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PHYSICIANS' AND NURSES' PERCEIVED THREATS TO-WARD HEALTH INFORMATION TECHNOLOGY: A MILITARY HOSPITAL CASE STUDY

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Abstract. The potential of Health Information Technology (HIT) to increase the quality of healthcare delivery is well documented but improvements can be hindered if physicians and nurses resist HIT. However, the technology is still facing resistance. The literature suggests that user resistance to HIT is predicated on their perception of its impact. However, we do not fully understand how users' perception is formed. In response, this study investigates the antecedents of perceived threats by examining the organisational factors, the personal traits of the user, HIT-related factors, and the factors related to the interaction between physicians and nurses and the organisation that lead to perceived threats. This study uses a case study of a military hospital to understand the antecedents of perceived threats and user resistance. The findings of the study indicate that dissatisfaction and risks are the main components of perceived threats of HIT for physicians and nurses. Furthermore, the study suggests that the antecedents of perceived threats are: system incompatibility, management support, related knowledge, and lack of trust. This research will contribute to identifying the core reasons for resistance and will lead to a better understanding of the phenomenon, hence, can help organisations solve the root causes of the problem.

Keywords: User resistance, Health information technology, Perceived threats.

1 Introduction

The potential of Health Information Technology (HIT), such as Electronic Health Records (EHR), to increase the quality of healthcare delivery is well documented [1]. However, even with the recognised benefits of HIT, the technology is still facing user resistance [2]. There are a number of examples of failed HIT implementation because of user resistance (c.f. [3,4]). Furthermore, various studies have shown that user resistance is a contributor to time and budget overruns [5]. Therefore, user resistance must be taken into consideration by organisations managers and IT project implementers [10]. Awareness about the factors that influence user resistance and recognising the behaviours of resistance will enable managers to better manage new IT projects [6]. It is envisioned that such understanding will improve the likelihood of

successful HIT implementation and continues use of the technology, thereby attaining the promised improvements in healthcare that HIT can provide.

User resistance literature indicates that resistance to HIT is predicated on users' negative perception of the technology [7,8,4,6]. However, very few studies have examined and explained how user perception is formed (e.g. [9]). Additionally, a number of re-searchers have highlighted the need for more studies that help our understanding of the issues that lead to negative user perception and user resistance [10,11,9]. To address this gap in literature, this study aims to investigate the conditions that lead physicians and nurses to perceive HIT as a threat, thus leading to user resistance. This research will take place in a military hospital, which could present unique opportunities to our understanding of user resistance due to several important factors, for example: (1) Studies have shown that physicians and nurses working in military hospitals have high professional autonomy and control over work practice [5]. The introduction of HIT is likely to reduce power and autonomy; hence, physicians and nurses might perceive HIT as a threat and opt to resist the system [12]. (2) The unique relationship between management who tend to be military personnel and between physicians and nurses who are mostly civilians [5], suggesting that managing change brought by HIT can be more challenging due to the different background between management and most of the users [13]. These factors will present an interesting dynamic and will provide new insights into our understanding of user resistance.

This study examines user resistance in the healthcare sector by examining the antecedents of perceived threats and it aims to answer the following research question: What are the organisational, personal, HIT, and the factors related to the interactions among physicians, nurses, and their organisations that lead physicians and nurses to perceive HIT as a threat? Thus, the study may help hospital managers to understand user resistance better and create the right policies and actions to mitigate resistance and increase the likelihood of HIT adoption. Healthcare cost is rising [14], and in many hospitals, IT investments represent a considerable percent of hospital's budget[14]. In light of this, understanding user resistance and the antecedents of user perception is crucial since resistance is a major cause of HIT implementation failure [2].

2 Literature review

User resistance has been the subject of much research, and in recent years IS researchers have developed various theoretical models that offer new insights and improve our understanding of user resistance. A number of these theoretical models consider the role of user perception to a new system implementation as the leading factor in user resistance, such as the role of perceived threat [7,8,15,16], perceived compatibility [7,17], perceived ease of use [7,9,17], and perceived dissatisfaction [4]. These theoretical models explain that users who believe that the system will negatively impact them, their work, or their status within the organisation will resist the new system [17,15,4]. However, few of the user resistance model explained how user perception is developed and how it affects user resistance. This study attempts to identify some of the factors that can influence perceived threats. The study will go further than existing user resistance research as it will explore the antecedents of user perception and will explain what influence user perception.

The perceived threats can be characterised as users' fear of HIT implementation because of expected negative consequences, such as fear of losing power, revenue, or control [7,11,18,8]. Some researchers have shown that perceived threat can cause emotional pain or perception of an unfavourable situation; thus, it can be deemed by the user as a reason for resisting IT implementation (e.g. [7,11,8,15]). Physicians and nurses are sensitive to the possible risk factors that HIT might cause, such as the fear that HIT will have negative effect on their job performance, or concern that system defects can endanger patients [8,6]. This study aims to examine how and why physicians and nurses may perceive HIT as a threat.

