Preparedness of Nurses at Hospitals to Utilize a Paperless Environment

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Abstract

The embracing of Health Information Technology (HIT) by hospitals is viewed as one mechanism to mitigate the ever-growing healthcare supply and demand gap, reduce medical errors, increase efficiency, improve quality of care and automate business processes. This has led to many hospitals investing large sums of money in the hope that HIT can help hospitals achieve this goal. The problem, however, is that similar to other industries that have undertaken this journey towards embracing Information Technology (IT), hospitals have not been very successful and have not achieved the expected benefits of IT. One of the major contributing factors to the high failure rate of IT implementation within the healthcare sector is user acceptance. The reason for low user acceptance can be attributed to HIT being a disruptive technology that changes the existing work procedures and processes. The main objective of this study was to determine the preparedness of nurses to adopt a paperless environment and to determine if the nurses were equipped with the necessary skills to be able to function within a paperless environment. A quantitative approach was used to gather information from a private hospital within the eThekwini municipality in KwaZulu-Natal. Hundred and sixty questionnaires were handed out and a total of 102 questionnaires were successfully answered giving the researcher a response rate of 64%. The findings indicate that both perceived usefulness and perceived ease of use by nurses are enablers to HIT usage while resistance to change is an inhibitor to HIT usage. The findings also indicate that both related knowledge and perceived compatibilities have a positive effect on the perceived usefulness and perceived ease of use respectively.

Keywords: E-Health, Technology Acceptance Model, Perceived Use, Perceived Ease of Use, Electronic Medical Records, Paperless Environment, Disruptive Technology

Introduction

The Institute of Medicine (IOM) note that each year preventable medical errors cause between 44000 and 98000 hospital deaths and over 770000 people are hurt or worse even die in hospitals due to undesirable drug prescriptions worldwide (Columbus 2002). In today's health care information systems nurses work independently without being aware of the patients' prescriptions or adverse drug reactions determined by fellow colleagues. In order to minimize medical errors, increase the efficiency of medical records and enhance the methods of communication, the health care sector needs to embrace Information Technology (IT).

Why then is the adoption rate of IT, which appears to be very meaningful and core to hospitals, been incredibly slow over the past few years? More precisely why do nurses resist embracing IT in hospitals? Could the resistance of IT be directly related to the perceived usefulness of IT by nurses in hospitals? Does the perceived ease of use of IT increase the potential use of IT by nurses? These are some of the questions that need to be addressed in ensuring that future systems are better designed and accepted by the target population and functionally stable.

The primary reasons for addressing these issues are to help ensure future hospitals that intend to embrace the journey towards becoming paperless are better equipped. On a much broader spectrum, the study also addressed the preparedness of nurses to utilize a paperless environment and can also be extended to other organizations that are moving towards being completely paperless environments.

Literature Review and Conceptual Framework

IT Potential in Hospitals

The health care sector is under "tremendous pressure to address a host of system ills; medical errors, rising costs, inconsistent quality, inefficiency, declining clinician job satisfaction, and mounting staffing shortages" (Johnston *et al.* 2002). However, IT has the potential to address some of the issues and improve the quality and efficiency of health care. The potential of IT in hospitals has been promoted as having tremendous promise in improving the quality of care, efficiency of nurses in hospitals and reducing costs. Throughout the world, many hospitals are embarking on the journey of IT adoption with the specific goal of improving patient care (Aldington 2007). This journey of IT adoption is exemplified in the study by Adeleke *et*

al. (2014) where they indicate that IT in hospitals has the potential to provide relevant information, improve the quality of care and improve the timeliness and accuracy of required health information.

"Advances in information technology can provide the foundation for important improvements in hospitals, such as more cost-effective monitoring and follow-up of patients beyond health care centers and dynamic, optimal targeting of specific sectors of the population for special education, screening, and early treatment where necessary" (Reddy 2001). The technology available in the health care sector today ranges from online prescriptions to Electronic Medical Records (EMRs) to incredibly fast Intranets that provide real time analysis of a patient's condition (Columbus 2002). With all of these technologies available to the hospitals the next step would be to use these technologies to not only improve the access to health care and health care information but also to ensure that it is delivered with the highest quality. Most processes in a hospital system can be done electronically and the next generation of IT in health care is the realization of paperless hospitals.

