

## **Drivers For Wireless Handheld Technology: Views From Queensland Nurses**

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### **ABSTRACT**

*The use of wireless hand held devices is becoming popular in healthcare due to its flexibility and mobility. In the nursing domain, the use of handheld devices, a specific component of wireless technology appears to be beneficial for data collection and other information management functions nurses may undertake. Studies in nursing literature have indicated that handheld devices deliver advantages and benefits at the point of care. In this study a set of 30 interviews with Queensland Nursing Staff in one district health centre was conducted over a period of three months to establish the drivers for the introduction of wireless technology among nurses. The outcome of these interviews is developed into a preliminary model and reported in this paper.*

Key words: wireless technology, health care, IS

### **INTRODUCTION**

Prior studies indicate that wireless applications using handheld devices can provide significant advantages by providing solutions to some of the existing problems that healthcare professionals face. These advantages include the reduction in transcription errors arising from paper based documents (Sausser, 2003), data collection at point-of-care (Simpson, 2003), considerable reduction in the amount of paper work required (Sparks et al., 2001), administering medications by having textbased alerts using these handheld devices (Dyer, 2003), remote monitoring of patients and connecting to other systems such as patient care (Yacano, 2002).

While prior studies have highlighted the advantages of handheld applications, they have not yet ascertained factors that determine adoption of such a technology. This study is designed to enable us to determine these factors. Once the factors of adoption are ascertained and appropriate solutions put in place, healthcare providers can enjoy the benefits of the application of this technology by providing solutions to staff associated with any crises encountered (Davis, 2002), managing the increasingly complex information challenges (Yacano, 2002), complying with the rigorous regulatory framework (Wisnicki, 2002), reducing the medication errors (Turisco,

2000), generating affordable applications that allow for greater mobility (Athey & Stern, 2002). In addition to these, wireless applications would also provide benefits to healthcare due to its flexibility and mobility in providing for better data management (Wisnicki, 2002), including complex patient data requirements (Davis, 2002), proper integration of data to existing systems (Craig & Julta, 2001), and improved access to data from anywhere at any time (Stuart & Bawany, 2001).

### **LITERATURE REVIEW**

In the healthcare literature, the concept of wireless technology is discussed by many authors (Wisnicki, 2002; Dyer, 2003; Simpson, 2003; Sausser, 2003; Hu et al., 2002). For example, Wisnicki (2002) provides details of how broadband technology, a component of wireless technology, can be used in healthcare. The discussion provided by Wisnicki (2002) involves the high cost of setting up a wireless technology in a healthcare setting, improvements to patient care using this technology and potential cost-effective quality of service to patients. (Sausser, 2003) provides information on how to improve clinical quality using wireless technology including challenges for maintaining security and privacy. Sausser (2003) also discusses the concept of portable devices for data collection purposes by providing an argument on benefits that can be realised using these devices. Simpson (2003), while critiquing the nursing domain, stresses the need for the innovative use of IT to improve patient care. He points out that new IT technologies can help to address some of the chronic problems encountered including saving nurses time, skilled nursing care and home health care. He also provides details on the expended time per hour of nursing care and suggests that new technologies would provide solutions to some of the acute problems of nursing due to these time constraints. Dyer (2003) on the other hand provides details of how text messaging using wireless devices can be effectively used to remind patients of their appointments. He reports the idea behind a radically new system of managing patient care in conjunction with modern telecommunication applications using wireless devices to improve the quality of patient care. Common to all these studies is the use of emerging technologies in healthcare and potential benefits that can be achieved.

While many other studies reviewed in the healthcare literature echo similar sentiments, none of these studies have examined the potential problems of using wireless devices. It appears that almost all studies have taken the smooth adoption of

this technology for granted. While some studies have indicated existing problems in collecting patient data and provided some theoretical solutions, these studies seldom analyse the changing nature of information systems using wireless devices. For instance, (Sausser, 2003) mentions the advantages of using mobile devices in collecting patient data, but did not provide an in-depth analysis of the strengths and weaknesses of such a procedure.

This mobility has prompted healthcare organisations to consider wireless devices for data collection and management purposes. Further, the data collection at point of care can eliminate transcription of data onto computer forms realising cost savings. Once the data is collected and verified, it is possible to integrate these data with existing systems for distribution to various organisational units. Collectively, these activities could realise significant financial savings.

