Handheld Wireless Devices and Opinions of Physicians in Healthcare Environment: A case of Pakistan

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Abstract

This paper examines the role of wireless handheld devices in the Pakistani healthcare environment using a quantitative approach. This study identifies a list of barriers and drivers, and a factor analysis of the qualitative data identifies the key determinants such as "technology management", data management", "improved outcome", "efficiency", and "application limitations" were concerned with the usage of wireless handheld devices in the Pakistani healthcare environment. The results of the study are further analysed through regression analysis, on the basis of factor analysis. The results for the regression analysis indicate that for the dependent factor "intention to use" with independent factors, "technology management", data management", "improved outcomes", "efficiency", and "software applications" there is relationship between the dependent and independent variables. The value for the adjusted r-square was 0.524 and p value was 0.00. A total of 300 surveys were distributed, 97 useable surveys were returned, and the data was analysed through the SPSS software. This study was limited to one city of Pakistan in the state of Punjab, so further research is need to generalize the findings of this study.

Keywords

PDA, wireless handheld devices, healthcare, Pakistani physicians

INTRODUCTION

The commercialization of the internet and maturity of wireless technology have brought changes in the industrialised and developing world. The use of Information and Communication technologies (ICT) in Australia is on the rise in almost every sector of the industry. Despite the early stage of the technology and shortages of resources and standardization, the use of ICT is expected to continue and grow in the Australian healthcare system. Uses of ICT has emerged in the Australian healthcare system as an important ingredient in formulating

the business strategy that helps them to improve customer service, business process and communication channels, both within the institution and in other stakeholders.

Among various other technologies, the use of wireless technologies is emerging rapidly in the Australian healthcare sector. The race is on to automate or redesign clinical processes and increase efficiency, productivity, and quality of care, and to meet future challenges of the Australian healthcare sector (AHCS). As it can be implemented quickly and relatively cheaply, wireless networking infrastructure can play an integral role in the AHCS. However, wireless technology in general can be used to, for example, automate processes, reduce paper work, reduce duplicate process, maintain timely and up to date information, and standardize information. Wireless technology can also be used to support new and innovative process and services in the primary, secondary, public, and private healthcare sectors.

At present, wireless technologies are being used by a few healthcare providers for a particular activity or in a limited environment with limited scope. Most of these environments have been initiated by individuals on a limited scale, usually on an ad-hoc basis for a particular activity or process in the Australian healthcare system. In order to utilize the real potential of wireless devices on a wider scale, there is a pressing need to identify critical factors of the adoption of wireless devices with a wider scope in a given healthcare setting. The current (albeit limited) use of wireless technology seems to indicate benefits such as customized care, ability to provide care at the point of care, high quality of care, cost reduction, job satisfaction, reduction in errors, and reduction of pressure on the Australian healthcare system. At present, wireless devices are being used on a trial and error basis, without proper planning, strategic integration, limited top management involvement, and without proper training.

LITERATURE REVIEW

A survey instrument with questions and multiple items scales was used to collect the views and opinions of the healthcare professionals. Through the questionnaire, data was collected to capture the information reflecting the perceptions and practices of those adopting the wireless technology, concentrating on what factors, including internal and external environmental factors, affect the adoption of wireless technology in a healthcare facility.

The survey was conducted among a random sample of healthcare professionals via a structured questionnaire. The questionnaire was developed based on the findings of qualitative study and focus group techniques, as published in our previous study. Originally, 300 questionnaires were distributed to randomly selected healthcare professionals in one of the states of Pakistan. The choice of this sample size arose from our discussions with the local health district, which suggested that it was possible to identify about 300 participants in various health facilities, including both public and private hospitals. A regression technique was used to test the variables and their influence on the adoption of wireless technology in a healthcare facility.

The instruments constituted two broad categories of questions. The first category of questions was related to the adoption and usage of wireless applications in the hospital environment. The second category of questions consisted of demographic variables. Prior to administering the survey, traditional validity checks such as face validity and peer review were performed. These checks were performed with USQ staff that have experience in questionnaire design methods, and with healthcare professionals.

In healthcare literature, the concept of wireless technology[1] is discussed by many studies (Dyer 2003; Hu et al. 2002; Sausser 2003; Simpson 2003; Wisnicki 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, the improvements to patient care using this technology and the potential cost-effective quality of service to patients. Sausser (2003) provides information on how to improve clinical quality using wireless technology including the challenges for maintaining security and privacy. Sausser (2003) also discusses the concept of portable devices for data collection purposes by providing an argument based on the benefits that can be realized 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 wireless technologies can help to address some of the chronic problems encountered including saving nurses' time, skilled nursing care, and home healthcare. 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 wireless applications in healthcare and the potential benefits that can be achieved.