IT Inhibitors in Hospitals

Amongst all the public institutions, the one that stands out as the most in need of improved information systems are hospitals. This is primarily due to the fact that they deal with people's lives on a daily basis (Samaha 2003). Technological advancements in the form of enterprise resource planning applications, electronic patient records and newly capable clinical applications have spurred many health care executives to use IT as an engine for institutional change" (Samaha 2003). The problem, however, is that similar to many other industries, hospitals have also been plagued with IT projects that fail, IT implementations that do not meet up to stakeholders expectations and IT projects that do not get accepted by its intended audience thereby leading the project to failure (Samaha 2003).

Even though there have been several advances in information technologies such as electronic medical records, use of hand held devices, automated business processes, clinical decision support systems and real time access to medical information, there will always exist barriers that prevent acceptance of these technologies (Jimison 2008). Some of these barriers include computer phobia, resistance to change, computer literacy, lack of industry standards and training, human and social barriers and the

significant costs associated with IT implementations (Jimison 2008 & Sockolow *et al.* 2014). These barriers more often than not require nurses in hospitals to change the manner in which they conduct their daily activities and the manner in which the organization as a whole operates (Mokgabudi 2006 & Hung *et al.* 2014). Finally a common inhibitor amongst many IT implementations in hospitals within the last decade has been the lack of interoperability between organizations through IT systems (McGeorge *et al.* 2013). This lack of interoperability has resulted in inadequate information exchange, lack of technical standards and increased implementation costs which results in a shortage of the implementation of new IT systems (McGeorge *et al.* 2013). Given these inhibitors, the preparedness and acceptance of nurses to utilize IT systems is key to unlocking the potential of paperless hospitals.

Paperless Hospitals

Many hospitals throughout the world have attempted or are in the process of attempting the voyage to a paperless environment which is made possible by electronic medical records (EMR), fully integrated health information systems and other improved clinical technologies (Carr-Bains & de Lusignan 2003). Vezyridis *et al.* (2011) in their study of paperless hospitals used the emergency department to implement a system called Emergency Depart-
ment Information System (EDIS) and showed that the current paper based information system was not adequate for tracking patients moving between hospital departments, lacked proper record keeping and was unable to quickly and easily access customer information. The study found that going the paperless route helped nurses easily store and retrieve patient information, improved the department's ability to track patients and assisted the nurses in coordinating activities.

"Improvements in information flow technologies, supportive national and local policies, as well as a motivated practice can contribute to the successful integration of computers and subsequently move many hospitals forward towards becoming paperless" (Carr-Bains & de Lusignan 2003). Carr-Bains and de Lusignan (2003) highlighted the following reasons as to why hospitals should move towards being paperless:

- Mitigate problems with transferring data from medical records

- Easier to query for patients information in an electronic format rather than a paper based format
- Reduced administration cost of manual paper work
- Improved efficiency
- The use of email and other electronic communication mediums reduce telephone expenses and faxes
- Enhanced security and confidentiality technologies for patient information.

IT Adoption in Hospitals

Many hospitals have invested large sums of money in the hope that information systems will improve the efficiency and quality of work, reduce medical errors and reduce administrative costs. However, similar to other industries that have undertaken this journey towards IT implementation in order to realize the potential of IT, hospitals have not been very successful in its IT implementation and hence have not achieved the expected benefits (Carr *et al.* 2006). According to Emam and Koru (2008), more than 50% of software projects are cancelled resulting in significant amount of investments made by organizations being lost. Lack of senior management involvement and scope changes contributed to 33% of software projects being cancelled while the main contributing factor still remains a lack of acceptance of the systems by its intended audience (Emam & Koru 2008). According to Westbrook and Braithwaite (2010), "Health professionals must embrace ICT as a "disruptive technology" that will produce significant changes in their roles and responsibilities and lead to real health reform with new, innovative models of health care delivery." A "disruptive technology" is a technological innovation that alters existing work procedures and processes leading to a radical transformation of the current landscape of a particular industry. Disruptive technologies can change traditional patterns of work and enable less IT skilled employees to carry out more IT related work tasks in less expensive ways (Christensen *et al*. 2000). This potential for disruption make health professionals to view HIT in a negative light resulting in a lack of acceptance.

