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Mobile technology adoption by doctors in public healthcare in the Western Cape, South Africa

Jean-Paul Van Belle
University of Cape Town, Rondebosch, jvbelle@commerce.uct.ac.za

MOBILE TECHNOLOGY ADOPTION BY DOCTORS IN PUBLIC HEALTHCARE IN SOUTH AFRICA

Banderker, Nesaar & Van Belle, Jean-Paul, University of Cape Town, Rondebosch, Cape Town, jvbelle@commerce.uct.ac.za.

Abstract

Doctors working in public healthcare in South Africa are faced with the unique resource constraints prevalent in a developing country. In this context, doctors can use information and communication technologies (ICTs) to obtain better information and decision support. However, the potential of ICTs to improve the healthcare sector will only be realised if individuals decide to adopt the new technologies. Therefore, an understanding of the factors that influence doctors' use of a technology needs to be developed and the research efforts to identify these factors have been lacking in the South African public healthcare sector.

This paper explores significant factors influencing the adoption of mobile devices by doctors in the public healthcare sector in the Western Cape, South Africa. The research methodology was shaped by qualitative enquiry and described through thematic analysis. Key adoption factors identified include those confirmed by prior research of: job relevance, usefulness, perceived user resources and device characteristics. Adoption factors that emerged during this research are support structures from national government and hospital administration, patient influence and unease in respect of malpractice legal suits.

Keywords: Mobile Technology; Mobile Devices; Healthcare Sector; Technology Adoption.

1 BACKGROUND

1.1 Healthcare in South Africa

In 2001, the World Health Organisation (WHO) estimated that total expenditure on healthcare in South Africa was 8.6% of the Gross Domestic Product (GDP), a figure significantly above the 5% that the WHO recommends for developing countries. This makes healthcare one of the more significant components of South African society, socially and economically (Chiasson *et al* 2004). However, there still remains huge fragmentation and gross inequality in health status, health infrastructure and health services. Mostly, this is a legacy of the apartheid era inequalities institutionalised through labour laws and highly unequal provision of services for different racial groups (Department of Health, 2004). There is still a movement of skilled resources from areas of poverty and low socio-economic development to more wealthy areas. Doctors who have recently qualified and completed their compulsory two years working for the public healthcare sector are either moving into private practice or leaving South Africa to work in other countries (Padarath *et al* 2003). This results in a scarcity of skilled clinical resources in the public healthcare sector.

The doctors working in the public healthcare sector are highly skilled and knowledgeable workers, whose available time is preciously sliced to try and diagnose and care for as many patients in a day as is possible (Anderson 1997). 78% of the South African population has access to only public healthcare facilities (WHO 2001). A doctor in the public day hospital environment is expected to diagnose, treat and manage about 40 patients during an 8–hour shift. This means that the doctor spends an average of only 12 minutes with each patient. Doctors in public healthcare also have to work extreme shifts of sometimes more than 30 hours. Due to this extreme pressure, doctors can easily make an incorrect diagnosis or prescribe the incorrect patient management routine. These problems not only affect the doctors working in public healthcare, but the patients attending these public hospitals, who have to wait in long queues to be seen by the doctor. When they finally see the doctor, the visit is rushed. A full examination of the patient is not always possible and this could result in inadequate care of the patient.

ICTs offer tremendous potential in supporting the public healthcare function in the South African society. Administrative healthcare systems have reached a point of maturity during the 1990s (Andersen 1997). However, the shift to systems that support the clinical work performed by healthcare professionals directly has been slow to take off (Andersen 1997). With the problems in the public healthcare sector, this shift is necessary to provide better support structures for public healthcare doctors. This will in turn enable doctors to facilitate the provision of high quality, better informed and cost-effective public healthcare to all the citizens of South Africa.

