

DRIVERS AND INHIBITORS OF THE ADOPTION OF WIRELESS HANDHELD TECHNOLOGY IN THE HEALTHCARE INDUSTRY: VIEWS FROM SELECTED WA STAKEHOLDERS

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ABSTRACT

The use of wireless hand held devices is becoming popular in healthcare applications for flexibility and mobility. While the concept is attractive, difficulties encountered by health professionals included the small size of the device, problems in fitting current data collection forms into one screen of a handheld device and data entry using the 'graffiti' option. It appears that prior studies, while highlighting the importance of wireless applications in healthcare, failed to ascertain factors that determine the adoption of these applications in healthcare. This study conducted a focus group interview to ascertain the factors of adoption (and barriers) of wireless applications in order to enhance healthcare data management. Preliminary findings of this focus group interviews are presented here.

Key words: wireless technology, health care, IS

INTRODUCTION

Prior studies indicate that wireless applications using handheld devices can provide significant advantages to healthcare professionals by providing solutions to some of the existing problems. 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 considerable amount of paper work (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 factor that determine adoption of such a technology. The outcomes of this study would enable to achieve this. Once the factors of adoption are ascertained, healthcare providers can enjoy the benefits of appropriate applications of this technology by providing solutions to the staff crisis 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 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 healthcare literature, the concept of wireless technology is discussed by many studies (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 the 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 every hour of nursing care and suggests that new technologies would provide solutions to some of the acute problems of nursing due to this time factor. 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 this crucial aspect for granted. While some studies have indicated existing problems in collecting patient data and provided some theoretical solutions, these studies have seldom analysed 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 this data with existing systems for distribution to various organisational units in a healthcare setting. Collectively, these activities would 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 data. The raw data collected at point of care by nursing staff is converted into information by feeding the raw data into various organisational databases. Current literature highlights the importance of incorporating wireless devices in organisations without discussing how effectively can nurses 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 of the adoption of wireless handheld technology in the healthcare industry.

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 handheld wireless technology in healthcare industry either directly or via other mediating factors.

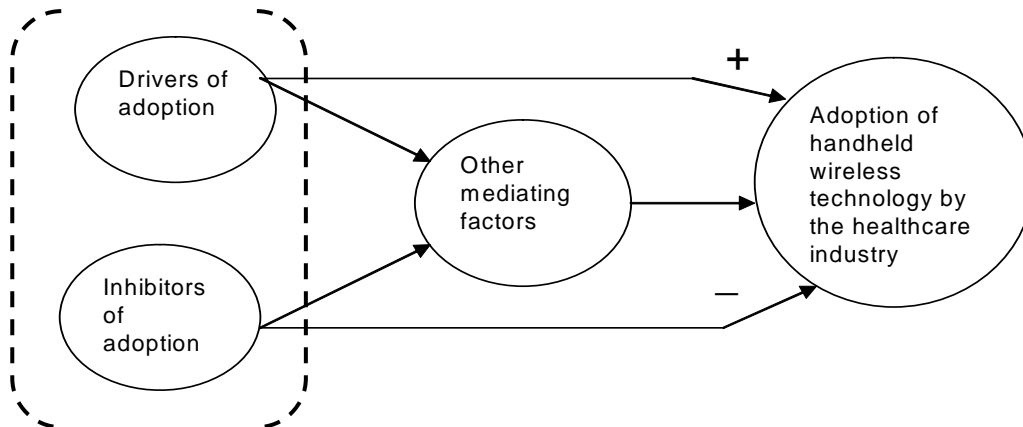


Figure 1: The Research Model

However, the focus of this specific study is to identify the drivers and inhibitors (shown inside the double brackets) as perceived by a selected group of stakeholders from WA healthcare industry. It is hypothesized that drivers affect the adoption positively, while the inhibitors affect the adoption negatively. The possible hypothesized impacts of other mediating variables are to be derived from extensive literature review.

The research for this project is carried out in three stages as follows:

Stage 1- Focus Group (exploratory):

In this stage a focus group session is conducted with a selected group of eight Western Australian stakeholders of healthcare industry. The group consists of healthcare academics and management practitioners from the healthcare industry.

The focus group sessions are conducted using the Group Support System (GSS) technology at Curtin Graduate School of Business (GSB). The Strategic Communication (STRATCOM) facility of Curtin GSB is equipped with a GSS technology called MeetingWorks (<http://www.entsol.com/>). GSS is a computer-based system used to support goal directed task of a group of people. A GSS session is facilitated by a team of two persons: a facilitator and a chauffeur who runs the computer system. Using GSS the drivers and impediments of handheld wireless technology adoption are *generated, discussed, and evaluated* in a group environment.

Stage 2 – Literature Review (exploratory):

Extensive literature review will be carried out in this stage to integrate the findings of stage 1 with the findings from the literature. The mediating factors will also be found in this stage and research model of figure 1 will thus be completed.

Stage 3 – Survey (confirmatory):

It is noted that the first stage of the research has been completed. Preparations are now underway to conduct the second stage of the research.