While healthcare organisations are keen to save money, they are also keen to provide high quality services to their patients. Crucial to this high quality is relevant and accurate data. The raw data collected at point of care by nursing staff is converted into information by feeding it into various organisational databases. Current literature highlights the importance of incorporating wireless devices in organisations without discussing how effectively nurses can collect data. Limited information is found on the factors of adoption and barriers associated with such devices. Therefore, this study will conduct an investigation into the factors of adoption of wireless applications for data collection. By doing so, this study will fill-in the gap in the literature and provide insights into those factors that need to be given priority while using wireless handheld devices for data collection purposes. It is also hoped that the outcome of this study would enhance the data collection procedures in healthcare, realising significant cost and time savings.

The overarching aim of this paper is therefore as follows:

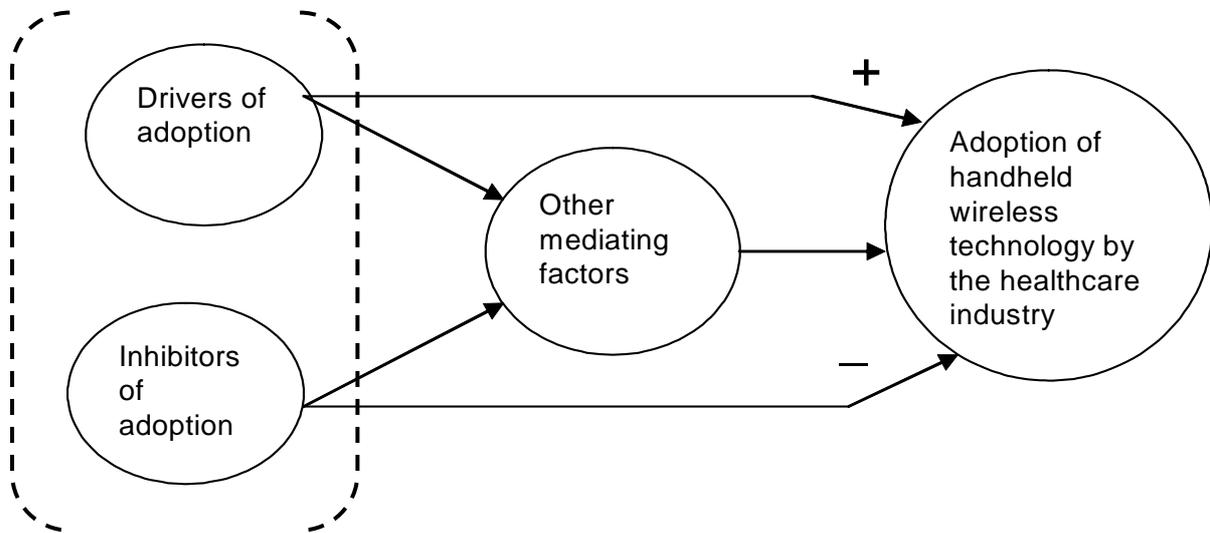
- (i) To explore and identify the drivers and inhibitors to the adoption of wireless handheld technology in the healthcare industry.

This paper produces details on drivers as we are still awaiting data for inhibitors.

## **RESEARCH METHOD AND DESIGN**

Figure 1 shows the integrated research model, which guides this study. It is noted that our ultimate objective is to investigate how drivers and inhibitors affect the

adoption of hand held wireless technology in healthcare industry either directly or via other mediating factors.



**Figure 1: The Research Model**

However, the focus of this study is to identify the drivers (shown inside the double brackets) as perceived by a group of nurses from Queensland healthcare. It is hypothesized that these drivers will affect adoption positively. The possible hypothesized impacts of other mediating variables are to be derived from an extensive literature review.

The preliminary stage of the research included conducting a set of interviews with nurses. The following paragraphs detail the procedures adopted for this study.

**Stage 1 – Literature Review (exploratory):**

Extensive literature review was carried out at this stage to integrate the materials available into the interview questionnaire. The questionnaire consisted of over 20 themes and an information sheet was prepared after this comprehensive literature review. The specific purpose of this stage of the study was to ensure that nursing staff were comfortable in answering the technical aspects of wireless technology as appropriate to their working environment. This stage did not identify any mediating factors and only main factors influencing the adoption of technology were the focus of this stage.

## **Stage 2 – Interviews (confirmatory):**

In second stage of the research a set of interviews were undertaken. In order to ensure the interviews were conducted on time, the local health district was approached through one of the authors of this paper and suitable candidate groups were identified. After obtaining ethical clearance from both the principal university and the health district, a research associate from the health district was contracted to undertake the interviews. The interviews were conducted in such a fashion as to minimise any disruption to nurses' work schedule, ensure comfort of nurses in answering questions, minimise any travel time by interviewees, synchronise the 'interview' language with participants and to prompt nurses when unknown aspects were encountered by participants.