1.2 Mobile Technologies in Healthcare

The public healthcare environment is very information intensive (Li & Chang & Hung & Fu 2005). Doctors do most of their work at the point of care, which is the patient. This means that they move around between wards, outpatient clinics, diagnostic and therapeutic departments and operating theatres. This movement, together with the fact that most South African public hospitals usually only have one central computer terminal per ward, makes it extremely difficult to service all the needs of the doctor. The use of an ICT in support of this point of care activity of the doctor is what is relevant to this research. Mobile device technologies are quite suitable for supporting the doctor at the point of care. They are small, lightweight, can be carried around with the doctor, and the middle of the range devices usually come with some form of networking protocol built into the device (Porn & Patrick 2002). Mobile devices are also becoming more affordable and offer more processing power and storage capabilities (Andersen 1997). Mobile technology ranges from cellular telephones, pagers and PDAs, to very sophisticated tablet computers. For the mobile computer to be used in a healthcare environment it should have the following basic characteristics: an interface that supports input via a stylus; expandable memory; software upgradeability; a method of developing custom built software for the device and network connectivity. Examples of such devices include the handheld PC devices

developed by Hewlett-Packard, tablet computers, as well as the range of smart phones being developed by cellular telephone manufacturers of which the Nokia 9xxx series, Sony-Ericsson P910 and iMate K-JAM are a few examples.

In a longitudinal study of mobile technology use among Canadian doctors, 33% of respondents to the study indicated that they used a mobile device in their clinical practice in 2003. The corresponding figures for 2002 were 28%, and only 19% for 2001 (Martin 2003). A similar study performed at selected healthcare institutions in Florida revealed that 95% of the respondents to the survey owned a mobile computing device (Joy & Benrubi 2004). The study also showed a pattern of perceived benefit for using the devices to maintain procedural statistic logs, pharmacology reference manuals and personal clinical protocols; but respondents did not perceive a massive time saving. Both studies also show quite a sharp increase in mobile device technology adoption by doctors. A further study of mobile device usage experience by physicians showed its usefulness to help with particular problems and situations (Harkke 2005).

Porn and Patrick (2002) identify the following healthcare applications that could be run successfully on a mobile device:

- *E-prescription*. This allows doctors to access basic patient information and check formulary compliance before writing the prescription. Potentially harmful drug interactions can be determined and often a patient's personal medication history is available. Prescriptions can be printed or transmitted directly to a pharmacy. The main benefits are a reduction in medication errors and less calls from pharmacies due to illegible handwriting (Berkowitz, 2002).
- *Charge capture*. This application allows a doctor to view schedules, capture patient charges and access or update patient information all at the point of care.
- *Order entry*. Applications to order certain tests could be scheduled, delivered to a central processing unit and acted upon. This will reduce errors due to misplacement of application forms.
- *Test result reporting*. The results of the tests can be delivered directly to the mobile device. This will free doctors from having to refer to a specific PC workstation to retrieve test results.
- *Medical information*. Access to the latest medication formulary, disease description, symptoms and treatment as well as access to clinical procedures can be provided on a mobile device.

2 RESEARCH OBJECTIVES

Despite the purported advantages of mobile technology for use in a healthcare environment there is a distinct lack of adoption of this technology in public healthcare in South Africa. The public healthcare sector is recognized as having lagged behind other industries, for example the financial sector, in the use and adoption of new information technologies (Bower 2005). Information and Communication Technologies encompass a wide range of technologies. This ranges from personal computers to wireless communication devices to a simple device like a telephone. This research focuses on mobile technology devices.

This research hopes to provide a better view as to *what* the significant factors influencing the adoption of innovative mobile technology solutions by public healthcare doctors to support them in their daily clinical activity are. Identifying these significant factors of influence will hopefully also provide an *insight* into how ICT solutions for healthcare should be developed, marketed, implemented and who the key stakeholders in the adoption process are.

. More specifically, the objectives of this research are:

- To identify key factors that hinder or assist doctors' adoption of mobile technologies in healthcare; and
- To determine doctors' perceptions of and attitude towards using mobile technologies in their daily activities.

3 RESEARCH METHODOLOGY

Firstly, relevant prior research on technology adoption, particularly technology adoption in healthcare was surveyed. From this, significant factors of influence were determined and these formed a framework that could be tested against public healthcare doctors. The rest of the methodology then addressed the problems of *who* to test the framework against and *how* it will be tested.

3.1 Adoption Models and Healthcare

In order to realise the full potential and promise of healthcare information systems, technologies and applications, a better understanding of the people, social issues, technology adoption, professional values, status and job relevance factors is required. However, explaining human behaviour in all its complexity is quite a daunting task. Therefore, a variety of models have been developed to explain and predict user behaviours and intentions. The most widely used of these models are the diffusion of innovation (DOI) theory published by Rogers (1995), the theory of reasoned action (TRA) (Ajzen & Fishbein 1980), the theory of planned behaviour (TPB) (Ajzen 1991) and the technology acceptance model (TAM) (Davis 1989). These models have been well tested, validated and proven to be reliable when used in the evaluation of user acceptance in studies of business organisations, corporations and even students. However, there is less research evaluating technology adoption using TPB, TRA, DOI within a healthcare context.