Hence, a major stumbling block to the successful adoption of IT in hospitals will always be user acceptance. The Technology Acceptance Model (TAM) developed by Davis *et al.* (1989) suggests that perceived usefulness and perceived ease of use are the two determinants of IT usage in any

workplace. The reason being is that end users want to use a system that will benefit their work but at the same time not cost them a lot of effort. Therefore this study made use of TAM and integrated it with the model created by Bhattacherjee and Hikmet (2007) to determine the perception and preparedness of nurses to utilize a paperless environment.

Technology Acceptance Model (TAM)

In the field of information systems research, TAM is seen as one of the leading theoretical models in explaining system use. Davis *et al.* (1989) developed the technology acceptance model (TAM) which is intended to explain the acceptance or lack thereof of IT by its users. The TAM model consists of perceived usefulness (PU), perceived ease of use (PEOU), while behavioural intention to use (BI) and attitude towards (AT) are also used in the model to explain actual system use (U). Figure 1 is the original TAM diagram created by Davis (1989) and indicates that PU impacts on the behavioural intention to use and PEOU impacts on both PU and behavioural intention to use.
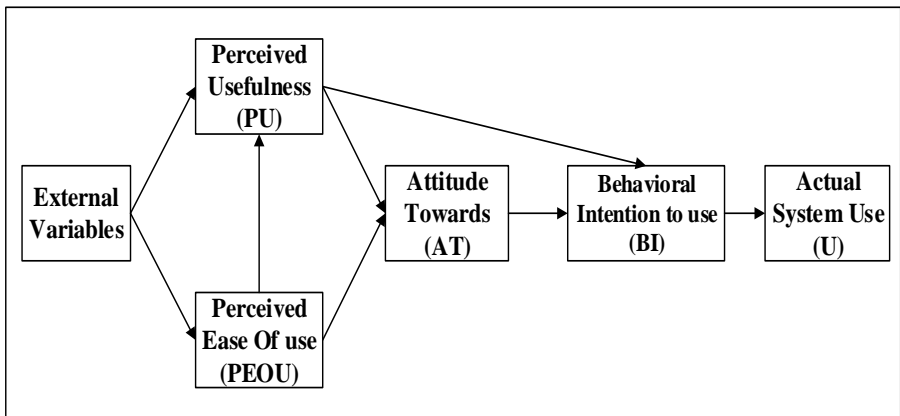

Figure 1: Original Technology Acceptance Model (Davis 1989)

Many researchers such as Raghupathi and Tan (2000), Parente and Dunbar (2001), Parente and Van Horn (2003) and Adlington (2007) have explained and demonstrated the potential that IT can bring to the healthcare sector are in abundance. However, research explaining reasons for resistance towards information technology and explaining the effect that resistance has

on information technology usage is few and far between. One possible reason for the abundance of such literature could be attributed to the fact that research models such as TAM, UTAM and TAM2 focus exclusively on the users positive factors of IT usage, while ignoring the negative factors that attribute the lack of system usage (Davis *et al.,* 1989).