Prior to the interviews, the line managers were approached for permission to release staff for interviews. Initially a consent letter was distributed to obtain consent for interview and the list of people interviewed was provided to the health district. The interview was recorded using a digital recorder and catalogued as per ethics requirement. These interviews were then transcribed for data analysis.

Participants for the interview were selected from the nursing staff in Queensland Health. The participants were initially screened for suitability as only nurses working with technology were considered for this purpose. Any nursing staff involved with administration only is eliminated from the interview to remove any unforeseen bias. The nurses were chosen from a wide range of background including pharmacy, oncology and emergency departments. As the nurses belonged to the health department, no further screening was employed for sampling.

## **RESULTS OF THE INTERVIEWS**

### **Drivers**

Table 1 shows the drivers of the adoption of wireless hand held technology as extracted from the interview notes. While there is some overlap between drivers, no attempt was made to aggregate the drivers in this paper. The main reason for this approach is the 'language' definition as nursing people use certain terminology with a varied meaning. We are in the process of conducting an in-depth analysis with a view to aggregate these drivers in to a small set. The numbers in the parenthesis refer to the driver numbers as extracted from the Qualitative software application, NVivo.

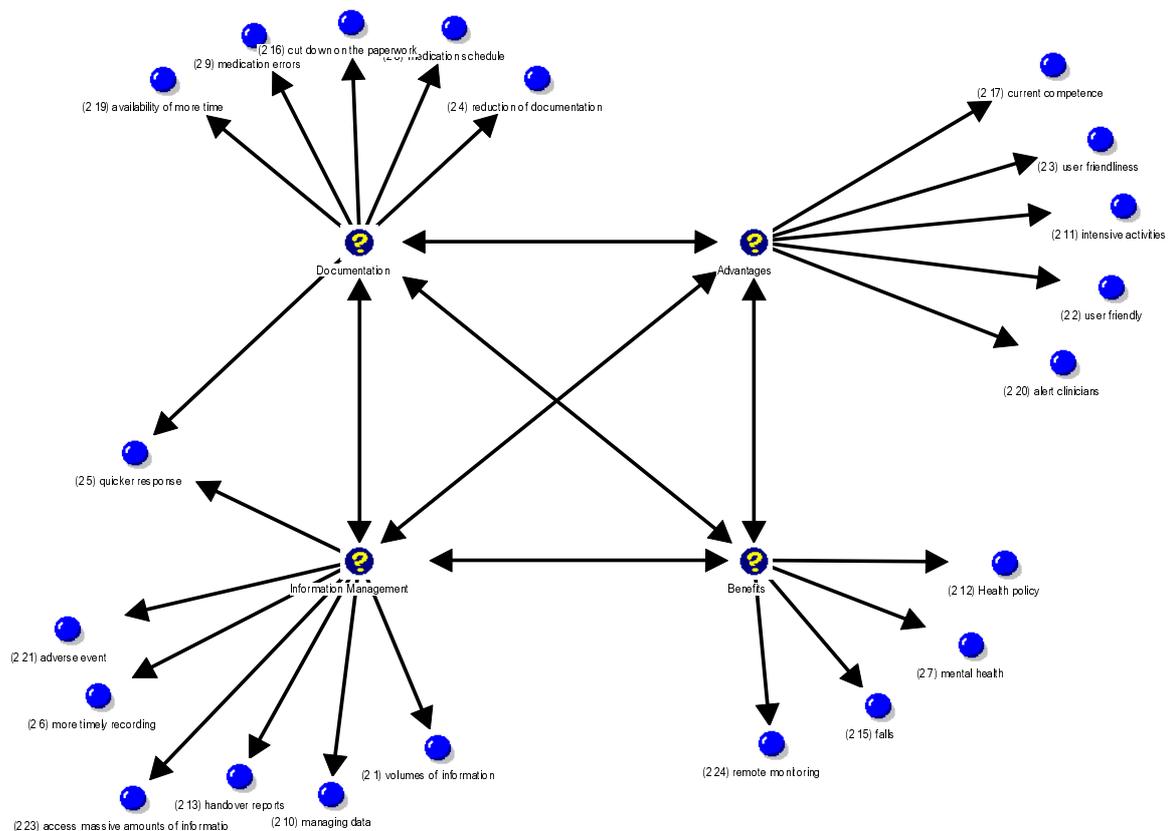
**Table 1: Organized drivers of the adoption of wireless hand held technology**