In validating TAM and its extensions, researchers have determined some key factors that are of significance for use in general technology adoption models. These include perceived ease of use, perceived usefulness, perceived user resources, voluntariness, experience, subjective norm, image and computer self-efficacy. However, doctors are professionals who are particularly highly skilled, knowledgeable, autonomous and pragmatic decision makers. This impacts on the applicability of a number of constructs and causes some of the models not to behave in the way determined by prior research in other contexts. For instance, Hu & Chau & Tam (1999) found that the original TAM did not correlate well with doctor's intentions to use a new technology. When reviewing literature on the adoption of healthcare technologies by medical professionals the majority of the studies found apply to general healthcare systems such as telemedicine, internet health and clinical systems (Chau & Hu 2002, Chismar & Patton 2003, Horan *et. al.* 2004, Malhotra & Galletta 1999, Tanriverdi & Iacono 1998). Two was found that applied to mobile healthcare (Wu & Wang & Lin 2005, Harkke 2005). These studies found the following factors to be of relevance when researching adoption in a healthcare setting:

- Perceived usefulness/Job relevance – A new technology needs to be useful to its user. Usefulness is defined as causing an increase in the doctor's productivity by being relevant to the doctor.
- Perceived user resources – The extent to which an individual believes that they have the personal and organisational support to use the device. This was validated by Horan *et al* (2004) whose research discovered that workplace compatibility played a more important role in predicting user intentions than the current TAM construct of perceived ease of use.
- Subjective norm – People who are close to the doctor could influence the doctor by their opinions of whether the device should be used or not.
- Image – Doctors will perceive the use of a mobile technology device as enhancing their status within their working environment. This was validated by Succi and Walter (1999) who state that doctors will more likely be influenced by the impact of the use of the new technology on their professional status. Further research has contested the idea that social processes of subjective norm and image would influence the decision to adopt. This is seen to be a result of the pragmatic nature of doctors in decision making, as well as a reliance on their own assessment rather than that of others. However, in the context of South Africa where being a medical doctor is often seen as a status symbol the two factors of subjective norm and image will be retained to ascertain whether they would play a positively influencing role.
- Task/technology fit – A study by Chau & Hu (2002), added this factor – defined as alignment with current work practices – to TAM. It was thought that doctors would more likely adopt a new technology if it aligned closely with their current work practices.

- Result demonstrability – The technology should visibly improve the doctor's quality of care provided and enhance his effectiveness thus improving the quality of the doctor's work

Furthermore, in the evaluation of TAM2 (Venkatesh & Davis 2000) by Chismar and Patton (2003), it was found that the construct of perceived ease of use showed an insignificant effect when used to predict intention of doctors. It has also been found that for technologies that are not mandated for use by the healthcare institutions, the construct of voluntariness can be removed from the model. In studies of a new technology the construct of experience can also be removed, since it was intended to measure the adoption of existing technologies. Due to the high intellectual and cognitive capacity of doctors, they appear to understand new technologies quicker. Doctors are therefore individuals with a high level of self-efficacy. This makes a good argument for the removal of the computer self-efficacy construct from the model. However, due to mobile technologies being relatively new to the South African market and not being widely diffused this factor will be included in the model developed.

The above research reduces the significant factors in the context of doctors' intention to use a mobile technology device to subjective norm, image, task/technology fit, result demonstrability, perceived user resources, computer self-efficacy and the technology device characteristics. These factors are summarized graphically in **Fel! Hittar inte referenskälla.** below.