The research model created by Bhattacherjee and Hikmet (2007), addresses the enabling factors for system usage but unlike the TAM model also addresses the inhibiting factors of system usage. The research model concludes that information technology usage considerations in a target population of potential users are determined by measuring the enabling and inhibiting factors of systems usage simultaneously. In the research model, the inhibitors are defined as negative factors that adversely affect systems usage when present. Figure 2 depicts the research model created by Bhattacherjee and Hikmet (2007), which bridges the gap between usage and change resistance of IT in an integrated model.
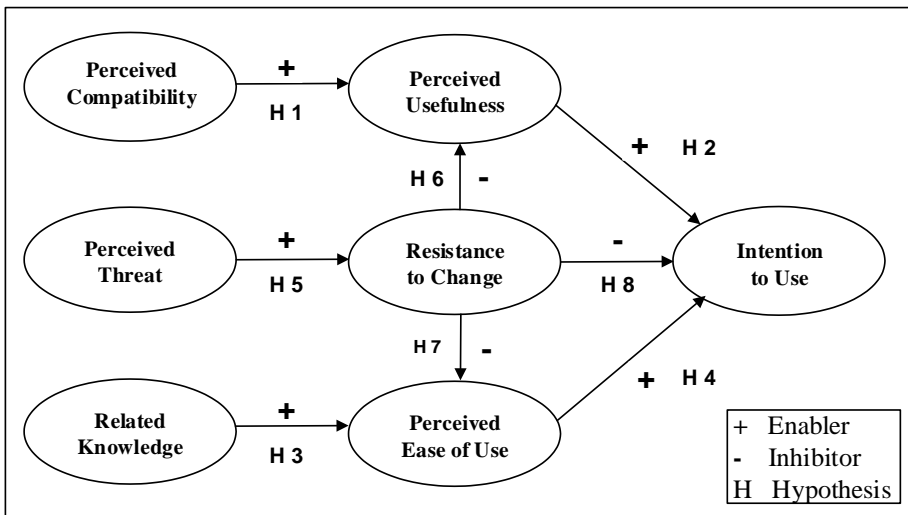

Figure 2: Research model used in study (Bhattacherjee & Hikmet 2007)

Hypotheses
It can be argued that if a system cannot cater for a health care practitioner's needs then the system cannot be perceived to be useful to that health care

practitioner's. Therefore, in light of this argument the H1 hypothesis is as follows:

H1: The perceived compatibility of HIT by nurses is an enabler to their perceived usefulness of HIT usage.

Perceived usefulness suggests that people will want to use the system because it will be of some benefit to them, and vice versa if no benefit is actually seen in the use of the system people will not see the usefulness of the system. Therefore, the H2 hypothesis is as follows:

H2: The perceived usefulness of HIT by nurses is an enabler to their intention to use HIT.

A major stumbling block of many system implementations is the lack of insight given to the relevant nurses of the systems. Research has shown that without having prior knowledge or familiarity with a certain technology, nurses find a lack of purpose for that technology. Therefore, the H3 hypothesis is as follows:

H3: Related Knowledge of HIT by nurses is an enabler to their perceived ease of use of HIT.

The minimum requirement for a system that is implemented to be perceived as easy to use is to be able to achieve the same results as before but with less effort. Therefore, the H4 hypothesis is as follows:

H4: The perceived ease of use of HIT by nurses is an enabler to their intention to use HIT.

There are several explanations as to why nurses feel threatened by information technology. Bhattacherjee and Hikmet (2007) note that people resist change if they expect it to threaten the status quo, such as a potential loss of power or control over strategic organizational resources. Therefore, the H5 hypothesis is as follows:

H5: The perceived threat of HIT by nurses is an enabler to their resistance to use HIT.

The introduction of HIT in hospitals is implemented to improve both the quality and efficiency of health care delivery. Changes are not necessarily easy to achieve in any sector and in the health care sector with the potential

life and death situations, changes might be particularly hard to achieve. A lack of knowledge of the benefits that HIT brings normally tends to be an enabler for the resistance to IT and leads to limited HIT usage. Given that resistance is clearly a contributing factor to the usage of HIT; the H6 and H7 hypotheses are as follows:

H6: Nurses' resistance to change is an inhibitor to their perceived usefulness to use HIT.

H7: Nurses' resistance to change is an inhibitor to their perceived ease of use to HIT.

One of the main objectives of the study was to determine the reasons many nurses resist IT. Therefore, the final hypothesis, H8, is as follows:

H8: Nurses' resistance to change is an inhibitor to their intention to use HIT.

Data Collection and Analysis

The study was conducted by doing census sampling of nurses from a private hospital within the eThekwini municipality in South Africa. A quantitative approach was used for the collection of data in the study and the research instrument used was a questionnaire comprising of Likert scale closed ended questions. The data was then captured and analyzed using SPSS 17.0 for Windows.