<b>Drivers</b>
1= (2) Drivers
2= (2 1) volumes of information
3= (2 2) user friendly
4= (2 3) user friendliness
5= (2 4) reduction of documentation
6= (2 5) quicker response
7= (2 6) more timely recording
8= (2 7) mental health
9= (2 8) medication schedule
10= (2 9) medication errors
11= (2 10) managing data
12= (2 11) intensive activities
13= (2 12) Health policy
14= (2 13) handover reports
15= (2 14) fantastic benefit
16= (2 15) falls
17= (2 16) cut down on the paperwork
18= (2 17) current competence
19= (2 18) benefits
20= (2 19) availability of more time
21= (2 20) alert clinicians
22= (2 21) adverse event
23= (2 22) advantages
24= (2 23) access massive amounts of information
25= (2 24) remote monitoring

Note: The numbers in the above table such as (2 1) are extracted from the software and left as they are. They may not provide any meaning while interpreting the data.

Once these drivers were identified from the interview notes, an effort was made to group them. While the interview data were analysed based on context, it was possible to extract four broad themes namely, documentation, information management,

advantages and benefits. The documentation theme refers to any incentives to reduce paper work encountered by nursing staff. Information management refers to access to information and associated aspects. Advantages refer to positive and direct influences encountered in their daily operations. Benefits refer to influences at organisation level as viewed by nurses. Themes that fitted these groups were identified and clustered under these four factors and a model was derived using NVivo. The developed model is shown in the following figure.



**Figure 2: Model derived from nursing data**

## DISCUSSION

The data indicate that the drivers can be loosely grouped into four categories as shown in the above diagram. Nurses appear to have a good understanding of the advantages of the technology with comments such as user friendliness, quicker responses, timelier recording and availability of more time all being associated with benefits and mentioned in the interviews. Other comments indicate that nurses are also aware of the reduction in documentation and the quicker responses associated

with the technology. If adoption is slow, it may be more an indication of implementation problems rather than the perceptions of the relative advantage of the technology.

Rogers (1995) discusses some characteristics of innovations and this could hold clues to potential adoption problems with wireless technology by nurses. These characteristics as perceived by the end-user are:

1. Relative advantage – the perception that the idea is better than the one it supersedes.
2. Compatibility – the degree in which the innovation is perceived to be consistent with existing values.
3. Complexity – the degree to which the innovation is perceived to be difficult to understand and use
4. Trialability – the degree to which an innovation may be experimented on.
5. Observability – the degree to which the results of an innovation are visible to others.

In his seminal work Rogers (1995) suggests five perceived attributes of an innovation, namely relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is “the degree to which an innovation is perceived as better” (Rogers, 1995, p. 15) and measures both explicit and implicit advantages. Compatibility is defined as “the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters” (Rogers 1995, p. 15) and measures how compatible an innovation is with the existing culture, structure, infrastructure, and previously adopted ideas. Complexity is defined as “the degree to which an innovation is perceived as difficult” (Rogers 1995, p. 16) and measures how difficult an innovation is to understand, learn, and use. Trialability is “the degree to which an innovation may be experimented with on a limited basis” (Rogers 1995; p. 16) and describes how easy an innovation is to try out or test. Observability is “the degree to which the results of an innovation are visible to others” (Rogers 1995, p. 16) and reflects how explicit are the results and outcomes of an innovation.

Besides the five perceived attributes, other variables also affect its rate of adoption, such as: (1) the type of innovation-decision, (2) the nature of communication channels diffusing the innovation at various stages in the innovation-decision process, (3) the nature of the social system, and (4) the extent of change agents' effort in diffusing the innovation.

In investigating the "drivers", the above factors appear to be dominating the perceptions of nurses for wireless technology adoption. These factors will be confirmed at the next level of this research using a quantitative instrument.

### **CONCLUSION**

The study is an attempt to understand user feelings on the issues impacting the drivers and inhibitors of wireless technology in healthcare. User opinions extracted through interviews, while confirming the literature, appears to reflect what has been echoed for the past three years without much change. This implies that the adoption of wireless technology is still debated without providing any proper solutions for healthcare industries. The next stage of this research will invite opinions from a wide range of users of healthcare on a questionnaire to quantify the opinion. It is hoped that this quantification will provide more insights into the adoption issues of wireless technology for healthcare to enable an IS model that can readily be used by healthcare organisations contemplating wireless implementation.

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