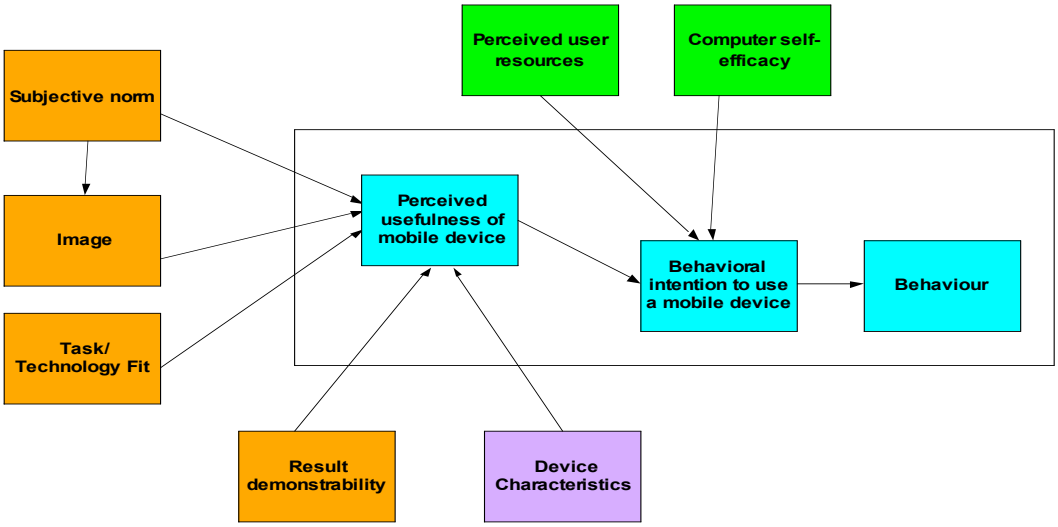

Figure 1. Significant influencing factors

3.2 Strategy

This research follows an exploratory qualitative research design strategy. It is exploratory since it is not directly involved with hypothesis testing and theory evaluation. It is more directly involved with laying a basic descriptive foundation to explain and understand the possible factors influencing adoption of a mobile technology device by doctors (Fitzgerald & Howcroft 1998). A qualitative study was chosen over a quantitative one since the former allows for a better understanding of the people, and the social and cultural context in which the technology adoption can occur. Also, richer data sets from which factors influencing the possible adoption of mobile technologies can be obtained by discourse between people instead of having them complete a questionnaire.

3.3 Site Selection and Sampling

The study was conducted in two public healthcare facilities in Cape Town, namely the Groote Schuur and Tygerberg Hospitals. These hospital are directly associated with the University of Cape Town and the University of Stellenbosch respectively. They are of similar size, offer very similar services, have similar administrative processes and are analogous to the rest of South Africa's tertiary public hospitals.

Due to time, resource and financial constraints as well as the limited time availability of doctors, a convenience sampling method was used. Possible doctors were identified by two doctors acting as the researcher's contacts in the hospitals and were selected based on their willingness to take part in the research since all participation was voluntary. Although a convenience sample allowed the researcher to skirt many of the resource issues mentioned, this did come at the expense of possibly compromising the potential data collected as well as reducing the credibility of the research sample (Pare 2004). In total, twelve doctors were interviewed. The interview sample was made up of doctors from each of the South African racial profiles.

3.4 Data Collection

Participant interviews were used as the primary source of gathering data (Marshall & Rossman 1999). The interviews were semi-structured, with set questions as well as open-ended questions. Basic demographic data was also collected from the doctors. Key questions were developed around all the significant factors of influence identified during the literature review (Figure 1 **Fel! Hittar inte referenskälla.**above) with additional questions being derived from Chismar and Patton (2003). Questions were not necessarily asked in the order they were set out since the conversation dictated which question would be asked next. The complete list of the questions is available from the authors. A checklist was kept during the interview to ensure that all questions were asked. Interaction and discussion usually led to further follow-up questions of both explanatory and exploratory nature (Ritchie & Lewis 2003).

The interview was recorded on an audio recording device, freeing up the interviewer to more closely observe the interviewee and possibly gain some further insight from the visual clues provided by the interviewee. A protocol for conducting the interview was established. This ensured that each interview process was consistent. It also helped ensure that standard items like obtaining consent, providing the interviewee with basic information about the research and informing them that the interview would be recorded, would not be forgotten.

As a departure point for starting the discussion, pictures of other mobile technology devices were shown to the interviewees. In addition, the interviewees were also shown a physical Nokia 9300 with a demonstration of some of the medical software obtained for the device, namely a drug formulary program, a fracture analysis program and a nutrition analysis program.