[1] NOTE: In the context of this study, wireless technology encompasses wireless applications as well

What can be realized from this review is that the majority of the studies have focused on the 'hardware' or 'physical' component of wireless devices, as this appears to be a focal point of interest to many authors now. Other studies refer to the 'implementation' or 'management' of these wireless technologies in healthcare organizations, as cost appears to be a determining factor in such implementations. None of the studies reviewed appear to have examined the 'usage' aspects of wireless applications. While studies such as that by Davies et al. (1989) examine the 'Technology Acceptance' in organizations and derive a model for such acceptance, the outcomes of such studies cannot be generalized for wireless applications as the technology is radically different from traditional desktop technology. With desktop technology, users access data using wired and fixed devices. On the other hand, using wireless technology, the data comes to the users via handheld devices, and this new paradigm gives users a lot of mobility and hence increased access to data.

Technology has promised us a "paperless world", but we are far from achieving that goal. Healthcare professionals, especially physicians and general practitioners (GP) are living examples for this. The majority of GPs still find paper works best for them (Chin 2001). On the other hand, evidence is available that mobile handheld devices have great potential to improve the communication, exchange of information, quality documentation, and quality of care (Ammenwerth et al. 2000; Haux 2006). This research provides some insight into the unique working environment of GP's as compared with other healthcare professionals in public and private hospitals. This research also presents the finding of the focus groups conducted to gather the views and opinions of GP's towards the use of wireless handheld devices in their daily practices. Qualitative data was analysed to identify the themes and issues associated with GP's attitudes towards using wireless handheld devices. The findings show that there is a mixed reaction to using wireless devices in general practice, and younger GPs can see the potential for wireless handheld devices, if the technology is mature, and appropriate applications are available. The study concluded that proper integration is critical for the adoption of wireless handheld devices in general practice in order to realise efficiency.

Pakistan's ministry for healthcare has suggested that Pakistan is realising significant advantages from the emerging information economy. This is reflected in the recent infrastructure investment and other technological developments. Despite this development, it appears that Pakistan is lagging behind in healthcare service provision. This may be due to the fact that Pakistan is slow to adopt wireless technology and this slow adoption can be attributed to the lack of management support, lack of training and perhaps lack of policies (Gururajan et al., 2005b, Lu et al., 2005, Gururajan et al., 2005a; Lu et al. 2005), the perceived lack of complexity and cost (Houston et al. 2003; Lu et al. 2005; Lu et al., 2003), the sensitive nature of information and logistics involved in a healthcare facility (Eastes 2001; Li et al. 2005), the nature and type of risk involved (Davenport 2005; Lu et al. 2003), the pressure for high quality of care, high litigation costs and a lack of infrastructure, the extent of integration with existing health systems (Li et al. 2005), and the necessity for other resources to support technology infrastructure (Davenport 2005; Lu et al., 2003).

This study does not investigate the decision making process for the use of wireless technology; rather, it assumes that a decision has been made at some stage to use the wireless technology. The study has tried to understand the views and opinions of Pakistani physicians towards the use of wireless handheld devices in healthcare environments.

METHODOLOGY AND DESIGN OF THE STUDY

In this study researchers have adopted the mixmode methodology to understand the adoption of wireless technology in the Pakistani healthcare environment. This strategy was adopted to get the views of the healthcare professionals directly due the explanatory nature of the research. In the qualitative part of this research a semi structure interview technique was adopted to collect initial views of the healthcare professionals about the wireless technology. Through the findings of the qualitative study, a survey instrument was developed in order to enable the generalization of the finding produced by this research. In the development of the interview protocols and the survey instrument, the usual processes of peer/expert review and piolet study were also conducted to ascertain the reliability of the instrument and protocols. The Survey was distributed to the 300 participants recommended by the local administration and to the supervisors and the ward/unit heads.

DATA ANALYSIS AND DISCUSSIONS

A survey instrument was developed from the interview process and 300 surveys were distributed among physicians in the Punjab region of Pakistan. A sum of 97 (30.92% response rate) usable cases were returned. There were 41 variables in the instrument including quality of information, efficiency, productivity, hardware/software features, and issues associated with usability. An initial factor analysis was conducted on the data to identify factor groupings. An iterative process was employed to finally arrive at the following five

factors. In deciding the factors, a loading value of 0.6 was set with varimax rotation. The groups were given appropriate titles in an arbitrary fashion based on the type of factors. A factor analysis data reduction technique showed that the 41 factors could be reduced or grouped together into only five determinants. On the basis of the groupings they were named "technology management", "data management", "improved outcomes", "efficiency", and "application limitations" and were concerned with the usage of wireless handheld devices in the Pakistani healthcare environment.

