemedicine and e-healthcare systems, it must be willing to admit that current practices are inadequate. This in essence implies the need for a fundamental paradigm shift in traditional thinking and practice and consequently the prevailing culture of the institution. Bennet and Bennet (2004:11) also claim that resistance to such change is usually high and in some instances may even initially go unrecognized by management in their endeavour to implement the new systems concerned. Munck (2002:23) concurs that transforming an organisation's culture constitutes one of the most fundamental, challenges confronting an institution, as people's natural inclination is to hold on to whatever feels familiar, even if confronted with better alternatives. Van Dyk, Fortuin & Schutte, (2012:74) confirm that despite generous funding and proven technology, not many South African telemedicine systems have lasted beyond the pilot phase. With the preceding discussion in mind it could be postulated a possible reason could be that the prevailing culture resulted in a business as usual situation. It would appear from Van Dyk et al.'s (2012:74) preceding contention that neither funding nor the technology itself were to blame, could be deemed to imply that the failure to engender a fundamental change in the entrenched culture of the institutions concerned ought to be considered as a possible cause of failure. Weeks (2010:43) attest to the fact that the concept "organizational culture" has assumed a very prominent place within the management literature and has been analysed from diverse multidisciplinary perspectives. Central to the importance attributed to the concept is the fact that it acts as a perceptual and behavioural determinant, which implies that it will have a significant impact on all human related institutional activities and thus the interest in the concept and its management within a healthcare technology change management context (Weeks, 2010:43). Suggested in the draft e-health strategy document is the need for a skills capacity development strategy, that focuses on the creation of appropriate structures and posts, establishing cooperation with education institutions, and the leveraging of partnerships and collaborations (Department of Health, 2011c:27). No reference, however, is made to the need for a realignment of the culture of the institution to ensure that it supports the e-health technology strategy envisaged. It is suggested in this paper that the failure to address the organisational culture considerations in implementing new technology systems, such as EMRs, could well result in significant people related difficulties and ultimately a failure in the project itself. Scott, Manion, Davis and Marchal (2003:111) for instance, based on their research; conclude that managing organisational culture constitutes an essential component of healthcare reform. The researchers further claim that "the latest National Health Service (NHS) reforms are based on the premise that a major culture transformation of the organisation must be secured alongside structural and procedural change to deliver desired improvements in quality and performance" (Scott et al., 2003:111).

The ensuing narrative account, by Thede (2009:Internet), serves to reflect the importance of addressing organizational culture in the introduction of an EMR, or in effect any technology system:

"The change from paper to electronic documentation appears to those outside of nursing, who too often may be administrators or information technology (IT) specialists, as an improvement. For clinicians, however, the introduction of the electronic record too often means disrupting our values and habits to accommodate this new technology ... Thus, it is imperative that those considering a new system consider both the value of the change and the magnitude of the disruption that the new system, or even an upgrade, will engender. This does not mean that these changes should not occur — they must. Rather it means that both the organizational culture and the technology must be considered when introducing a new system. Any system, whether well designed or poorly designed, accents or obviates certain values, some of which may be an ingrained part of our organizational culture".

The narrative brings home a number of key aspects that need to be considered. What appears to the technologists as being a logical and rational technology system implementation that will support and facilitate healthcare service delivery is at the same time logically experienced by the clinicians as a disruption to the "way they do things around here." The quotation is also instrumental in depicting the

importance that needs to be attributed to organizational culture as a dimension of the people element of technology management within a healthcare context.

CONCLUSION AND RECOMMENDATIONS

A number of important findings and conclusions may be derived from the literature study that could serve as aspects to be considered in formulating and implementing the technology support systems underpinning healthcare service delivery. It would appear that the healthcare context from a systems perspective is not only multi-disciplinary in nature, but also extremely complex. The various systems concerned cannot be seen in isolation, but need to be considered in relation to their mutual interaction and cause effect relationships. This is particularly relevant in the case of healthcare technology where the people element of technology management could have a ripple effect that seriously disrupts healthcare services delivery systems. The failure of many of the telemedicine projects could serve as a case in point, although it needs to be acknowledged that further research will be required to demine if this in fact is the case. The shortage of a blend of healthcare clinical and technology skills can be expected to seriously impact on the roll-out of healthcare technology support systems and this ought to be taken into consideration in formulating an e-health strategy. While the design, implementation and management of the healthcare technology systems could well be quite complex in nature, it would seem that it is the people element of the concept that presents some of the most complex challenges. It is therefore recommended that a holistic perspective be adopted of the concept "theology" in the planning, implementation and management of the NHI initiative. One that takes cognizance of the context, systems and people dimensions of the concept technology. It is recommended that further research be undertaken to determine how best the culture of South African healthcare institutions can be realigned so as to support the envisioned e-health strategy deemed essential for effective healthcare service delivery.