The reason for choosing the nurses as participants was because a large number of nurses use clinical applications on a daily basis in order to deliver comprehensive health care to the patients. In using this population of participants the researcher was able to determine the preparedness of the nurses to utilize a paperless environment and empirically validate the research model used in the study. One hundred and two nurses answered the questionnaire out of the 160 nurses invited to participate in the study.

Of the 102 nurses that answered the questionnaires 31.37% of the respondents were aged between 30 to 39 years old and 24.51% were aged between 20 and 29 years old. The results also indicated that 43% of the respondents were Indian and 17% were African. The remaining 40% of the respondents were made up of Whites, Coloureds and Asians.

Cronbach's coefficient alpha (CCA) test was used to determine the reliability of the measurement instrument. The Cronbach's coefficient alpha normally ranges between 0 and 1 and the closer the alpha is to 1 the greater the reliability is of the questionnaire.

Table 1: Cronbach's coefficient alpha

Section	CCA	Number of questions
Perceived Compatibility	0.953	5
Intention to use HIT	0.876	11
Perceived Usefulness	0.985	4
Perceived Ease of Use	0.546	4
Related Knowledge	0.793	2
Perceived Threat	0.975	4
Resistance to change	0.944	4

The calculated Cronbach's coefficient alpha that is less than 0.5 is deemed unacceptable (Cooper & Schindler 2001). Table 1 indicates that the Cronbach coefficient alpha's calculated are greater than 0.5 meaning that the questionnaire was a reliable instrument to measure and quantify the research model used in this study.

The factor analysis was justified by using the Kaiser-Meyer-Olkin (KMO) test. The greater the value of the KMO test is, the greater is the justification for a factor analysis to be conducted. Table 2 illustrates the results received from the KMO test for each section of the questionnaire.

Table 2: KMO adequacy

Research Model Component	KMO Adequacy	Bartlett's Test of Sphericity		
		Chi^2	df	Sig.
Perceived Compatibility	0.814	661.584	10	0.000
Perceived Threat	0.706	835.149	6	0.000
Related Knowledge	0.500	57.540	1	0.000
Perceived Usefulness	0.811	800.397	6	0.000
Resistance to Change	0.639	612.502	6	0.000

| Perceived Ease of Use | 0.751 | 369.652 | 6 | 0.000 |
| Intention to use HIT | 0.830 | 1354.867 | 55 | 0.000 |

A KMO adequacy measure of greater than or equal to 0.500 was achieved for all the questions in the questionnaire indicating that an adequate correlation does exist among the questions to justify the factor analysis. Thereafter a measure of sampling adequacy (MSA) for the individual questions in the questionnaire was performed. For each of the dimensions tested from Table 2, the MSA for each question was greater than the 0.5 ($\varepsilon>=0.5$) which justified factor analysis being conducted for the data that was collected.

Hypothesis testing was conducted using Partial Least Squares (PLS). In determining the individual path coefficients of the research model the adjusted R^2 was calculated using the PLS algorithm. The enabling or inhibiting factors of the research model were the dependent variables and the affected factor was the independent factor. Table 3 illustrates illustrates the extracted latent factors.

The PLS model indicates that the cumulative X variance and the cumulative Y variance is the percent of variance in the X variable and Y variable, respectively which are accounted for by the latent factors, of which in regression is interpreted as the cumulative R^2. The last column in the table is the adjusted R^2 table which actually penalizes for model complexity. All of the R^2 values in Table 3 are greater than 0.05 ($R^2 > 0.05$) indicating that the dependent variables are positive in nature indicating that the independent variables can be used to determine the dependent variables. This relationship is further illustrated by Figure 3 which examines each of the individual path coefficients (β) for the hypothesis tested in the research model.

The research model used in the study attempted to bridge that gap by understanding the reasons behind the lack of user acceptance of HIT in the health care sector thereby preparing future organizations that want to implement a paperless environment. In validating the research model the next step was to examine the strengths and significances of individual paths in this model. The path coefficients were calculated using PLS and then mapped to match the hypothesis in Figure 2.