3.5 Data Analysis

There are many methods of analysis suggested for the interpretation of the data collected. These include Hermeneutics (Klein & Myers 1999), Grounded Theory (Sarker & Wells 2003), Semiotics – which includes content analysis, conversation analysis and discourse analysis – and thematic analysis (Ritchie & Lewis 2003). However, these modes of analysis work to develop theory in most cases and fit closely with the interpretive paradigm (Fitzgerald & Howcroft 1998). A thematic analysis of the textual data was performed, as recommended by Ritchie and Lewis (2003).

The analysis process that was followed can be described as follows:

- The recorded data from the interviews was listened to. While listening to the recording, reflective remarks about the interview and the data from the interview were made. This allowed for the visualization of the researcher's perceptions and ideas (Miles & Huberman 1994).
- A coding scheme that is consistent with the theoretical propositions identified during the literature review was then developed (Hammersley & Atkinson 1983). Additional codes were created for ideas presented by the interviewee that did not fit into the original coding scheme.
- The coding scheme was used to allow the segmentation of the data into units that are easily mapped to the theoretical propositions identified during the literature review. The scheme also allows for easier organization and retrieval of the data.
- These codes were then grouped together in logical units which formed higher order categories.
- For these categories a response from each interviewee was mapped. This formed the basis of a thematic chart. The visual nature of a thematic chart helped in discovering connections between coded segments (Miles & Huberman 1994).

- From this thematic chart, themes were developed by checking the occurrence of a certain idea and the language used by the interviewee.
- These themes were then used to answer the objectives of the study.

4 FINDINGS AND DISCUSSION

The results obtained by the analysis of the interview data as well as a discussion of these results are presented together in order to maintain a logical flow of information. Since the data analysis was done using a thematic analysis, the findings will be presented in the themes identified. These themes can also be referred to as the adoption factors identified. The discussion of each theme starts off with a table containing a code for the doctor interviewed as well as the concept identified. During the discussion with the doctors they either agreed with the postulation that the factor under discussion would influence them to use the device or not. ✓✓ indicates a vociferous and emotionally positive influence; a ✓ indicates a not particularly strongly positive influence; an empty box indicates that the doctor did not agree and would not be influenced by this; and a X indicates a negative influence.

4.1 Postulated Themes

4.1.1 Perceived Usefulness of a Mobile Device

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Device usefulness	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Job relevance	✓	✓✓	✓✓	✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

The doctors agreed unanimously that the mobile technology device would be very useful and relevant to them. Two of the older doctors, however, could only conceptualise the device being useful by providing information to them. This use as an information providing tool was confirmed when a doctor emphatically stated that he "*currently carr[ies] 2 to 3 management reference books around with me. I know that there is an electronic version of all 3 books available for the iPaq*."

The younger doctors could conceptualise many other exciting uses for the device. A few of the solutions that really excited the doctors are:

- Making paper records of patients obsolete: "*Such a device could make the need for paper records obsolete. All patient information could be stored electronically and accessed from this device and not from the only PC assigned to an entire ward. This will make missing folders and folders not containing up-to-date patient information a thing of the past.*"
- Not having to struggle with reading illegible notes and other information: "*Doctors handwriting is generally quite poor and illegible. This device could make incorrect prescriptions due to bad writing a thing of the past.*"
- Mobility: "*Patient information could be delivered to such a device when you walk into the ward. This would alleviate the need to consult the slow, outdated PC assigned to the floor.*"
- As a decision support tool: "*I will have the latest available patient management information and with this can ensure that the patient is treated correctly.*"

However the doctors did strongly indicate that the device would never be able to replace their skill and training and actually make the decision for them.

Most of the imagined uses envisaged by the doctors are a reality in more developed countries. Examples of mobile electronic patient record systems exist (Turisco & Case 2001). E-prescriptions systems which make the "illegible" handwriting problem of doctors obsolete also exist (Berkowitz 2002). The transmission of real-time patient information using mobile devices and telecommunication infrastructure has been implemented in Sweden and the Netherlands (Wu, Wang & Lin 2005). There are also examples of medical reference material on mobile devices being useful in certain situations (Harkke 2005).