REFERENCES

- Al-Shorbaji N. 2001. Health and medical informatics. Technical paper. World Health Organization, Cairo, Egypt.
- Al-Shorbaji N. & Geissbuhler A. 2012. Establishing an evidence base for e-health: the proof is in the pudding. *Bulletin World Health Organization*, 2012(90):322-322a
- Bailey C, Maphumulo S & Govender P. 2012. Public hospitals in Gauteng sick and tired. Available online: <http://www.timeslive.co.za/sundaytimes/2012/03/25/public-h> [14 March 2012]
- Bateman C. 2010. NHI consensus: Fix the existing system or risk failure. *South African Medical Journal*, 100(12):791-793.
- Bateman C. 2011. Cutting-edge telemedicine venture freezes as official bodies frown. *South African Medical Journal*, 101(6):368-372.
- Bennet A. & Bennet D. 2004. *Organizational survival in the new world: The intelligent complex adaptive system*. Amsterdam: KMCI.
- Bhagwandin N. 2011. Health Technology for equitable access to quality health services. *South African Health Review*. Available online: <http://www.hst.org.za/sites/default/files/Chap%208%20Health%20Technology%20pgs%2091-98.pdf> [29 May 2012].
- Burgelman RA., Christensen CM. and Wheelwright SC. 2009. *Strategic management of technology and innovation*, international 5th edition. Boston: McGraw-Hill.
- Cohen T. 2004. Medical and information technologies converge. *IEEE Engineering in Medicine and Biology Magazine*, 23(3):59-65, May/June.
- Connors R. 2009. EHR,EMR,PHR. Available online: <http://www.ehealthdesigns.com/?p=575> [10May 2012].

- Cullinan K. 2006. Health services in South Africa: A basic introduction. Available online: <http://www.health-e.org.za/uploaded/cb1f388f3b351708d915c12cfb4fc3cf.pdf> [7 June 2012]
- Department of Communications. 2011. Strategy plan 2011-2014. Department of Communications, iParoli Office Park, Hatfield Pretoria.
- Department of Health. Undated. National Health Insurance: Healthcare for all South Africans. Department of Health, Pretoria.
- Department of Health. 2011a. District Health Management Information Systems (DHMIS) Policy. Department of Health, Pretoria.
- Department of Health. 2011b. Human resources for health South Africa 2030: Draft HR strategy for the health sector 2012/13 – 2016/17: Consultation document V5. Available online: <http://www.info.gov.za/view/DownloadFileAction?id=152426> [14 June 2012]
- Department of Health. 2011c. Draft ehealth strategy 2010-2014 South Africa. Department of Health, Pretoria.
- Edwards D. 2009. The converging face of healthcare. Available online: http://www.sagentia.com/resources/articles/2009/gen-summer-09_feature.aspx [12 June 2012]
- El Din MMMN. 2007. Physicians' use of and attitudes toward Electronic Medical Record System implemented at a teaching hospital in Saudi Arabia. *Journal of the Egyptian Public Health Association*, 82(5/6):347-346.
- English R., Masilela T., Barron P. & Schöfeldt A. 2011. Health information systems in South Africa. *South African Health Review*, 2011:81-89. Available online: <http://www.hst.org.za/sites/default/files/Chap%207%20Information%20Systemspgs%2081-90.pdf> [10 June 2012].
- Eysenbach G. 2001. What is e-health? *Journal of Medical Internet Research*, 3(2):e20.
- European Commission. 2007. eHealth priorities and strategies in European countries. Office for official publications of the European Communities, Luxemburg, Belgium.
- Fraser HSF., Biondich P., Moodley D., Choi S., Mamlin BW. & Szolovits P. 2005. Implementing electronic medical record systems in developing countries. *Informatics in Primary Care*, 2005(13):83–95.
- Gaturo GM. 2011. Utilization of ICTs for accessing health information by medical professionals in Kenya: A case study of Kenyatta National Hospital. *Journal of Health Informatics in Developing Countries*, 5(1):60-88
- George G, Quinlan T. & Reardon C. 2009. Human resources for health: A needs and gaps analysis of HRH in South Africa. Health Economics and HIV & AIDS Research Division, University of KwaZulu-Natal, Durban, South Africa.
- Gill L., White L. & Cameron ID. 2011. Service co-creation in community-based aged healthcare. *Managing Service Quality*, 21(2):152 – 177.
- Hersh RW. 2002. Medical informatics: Improving health care through information. Available online: <http://skynet.ohsu.edu/~hersh/jama-02-informatics.pdf> [7 June 2012]
- Hillestad R., Bigelow J., Bower A, Girosi F., Meili R., Scoville R.& Taylor R. 2005. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Affairs*, 24(5):1103-1117.
- Intel. 2007. Converging technologies in healthcare IT. Available online: <http://www.intel.com/it/pdf/converging-technologies-in-healthcare-it.pdf> [4 June 2012]
- Jack C. & Mars M. 2008. Telemedicine a need for ethical and legal guidelines in South Africa. *South African Family Practice*, 50(2): 60-60d.