To understand the relationship between these variables identified through factor analysis and healthcare professional's intention to use the wireless handheld technology, a multiple regression analysis technique was adopted. Multiple regression analysis helps to understand the amount of variation in the dependent variable "Intention to use" that can be explained by the variation in the dependent variables "Technology Management", "Data Management", "Improved Outcomes", "Efficiency", and "Software limitation". The value of the regression analysis, $R=.724$, with $p<.05$, shows that there is a significant relationship between the dependent and independent variables. The adjusted r-square, $r=.524$, shows that 52.4% of variation in the independent variable "Intention to Use" is explained collectively by the variation in the independent variables "Technology Management, Data Management, Improved Outcomes, Efficiency, and Software Limitations".

Whereas F-statistics showed that the degree of freedom $F(5, 91)$ is 20.0 at a significant level $p< .05$, that means the independent variables are significantly related to the dependent variable; hence, the multiple correlation coefficient is significant as well. Coefficient analysis also showed that the independent variables "Efficiency, and Improved Outcomes" are significant, $p<.05$ with "Beta values .35, and .49" respectively. The independent variables "Data management, Technology Management, and Software Limitation" are not significant as $t = 4.5$ and $t = 6.4$, $p>.05$ respectively in relation to the dependent variable "Intention to Use". Therefore, the independent variables "Efficiency and Improved Outcomes" add something to explain the variance in the dependent variable "Intention to use" for wireless handheld technology in the Pakistani healthcare environment.

It is evident that from the data analysis that Pakistani healthcare professionals believe that variation in the variable "Intention to Use" can be explained by the efficiency offered by wireless handheld technology and the positive benefits offered by the use of wireless handheld technology in the healthcare setting. Therefore, the five factors identified by the factor analysis cover a wide range of issues relating to technology and management. Even though, through the multiple regress analysis, some variables were not significant, it is crucial to understand that Pakistani healthcare professionals are looking for immediate outcomes from wireless technology in the healthcare environment. Such perceptions and beliefs can be very crucial for any implementation strategy of wireless handheld technology in the Pakistani healthcare environment, as evident from the statistical data analysis presented in this paper. Another implication of the data analysis is that Pakistani healthcare professionals believe that the usefulness of the technology is crucial in the clinical domain. The ability of any wireless device to be perceived as useful will have an impact on the management and attitude of healthcare professionals. Therefore, it can be concluded that if the technology is useful in a clinical setting, then the healthcare professionals will be motivated to use the technology, which can then transform into technology adoption, which is supported by the data analysis presented in this paper.

Findings, Implications & Contributions

Factor and regression analysis shows that Pakistani healthcare professionals are keen to adopt the wireless technology in healthcare. It was also found that Pakistan healthcare professionals are concerned about the ease of use and benefits received from the wireless technology in the healthcare domain. This is in alignment with the findings of TAM and other studies in the healthcare area in the information system discipline. It seems that Pakistani health professionals are not much concerned about the technology itself as long as they see there is opportunity to improve the workflow and quality of care. Even though this research is limited to a single city in Pakistan, it provides clear directions to the policymaker and the decision maker about the strategic and implementation of wireless technology in healthcare environment of Pakistan. From actual Pakistani healthcare professional points of views, it seems they are willing to adopt the technology with limited training and information technology infrastructure. The findings of this study also have implications for non-healthcare environments – such as education, travel industry, and supply chain management – for the use of wireless technology. This research is unique in its nature in the Pakistani healthcare environment despite of the economic and political situation and its implications on the domains of healthcare requirements of the general population. This research will not only encourage further research in the healthcare domain it will also provide opportunities for other government and non-government organization to consider the adoption of wireless technology.

CONCLUSION

This research study was conducted to investigate Pakistani healthcare professionals' views and opinions about the use of wireless technology in a healthcare setting. The findings of this study demonstrate that if wireless technology can be useful in the clinical infrastructure of the healthcare facility, healthcare professionals are willing to adopt the technology. This is also reinforced by the finding that the usefulness of wireless technology was considered a prominent factor for the adoption in a healthcare setting. This research also reinforces similar findings of previous studies in the Australian healthcare system conducted by the authors.

LIMITATIONS AND FUTURE RESEARCH

This is only research of an exploratory nature in the Pakistani healthcare environment and was conducted in only one state of Pakistan. Further research studies are needed to further explore the adoption factors for wireless handheld technology in the Pakistani environment, before the findings can be generalized.

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