4.1.2 Social Influences

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Status			✓✓									
Image												
Subjective norm				✓								

A strong statement *against* the effect of social influences guiding a doctor's decision to use a mobile technology device was made. One of the older doctors hesitated when answering the questions regarding status. When clarifying her hesitation she stated: "*Indian doctors, especially the older ones, were usually recommended by their parents to become a doctor.*" This was usually for the prestige that came with being able to say that one's child is a doctor as well as the desire to have their children "be better off than the parents". This image of the medical profession being one of status was hard to totally avoid for an Indian doctor. The remainder of the doctors did not agree with the statement that status, image or peer influence will have some bearing on their decision to use the device. "*I would not at all be influenced to use this device by my peers nor would I think of it as increasing my status.*"

There was one softly conflicting statement of "*...as more doctors start using these devices you will become the odd one out for not using one…*" but when explored further it developed into the fact that doctors would only use the device when found to be useful and relevant to their daily clinical activity: "*If I see a colleague using such a device and he is able to provide better care to his patients I would most definitely be influenced to get one.*"

4.1.3 Perceived User Resources

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Perceived user resources												

When asking the interviewees questions around perceived user resources, they were quite emphatic that they did not believe they would obtain support for the use of a mobile technology device from within the public healthcare environment. There was a feeling of hopelessness when talking about the public hospitals IT support structures. One aspect of the lack of support related to the level of skills: "*I believe that the hospital IT department is not highly skilled and would take some time to adjust to support a more innovative device like this Nokia 9300.*" It was also felt that the hospital IT department was under-resourced and would not be able to cope with the added support required for the mobile technology device: "*They barely cope with just running the daily activities of the hospital. How will they cope with the added support required for this device?*"

Even though doctors felt that public hospitals did not have the resources to support the use of such a device, they would not be negatively influenced by this: "*The hospital might not support the device but that still will not stop me from using it.*"

4.1.4 Computer Self-Efficacy

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Computer Literate	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
I would be able to use a mobile device	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

All the doctors interviewed considered themselves to be highly skilled professionals who had daily interaction with computers. "*I have an interaction with computers throughout my working day.*" The fact that 10 of the 12 doctors did not have much prior experience with mobile technology devices did not scare them away from using the device: "*As a highly skilled professional I think I am capable of learning to use a new technology from a user manual.*"

4.1.5 Device Characteristics

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12

Size of screen	X	X	X	X	X			X	X	X	X	X
Theft	X	X	X	X	X			X	X	X	X	X
Task/technology fit Result demonstrability		✓✓	✓✓		✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

Ten doctors expressed an initial concern that the limited screen size of the handheld devices might make it less useful: "*Perhaps the screen on this device would not be able display information very legibly*" and "*I don't think a web page will display very nice on such a small screen*". However, some were quite surprised at the amount of information displayed with the drug formulary program on the Nokia 9300: "*That displays information in a very comprehensive manner and with one click of page down you can see the rest of the information.*"

Both loss and theft of the device was also a major consideration for the doctors. "*I think such a device would easily be able to get feet.*" However, the two doctors who were high adopters of a mobile technology device said that doctors would have to learn to take care of the device in a similar manner in which they care for their stethoscopes.

The software demonstrated to the doctors was accepted with great enthusiasm. "*That could most definitely help me as a look up when I don't know what the drug does*" and "*You could look up side effects to make certain there will be no complications for the patient.*" The doctors were enthusiastic that the technology would be able to help them deliver better quality care. This is supported by the uses they conceptualised for the device. One of the doctors working in an emergency trauma unit, where rapid diagnosis and accurate patient management are essential, was sure that a mobile device could further ensure that patient management was in line with the diagnosis as well as being the most effective one and aiding in the fight for the patient's life.

4.2 Emerging Themes

A number of additional themes were identified during the analysis of the interview data. They do not form part of the original significant factors of influence identified during the literature review and appear to be specific to the healthcare environment.

4.2.1 Patient Influence

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Patient Perception		X	X									

An addition to the social influences theme that was not part of the original significant factors was the patients' perceptions of the doctor if they should see the doctor using a mobile technology device. When talking about a patient's perception of the doctor if the patient should see the doctor using a mobile technology device to reference information from, there was a majority consensus that the patient's perception would *not* negatively influence their decision to use the device. This was conveyed strongly through statements like: "*It will help me improve the care and management provided to the patient and result in a much improved patient outcome*"; "*I will not mind at all to use the device to look up information in front of a patient*" or "*Patients should understand or be educated that having the latest information available as a reference tool will be of great benefit to them at the end of the day*".