- Khalil T. 2000. Management of technology: The key to competitiveness and wealth creation. Boston: McGraw-Hill.
- Keeton C. 2012. Measuring the impact of e-health. *Bulletin World Health Organization*, 2012(90):326-327.
- Laerum H., Ellingsen G. & Faxvaag A. 2001. Doctors' use of electronic medical records systems in hospitals: Cross sectional survey. *British Medical Journal*, 323:1344-1348, December.
- Loveday M. Smith J. & Monticelli F. 2006. Healthcare information audit report South Africa, Health Systems Trust, Durban.
- Mars M. 2012. Building the capacity to build capacity in e-health in sub-Saharan Africa: The KwaZulu-Natal experience. *Telemedicine and e-Health Journal*, 18(1):32-36, Jan/Feb.
- Mars M. & Jack C. 2010. Why is Telemedicine a challenge to the regulators? *South African Journal of Bioethics and Law*, 3(2):55-58.
- Muller M., Bezuidenhout M. & Jooste K, 2006. Healthcare services management. Cape Town: Juta.
- Munck B. 2002. Changing a culture of face time. *In Harvard Business Review on culture and change*, Boston: Harvard, p21-36.
- Oh H., Rizo C., Enkin M. & Jadad A. 2005. Available online: <http://www.jmir.org/2005/1/e1/> [10 October 2012]
- Poluta MA; 1996. The need for a systems approach to healthcare technology management interventions in sub-Saharan Africa. Paper presented at the 18th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Amsterdam.
- Pretorius MW. 2000 Technology Assessment in the Manufacturing Enterprise: A Holistic Approach, Proceedings of the 9th International Conference on Management of Technology, 21-25 February, Miami, Florida, USA.
- Rau HH., Lee Y., Chen W., Jian W. & Hsu C. 2010. Information Technology in the Development of Electronic Health Records in Taiwan. *IT Professional, IEEE Computer Society Digital Library*. Available from: <http://www.computer.org/portal/web/csdl/doi/10.1109/MITP.2010.1> [8 June 2012]
- Stroetmann KA, Artmann J, Stroetmann VN, Protti D, Dumortier J, Giests S, Walossek U and Whitehouse D. 2011. European countries on their journey towards national eHealth infrastructures: Final European progress report. European Commission, Brussels, Belgium.
- Thede, L. 2009. Informatics: Electronic Records and Organizational Culture. Available online: <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/Columns/Informatics/Electronic-Records-Organizational-Culture.html> [18 June 2012].
- Van Dyk, L., Fortuin, JB. & Schutte, CSL. 2012. A Maturity Model for Telemedicine Implementation. Paper presented at eTELEMED, the fourth international conference on e-health, telemedicine, and social medicine, Valencia, Spain.
- Weeks R. 2010. Organisational culture: A contemporary management perspective. *Acta Commercii*, 10:43-58.
- Weeks RV & Benade SJ. 2011. Service science: A servitization systems perspective. Paper presented at the Internationally Conference on Industrial Engineering Systems and Engineering Management for Sustainable Global Development, Spier, Western Cape, South Africa.
- World Health Organisation. 2011. M-Health: New horizons for health through mobile technologies. World Health Organization, Geneva Switzerland.
- Yadin D. & Jahnke EG. 2004. Planning hospital medical technology management. *IEEE Engineering in Medicine and Biology Magazine*. Available online: <http://0-ieeexplore.ieee.org.innopac.up.ac.za/stamp/stamp.jsp?tp=&arnumber=1317985> [27 May 2012].

Yap J. 2011. Healthcare IT booming but faces talent drought. ZD Net Asia. Available online: <http://www.zdnetasia.com/healthcare-it-booming-but-faces-talent-drought-62301123.htm> [17 June 2011].