In second stage of the research a survey is planned to be conducted among a random sample of healthcare professionals via a structured questionnaire. The questionnaire will be developed based on the findings of stage 1 and the research model of Figure 1. Structural equation modelling (SEM)

approach will be used to test the model of Figure 1. A tested and validated model will confirm the findings of stage 1 of the research.

This paper presents the results of the findings of stage 1 of the research project.

Research Design of Stage 1

Invitations to participate in the focus group session were sent out to a selected group of stakeholders. As mentioned earlier, eight stakeholders eventually agreed to participate in the focus group. The group sessions were conducted in February 2005. Before the session the group members were briefed on the aims and objectives of the research project. The focus groups session was conducted as follows:

- (i) The facilitator (one of the authors of this paper) welcomed the participants in the focus group session and highlighted the aims/objectives of the session and the script/procedure of the group session. The facilitator also discussed the overarching question of the group session, which was “*What do you perceive to be the drivers and inhibitors of the adoption of wireless hand held technology in the healthcare industry?*”
- (ii) The chauffeur (an outside consultant) briefly highlighted the technology aspect of the session.
- (iii) The group session started with *electronic brainstorming* – a module of the GSS technology which facilitates the computer aided brainstorming. Each participant used a laptop computer to enter his/her ideas into the GSS. From time to time the list of ideas was displayed in the common screen for everybody to have a look in order to generate more ideas. This phase of the group session was completely anonymous.
- (iv) After electronic brainstorming was completed the *discuss/organize* module of GSS was invoked. This module facilitates an open discussion on the brainstorming items of step (iii). In this step each item of step (iii) was discussed by the participants and grouped under *drivers* and *inhibitors*. Similar items were grouped together (giving a new name, if necessary), and comments/discussions of the participants were captured by the chauffeur into the GSS. The primary objective of this module is to come up with an agreed upon unique set of idea items under the heading of *drivers* and *inhibitors* in a group environment.
- (v) Finally, the *evaluate* module of GSS was used in order to evaluate the unique items of step (iv) in a group environment. In this module each participant rate the items in a scale of 1 (lowest rating) to 10 (highest rating). The GSS produces the average rating of each item along with the variance (a measure of disagreement) of the rating.

RESULTS OF THE FOCUS GROUP

The research design, as presented in the last section, was strictly followed to conduct the group session. The group first used the *electronic brainstorming* module of the GSS. In half an hour they came up with a list of 90 items of drivers and inhibitors of the adoption of wireless hand held technology in the health care industry. The raw data is shown in Appendix 1. The group then *discussed and organized* 90 items and came up with 7 unique drivers and 15 unique inhibitors. Appendix 2 shows the full blown raw data of discuss/organize session.

Drivers

Table 1 shows seven unique drivers of the adoption of wireless hand held technology in the health care industry. The numbers in the parenthesis (third column of table 1) refer to the driver numbers from Appendix 2.

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

Average rating	Variance	Drivers
9.1	25%	(1.2) access to applications and information everywhere

9.0	22%	(1.1) user requirement/demand
7.9	46%	(1.6) data integrity
7.4	39%	(1.5) time efficiency through immediate transfer of tasks and information
7.3	44%	(1.7) governance
5.6	42%	(1.4) with adequate devices you would not need to produce and store paper reports
5.3	52%	(1.3) technology is here to stay at an advancing rate

The group then *evaluated* the drivers of Table 1 as per the research design using a scale of 1 (lowest) to 10 (highest). Figure 1 presents the results. The first column of Table 1 also reveals the average rating of the drivers, with the variance reported in column 2. Ideally, the variance in column 2 should be less than 30%. However, no re-rating was conducted to reduce the variance for some of the drivers as the group felt that it was not worthwhile.

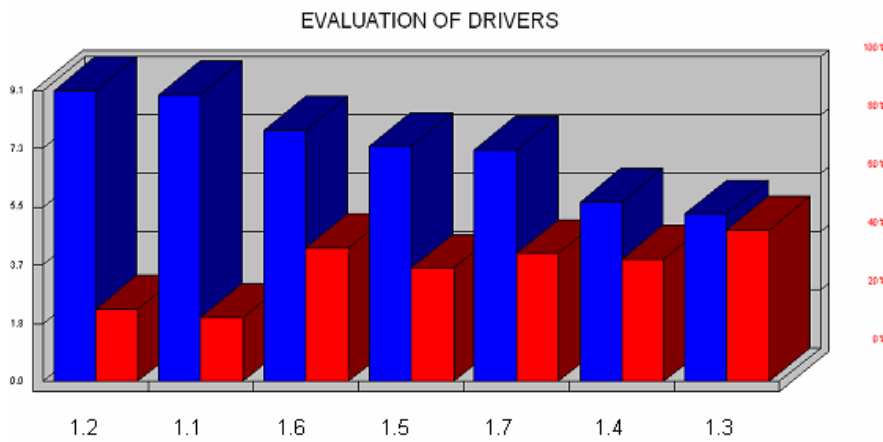


Figure 1: Evaluation of the Drivers by the Group

It is worth noting that the group rated “(1.2) access to applications & information everywhere” and “(1.1) user requirement/demand” extremely highly (having a rating of 9 or more). These two seem to be the main drivers of adoption. Appendix 2 shed more meaning to these two items. It is also noted that persistent nature of the technology (item 1.3) has the lowest rating as adoption driver.