However, two doctors did say that they would be hesitant to use the device while sitting with the patient: "*The patients might question my competence if they see me looking up information in front of them with this device. The same goes for looking up information from a book.*" However, that would not stop them from using the mobile device to look up information, just that they would not do it while the patient was sitting with them. "*I would most definitely use it when not in front of a patient*" or "*If I needed to look up information then and there I would go to another room and then come back.*"

By contrast, it was also mentioned by one of them that patients are starting to move away from the idea that a doctor should know everything. They are generally starting to ask more questions about the conditions they are diagnosed with. He did say that a mobile device might be useful in explaining conditions graphically to patients, as they would more readily be able to understand a picture than a

wordy explanation. "*When patients ask questions about their medical condition, we could perhaps provide a clearer explanation to patients using such a device to display information graphically.*"

4.2.2 Malpractice Legal Suit

	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Fear of legal suit			✓✓		✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

Another social influence factor was identified by the pattern of doctors wanting to use the mobile technology device as an information and decision support tool, reflecting the growing unease amongst the doctors of the increasing trend of malpractice legal suits being brought against doctors. This device could help doctors prevent such a situation from arising: "*This will help in action that could be taken against the doctor for incorrect treatment and management.*" If such a device could keep a history of the patient and all decisions made regarding diagnosis and treatment, it could help defend the doctor's decisions: "*An audit of patient information and history, patient management and drugs prescribed could be kept.*"

This unease of legal action being brought against the doctor was also discovered during the discussion on patient influence. So long as the patient knew that the device was being used to make 100% certain that the correct diagnosis and management of the patient takes place, doctors would use the device in front of a patient.

4.2.3 Management and Government Support

	d1	d2	d3	d4	d5	d6	d7	D8	d9	d10	d11	d12
Management support												
Government support												

Even though these two factors of hospital administration and government help could form part of perceived user resources on a micro-scale it is the macro-scale that was being referred to by the doctors. They were referring to national government and healthcare management and the fact that healthcare could not escape the political reality it found itself in. This is why these two factors are regarded as separate from the de facto definition of perceived user resources.

Support from the managerial structures of the hospital evoked responses tainted with a lot of emotion: "*The people in hospital management have completely forgotten what it is like to be a doctor. They seem to be fighting for some of the wrong things.*" There was a unanimous agreement between all doctors interviewed that absolutely no support would be garnered from the management of public hospitals for the purchase of mobile technology devices: "*Even if we proved to them how useful such a device would be and how it would increase my productivity and improve patient outcomes, I really don't think they would spend money on it.*"

However, this stance is understandable in the context of South Africa as a developing country with more than 70% of working age adults being unemployed, 53% of the population living below the poverty line and 20% of the population being HIV positive (Department of Health, 2004). There are too many needs for the already thinly sliced portion of resources cake provided to the public healthcare sector by the South African government with problems of HIV, TB and inadequate resources deemed to receive more share of the healthcare budget: "*In a developing country like ours we have too many other health concerns to warrant healthcare budgetary expense on such a device*"; "*TB, HIV, infant mortality and cost of health services to the general public all take priority on already scarce financial resources*" and "*Our hospitals are overcrowded and you cannot spend money on a nice-to-have while you do not have beds for patients or doctors to service the patients.*"

These findings show that there is a clear statement being made by the doctors that no support would be given to them by the hospitals in the use of a mobile technology device. However, this lack of support for the adoption of a mobile technology device by the environment doctors find themselves in will not detract from there willingness to use the device. In fact 10 of the 12 said that they would purchase the device from their private funds as they could see many potential uses for the device: "*So long as it does not cost too much and the benefit it will add is quite visible, I will not mind paying for it*"; "*I*

don't think I would mind paying for such a device out of my own pocket if one can be found for about R3500" (≈ US$500). It was mentioned that if the use of the device was privately funded, hospital management would grab the opportunity to use the device in the hospital. "*If a company like HP came and privately funded such a device they would jump at the opportunity.*"

5 SUMMARY AND CONCLUSION

The data analysis revealed that the factors of job relevance, usefulness, task/technology fit, result demonstrability, computer self-efficacy and device characteristics were in agreement with the findings of previous research on ICT adoption in healthcare. The more technically competent doctors are, the more likely their intention to use a mobile technology device. Where doctors found the device relevant and useful to their daily clinical activities, they would use the device. The better the device and its software could support them, the greater would be their intention to use such a device. Table 1 lists the adoption factors identified as significant during this research.