Table 3: Adjusted R^2

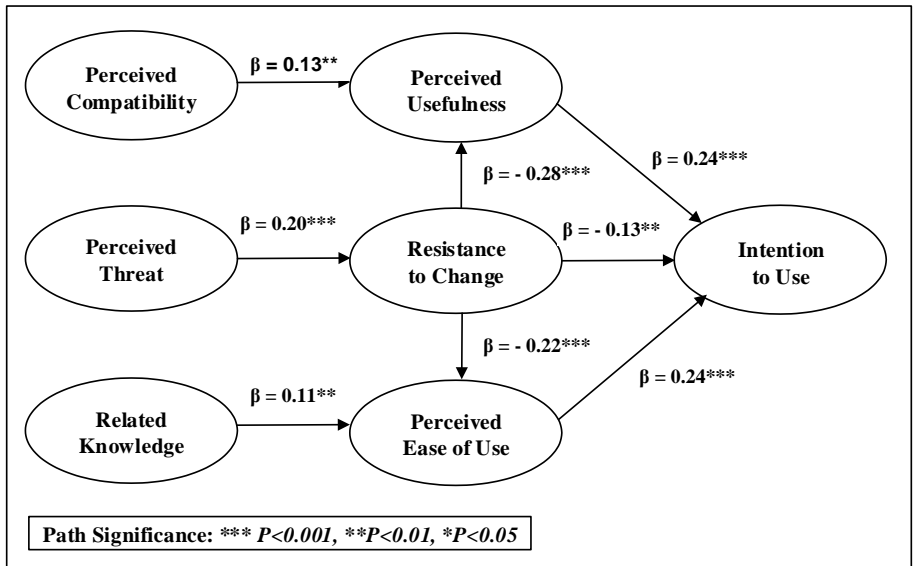| Hypothesis	Statistics				
	X Variance	Cumulative X Variance (R^2)	Y Variance	Cumulative Y Variance (R^2)	Adjusted R^2
H1	.123	.123	.145	.145	**0.136**
H2	.958	.958	.184	.184	**0.175**
H3	.799	.799	.093	.093	**0.084**
H4	.698	.698	.193	.193	**0.185**
H5	.930	.930	.199	.199	**0.191**
H6	.847	.847	.207	.207	**0.199**
H7	.830	.830	.117	.117	**0.108**
H8	.837	.837	.019	.019	**0.009**

Figure 3: Path Coefficients of research model

In exploring the findings of the individual path coefficients, the research study strongly indicated that all eight of the hypothesized paths in the proposed research model were significant at $P<0.05$. Three of the path coefficients, related knowledge to perceived ease of use, perceived compatibility to perceived usefulness and resistance to change to intention to use HIT, were all significant at $P<0.01$, while the remaining five path coefficients where positively significant at $P<0.001$ as illustrated in Figure 3. The directionality of each individual path, either negative or positive was hypothesized in the research study and contributed to the support of the proposed research model.

Perceived compatibility of HIT by nurses was predicted positively by perceived usefulness ($\beta = 0.13$, $P<0.01$) providing empirical support for hypothesis H1. This supports the research expectations illustrating that perceived compatibilities is an enabler for perceived usefulness. The path coefficient from perceived usefulness to intention to use HIT was positive ($\beta = 0.24$, $P<0.001$) and supported the hypothesis H2 that perceived usefulness is indeed an enabler for intention to use HIT. The findings also supported the research model in testing positively for hypothesis H4 which indicated that an additional enabler for intention to use HIT is perceived ease of use. The path coefficient tested positively with a result of ($\beta = 0.24$, $P<0.001$). This was further elaborated by Bhattacherjee and Hikmet (2007) in their study by stating that HIT can only be perceived as useful if it provides some benefit to the nurse and can only be perceived as easy to use by being able to accomplish the same task as previously done with less effort.

Resistance to change had a negative effect on intention to use HIT with a path coefficient of ($\beta = -0.13$, $P<0.01$) and tested positively for hypothesis H8, thereby supporting the argument that resistance to change is an inhibitor to intention to use HIT. In a study conducted by Bhattacherjee and Hikmet (2007) they concur with this finding by noting that if the level of change is a significant one and given that humans naturally have the tendency to oppose change, this would potentially lead to many users resisting the change which would eventually lead to a lack of HIT usage.