Inhibitors

Table 2 shows fifteen unique inhibitors of the adoption of wireless hand held technology in the health care industry. The numbers in the parenthesis (third column of table 2) refer to the inhibitor numbers from Appendix 2.

Table 2: Organized inhibitors of the adoption of wireless hand held technology

Average rating	Variance	Inhibitors
8.4	30%	(2.6) security concerns
8.4	29%	(2.5) availability of suitable handheld devices
8.3	34%	(2.4) existing software limitations
8.1	32%	(2.9) cost
7.9	51%	(2.1) user demand -some do not want it - some have not accepted it
7.5	24%	(2.2) unrealistic user perception and expectations
7.5	50%	(2.11) management of handheld devices
6.8	61%	(2.10) legal issues
5.9	25%	(2.8) Potential for EMR problems (electro magnetic radiation)
5.8	58%	(2.14) clinical issues

5.6	60%	(2.15) environment of change
5.3	21%	(2.13) standards (platform/environment)
4.8	60%	(2.12) consumer issues
4.1	47%	(2.3) technology is here to stay at an advancing rate
2.9	34%	(2.7) where are we going to store all the paper data

As before, the group then *evaluated* the inhibitors of Table 2 as per the research design using a scale of 1 (lowest) to 10 (highest). Figure 2 presents the results. The first column of Table 2 also reveals the average rating of the inhibitors, with the variance reported in column 2. It is noted that some of the variances are more than 30%. However, no re-rating was conducted to reduce the variance of the inhibitors.

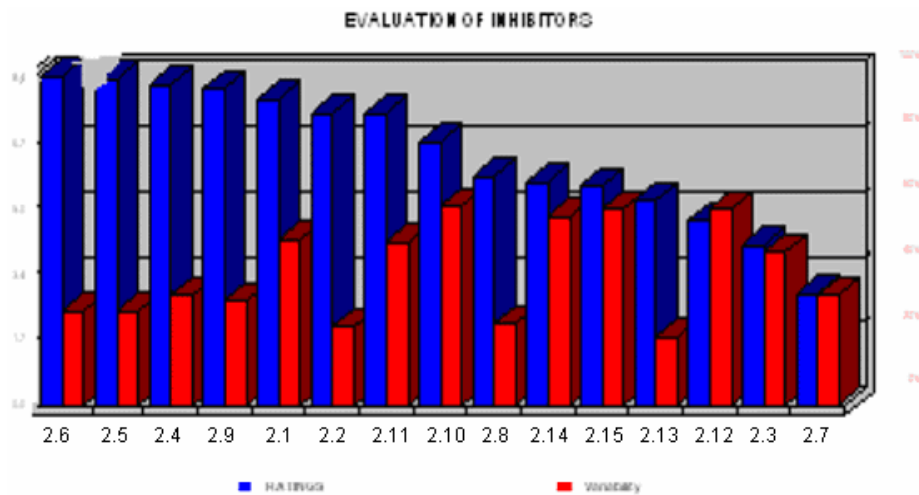


Figure 2: Evaluation of the Inhibitors by the Group

On the inhibitors side it is noted that four inhibitors (2.6, 2.5, 2.4 and 2.9) have ratings of 8 or above are the group of major inhibitors of adoption. However, they are also closely followed by another three inhibitors with ratings of above 7 (see table 2). Unlike drivers, inhibitors seem to have a large cluster impacting the adoption.

DISCUSSION

The focus group data indicate that there are more barriers in users' view than drivers. There is support in the literature to conform this notion as previous studies have warned that this technology as applicable to health is still in infant stages and caution should be exercised prior to any adoption (Redman, 2002). Previous studies have warned issues of security (Sausser, 2003), availability of suitable devices (Atwal, 2001), clinical issues (Hu et al., 2002) and management of wireless devices (Dyer, 2003). Vast majority of the studies reviewed in this area clearly indicated that drivers identified through the focus group are valid.

The focus group discussion also brought out some new issues that are perhaps relevant to the Australian context. For instance, the issue of 'standards' appears to be impacting the way services are provided to users of healthcare in Australia. There are various standards available to date and these standards require proper integration in order to realise quality of services provided to users. Similarly, the issue impacting 'legal' liabilities are not well researched specific to wireless technology in the context of healthcare and needs more investigation. Due to the current technical advancement, it is now a common practice to send data overseas for analysis and diagnosis. While this is an acceptable practice in a business sense, legal issues relating to data transmission over unsecured networks may become a major business problem to healthcare service providers. Future research need to investigate aspects relating to data transmission regulations. There appears to be limited information available in terms of cost models to justify wireless investment in healthcare

and this needs urgent attention. Finally, unrealistic user expectations appear to be contributing to the cost of providing medical services. This is already identified in a 2005 department of health and ageing report and used as a statement in the recent Medibank advice sent to customers on insurance premium increase. Research is urgently required to explore this dimension further in order to develop awareness packages.

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 the focus group discussions, while conforming 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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