Factors	Supports the literature	Comments
Perceived usefulness of a mobile device	Yes	In general a very positive perception of mobile technology devices by doctors was evident even though half of them had never come into contact with one before. They perceived the device being able to provide them with relevant information either via the internet or software for the device. They perceived the device as a reference tool, patient information tool and even contemplated its use as a decision support tool that could help in diagnosis and medication prescription.
Social influences	No	Doctors in public healthcare in the Western Cape display a professional maturity that does not allow factors like image or subjective norm to influence them.
Perceived user resources	No	Lack of resources to support their use of these devices by the hospitals did not negatively influence their intention to adopt. This could be attributed to the social circumstances South African doctors find themselves in, where they have learnt to cope with limited resources on a daily basis. Despite their extremely pressurised work environments, and poor hospital management and administration, patient care is uppermost in their minds.
Computer self-efficacy	Yes	Concurred with previous research (Chismar & Patton 2003), that due to the high self-efficacy beliefs of doctors this factor can be ignored even when researching an innovative technology in a South African context.
Device characteristics	Yes	Doctors would be negatively influenced by characteristics they regarded as being important for them.
Task/technology fit	Yes	The medical profession is a very information intensive one (Harkke 2005) and doctors realised that this device would be able to help keep abreast of the latest information.
Result demonstrability	Yes	Doctors believed that the technology would be able to help them deliver better quality care to their patients.
Patient influence	New	Doctors did not feel intimidated by possible patient perceptions on their doctor's use of the device. Most doctors did however expect that the patient perception would be positive anyway.
Fear of legal action	New	Underlying doctors' perceptions of the device as an information tool was an unease in respect of malpractice legal suits. It was thought that the technology could aid the decisions made. This could help reduce the possibility of incorrect diagnosis and treatment and perhaps legal action against the doctor.
Management and government support	New	Negative sentiments were expressed about the lack of national healthcare structures and government support for the use of such a device. Nevertheless this did not appear to influence their personal intention to adopt mobile technology. It was however felt that these structures should be providing more impetus for the use of these devices.

Table 1. Adoption factors identified by the research

Could these factors form part of a generalised technology acceptance model for innovative technology in the South African public healthcare sector? It has been stated that the hospitals from which participants were obtained are comparable to the rest of the South African public hospitals. Doctors working in these hospitals face similar working conditions, challenges, administrative tasks and resource shortages. Could the opinions of the doctors interviewed therefore be representative for the South African public healthcare sector? Given the similarities between public hospitals in South Africa as well as the fact the doctors in the sample did not strongly contradict each other, it can be argued that there would be a concurrence of views between doctors working in similar public hospitals. This would mean that the factors identified could form a revised TAM for South African public hospitals.

In conclusion, the research shows that South African public healthcare doctors are eagerly looking for ways to support themselves in their daily clinical activities. They can conceptualise many uses for a mobile technology device, many of which are already a practical reality in countries like the USA, UK and many countries in Europe. Using the device as an information and decision support tool can be made a reality for public healthcare doctors in South Africa. This will not only provide much needed support to overworked doctors, it will also help improve healthcare outcomes for the majority of the South African public. The key stakeholders involved in the public healthcare function, the government, healthcare management and ICT industry, can help push the adoption of these devices. The ICT industry could get involved by developing strategic partnerships with the public healthcare sector. These partnerships can be used firstly for the showcasing the potential of mobile devices to the public healthcare sector. Once an interest is shown the partnerships can be used for the development of standards, infrastructure and solutions. Government can involve themselves through e-government initiatives and push the concept of mobile technology and healthcare. Hospital management can become involved by starting to support initiatives to help doctors provide better quality care to patients by using these devices as they have envisaged in this research, as a reference-, decision support- and record keeping tool.

The research has a number of limitations. Obviously, the sample was small and, to an extent, self-selected. Also, some of the findings involve the hospital management, none of which were interviewed. Even though most hospital managers are doctors, interviewees generally regarded them as "having forgotten what it is like to be a real doctor". Future research should actually include the hospital management and patients as interviewees. Finally, some doctors conceptualised many uses for a mobile technology device to help them in their daily clinical activities. The authors intend to conduct an action research programme by providing doctors with a mobile technology solution that can provide support for them, and researching their perceptions and usage of the device after they have actually used it.

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