The findings also support the initial research expectations that resistance to change is an inhibitor to both perceived usefulness and perceived ease of use. Both hypothesis H6 and H7 tested significantly negative with path coefficients of ($\beta = -0.22$, $P<0.001$) and ($\beta = -0.28$, $P<0.001$) respectively, providing strong support for H6 and H7. More often than not the lack of

perceived usefulness and perceived ease of use of HIT can be attributed to the lack of training or lack of understanding of the HIT.

Therefore, if the nurses resist the technology they would also perceive HIT as not useful or easy to use. Perceived threat was tested positively to have a strong and positive effect ($\beta = 0.20$, $P<0.001$) on resistance to change and supported hypothesis H5 while hypothesis H3 was also tested positively with a path coefficient of ($\beta = 0.11$, $P<0.01$) confirming that related knowledge is an enabler for perceived ease of use.

Discussion

The findings from the study indicated that the perceived compatibility of the current HIT available at the hospital to the nurses was aligned with their daily activities. This means that the nurses felt that the technology provided to them would enable them to go about performing their daily activities but does not necessarily mean that the nurses will be comfortable using the technology. The study also found that a minority of the respondents indicated that the current systems at the hospital provided the nurses with the information they needed and in a format that they were accustomed with. This could possibly be attributed to another finding from the study which indicated that 44% of the nurses have not received formal training on the HIT at the hospital. A lack of knowledge of a particular system by the nurses generally decreases their willingness to use HIT (Bhattacherjee & Hikmet 2007).

Ammenwerth *et al* (2003) indicated that many IT implementations fail primarily because the nurses are dissatisfied with the system. Therefore, it is important to ensure that when implementing an HIT into a paperless environment the current system compatibilities are taken into consideration. The success of a paperless environment within a hospital not only depends on the economic benefits but also the actual use of the system by its intended audience. The HIT implementation could be within budget and timeframe allocated for the project and could also have helped reduce the administrative workforce previously required for manual work. However, if the information technology is not going to be perceived as useful by the intended users then the technology can be deemed a failure.

Many HIT systems that are built do not take into consideration the current capabilities of the nurses and HIT systems designed by the vendor which may sometimes force the clinical staff to change their way of working

to accommodate the new system (Bhattacherjee & Hikmet 2007). This, therefore, leads the nurses to perceive the HIT implementation as not being useful to them as it would require much more effort from their perspective to conduct daily activities. The ripple effect of nurses not perceiving HIT as useful is that it would lead to a lack of usage of the system which could potentially lead to the project failing.

The minimum requirement would be that the nurses should still be able to perform the same functionality as they could previously perform with less effort. The research model indicates that perceived compatibility is an enabler to perceived usefulness. Therefore, the managers and executives at the hospitals that want to implement a paperless environment should ensure that the IT vendor will be tasked with the responsibility of doing the implementation and ensuring that a thorough analysis is done of the current compatibilities of the system.

Advances in HIT at hospitals includes the use of electronic medical records, use of hand held devices, automated business processes, clinical decision support systems and real time access to medical information. However, despite these advances in HIT there remains many barriers to the use of these technologies in our hospitals. The researcher's findings indicated a strong resistance by the nurses towards the usage of HIT in a paperless environment. More than 60% of the nurses indicated that they would be resistant to working in a paperless environment while 20 % of the respondents have a neutral perspective on the HIT in a paperless environment. Therefore, in order for the organization to pursue the journey towards becoming a paperless organization, these barriers need to be identified, quantified and then overcome.

One of the main resistance barriers is the acceptance of HIT by nurses. The acceptance of information technology by the relevant nurses in the hospitals is of the highest importance in order to increase the adoption of HIT, so that the transition towards a paperless environment is done seamlessly. Kripanont (2007) states that the satisfaction of the information technology by the nurses is essential to the actual survival of the system. A large number of HIT implementations that have either failed or been plagued with difficulty are those which the nurses are dissatisfied with (Ammenwerth *et al*., 2003). The high number for this failure rate can be attributed to the lack of acceptance of the system by the intended users because the system was built without taking into consideration the manner in which the nurses

go about their daily activities. Clinicians perceive HIS as both disruptive and inefficient because of the mismatch between their daily work procedures and how it is implemented by HIT (Karsh *et al*., 2010). According to Georgiou *et al* (2007) HIT radically changes people's work procedures and roles and this change is viewed by many as a threat to day to day tasks that enable the optimal functioning of an organization.

Resistance barriers have a direct impact on the nurses' intention to use HIT. Therefore, measures need to be put in place to ensure that nurses are not resistant towards the HIT. These measures include, but are not limited to, are:

- Ensure that the nurses feel that they are a part of the implementation so they do not feel threatened by the technology
- Nurses' existing work routines and practices must be taken into consideration to ensure that that the new HIT implementation adapts accordingly
- Nurses are made aware of the potential benefit that the HIT would bring to them and the patients and how it can be used to assist the nurses with their work and also make their work easier. If this is achieved then the nurses would perceive the HIT as both easy to use and useful.
- Availability of computers together with continuous training and support must be provided to the nurses so that they become experts at the system
- Security and confidentiality measures of patient information must be put in place to ensure that the nurses view the HIT as a secure system and also so that the nurses do not use the HIT for malicious intent.

The study was limited to nurses who would interact with the clinical applications in a paperless environment on a daily basis to conduct their activities. This study was undertaken in an environment where there exists a lack of related knowledge pertaining to the benefits of HIT and, in certain circumstances, where HIT is perceived as a threat. Such circumstances could be an inhibitor to information given by the respondents when answering the questionnaire. The researcher was also limited to staff at one private hospital

which meant that the sample population was relatively small. A larger sample size would have increased the reliability of the findings of the study.

Future research should be undertaken that does a comparison between nurses from both private and public hospitals in order to measure the preparedness of those hospitals to pursue the journey towards becoming a paperless environment. Additionally, the research model used in the study indicated that the enablers for HIT usage are perceived usefulness and perceived ease of use. There may be other factors such as availability to technology, IT support, IT infrastructure and cultural backgrounds that could be enablers or inhibitors to HIT usage that can be the subject for future research. The study also used perceived threats as being an enabler of resistance to change. Future research should be also conducted on other enablers of resistance to change such as change management, fear of loss of control, power and status and the HIT users' psyche. The study has alluded to the fact that resistance to change is a major problem for any organization intending to perform an HIT implementation. Therefore understanding the contributing factors of resistance to change by nurses and then overcoming these factors are essential in contributing to a successful HIT implementation.

Conclusion

This study applied the TAM model with the framework for technology acceptance by nurses to study the preparedness of health care professionals to utilize a paperless environment. The findings of the study indicated that a positive perception pertaining to the ease of use and perceived usefulness of clinical applications in a paperless environment enables increased acceptance of HIT while a negative perception pertaining to the ease of use and perceived usefulness of clinical applications in a paperless environment positively influenced resistance to change. The study also illustrated that an enabler for resistance to change is if the technology is perceived to be a threat, however, other contributing factors to the resistance to change such as the fear of technological obsolescence, high cost of technology and lack of requisite knowledge which are primarily sociological, cultural and organizational factors, rather than technological factors were not taken into consideration. It therefore empirical to point out that the responsibility for providing an environment that encourages the adoption of IT by healthcare professionals in hospitals is not only limited to the IT engineers but should

also be extended to management to make sure the exiting work processes are aligned with the new HIT system.

The perceived usefulness of a HIT system is not only related to system compatibility, but also influenced by the trustworthiness of a system (Hung *et al*. 2014). The perceived usefulness of a system can be further enhanced by performing detailed tests on the actual system and ensuring that the system is compatible with the work requirements of the nurses. This would result in the output of the HIT system being trusted by the healthcare professionals. Finally, the model showed that related knowledge and compatibility of HIT by the nurses are positive enablers for the perceived usefulness and perceived ease of use of HIT.

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