A review of user resistance literature indicates that four general factors can influence perceived threats and user resistance to technology, which are personal factors, organisational factors, system factors, and the interaction between the people, the system, and the organisation. First, the personal factors refer to internal and external factors of people, such as their personality traits, cognitive style, and the natural human tendency to resist change [3,16]. Personal traits suggest that an individual's perception of the technology can be influenced by specific characteristics such as gender, age, background, lack of confidence, and lack of IT skills [18,9]. Studies have found that the more familiar users are with HIT, the more likely that they will feel confident using the system, whereas, users who lacked IT skills are more likely to feel anxious about the new system and be unhappy in the workplace [11]. Consequently, it is likely that these users will resist the system [4]. Second, the organisational factors refer to factors related to the culture, structure, or management of the organisation [10,5]. Introduction of large IT projects such as HIT may lead to several organisational changes in terms of the general culture of the organisation, the job structure, and the work style of employees [3,17]. These changes require organisations to have the capacity to accept such changes [19]. The case reported by Lapointe and Rivard (2005) [8] shows that physicians and nurses tend to be sensitive about changes in the work environment.

Third, HIT-related factors refer to factors related to the system itself [20]. This can include the design of the interface, system reliability [20], the complexity of the system [18], the compatibility of the system with the existing work requirements [3,18]. Finally, the interaction factors refer to the interaction between characteristics related to the people, the organisation, and HIT [16]. It is expected that HIT implementation could change the dynamic of the organisation and lead to changes in the relationships between employees [17,16]. Typical interaction between people could affect how people perceive things; as an example, the IS literature has suggested that social influences such as the opinion of colleague and other IT users are a key predictor of user behaviour [21].

To summarise this section, user resistance literature suggests that perceived threats is influenced by personal factors, organisational factors, HIT-related factors, and factors related to the interactions among physicians, nurses, and their organisations. Section 5 identifies these factors.

3 Methods

A single exploratory case study approach was employed to meet the objective of this study - identifying and understanding the major factors that influence physician's and nurse's perceived threats of HIT. The case consists of a military hospital that has recently implemented and used HIT. The HIT is an Electronic Health Records (EHR) system that grants physicians and nurses access to patients' records. The system allows physicians and nurses to enter and retrieve data such as patient's treatment plans and medication. In addition, it allows physicians to request and obtain test results such as lab exams and X-rays. The research context and the case study will be presented in detail in section 3.3.

A qualitative research method was selected because it is well-suited to answer the research questions as it facilitates for the exploration of new ideas, capture of new phenomena, and rich contextualised details of complex concepts such as physicians' and nurses' resistance [22,23]. Furthermore, user resistance behaviour can range from cover to overt [8]. It is important for researchers and organisational managers to understand user resistance behaviour to effectively respond to user resistance. A nuanced qualitative approach is apt as it allows users to express their feelings without appearing obstructive to the organisation that was selected [23]. In addition, it will allow the researchers to better identify and understand user resistance behaviour. The study will take a post-implementation perspective (6-12 months after initial adoption). User resistance during pre-implementation and implementation phases is very high and well documented because of the widespread disruption to existing processes [3]. Furthermore, a dearth of research focuses on the post-implementation phase [24], and addressing this gap in existing research will allow us to examine the longer term and non-implementation related factors that could lead to user resistance and potential system abandonment [25]. Moreover, after their direct interaction and actual experience with the system, users will reevaluate their initial perception of the system [26], thus providing us with an opportunity to study the actual causes of user resistance.

Semi-structured interviews were conducted (May and June of 2018) with physicians and nurses in a military hospital. The interview captured socio-demographic information and was guided by the factors presented in the literature review. Open-ended questions were asked. These questions were developed from the factors discussed previously in the literature review section. The questions provided valuable insight into the participants' perception of HIT. The interviews were useful in allowing people to be free to describe their perceptions [27]. Therefore, effective in allowing the researcher to comprehend the perception of physicians and nurses' and the conditions that lead them to view HIT negatively. A snowball sampling strategy was used to identify subsequent respondents, where each initial respondent was asked to suggest other physicians and nurses working in the hospital. The respondents were physicians and nurses who are familiar with the hospital HIT and represented a subset of the hospital population. The data collection process ended at the point of redundancy. In total, 13 physicians and 15 nurses across four different departments were interviewed. The study received ethical approval from University College Cork Ethics Committee

For a comprehensive data analysis, the data were analysed based on the recommendations of Strauss and Corbin (1997) [28] - three coding procedures are used in the process of

analysing qualitative data, which are open coding, axial coding, and selective coding. This approach is considered appropriate for this research because it allows for flexibility and rigour [29]. Furthermore, it provides a structured approach for analysing the phenomenon of interest [30]. Each interview was transcribed and coded on a line by line basis using NVivo 9.0 to help in the analyses of the data and to identify themes for analysis. The codes were grouped together to form categories or themes through comparative analysis across interviews. Axial coding was then used to establish relationships between categories and themes. Finally, the selective coding was used to build a story through identification of core categories and the relationship between categories and explaining the categories that need further development and refining. Moreover, the researchers utilised a chain of evidence technique to group the quotations from each physician and nurses that participated in the study. By doing this, the researchers were able to present and support their findings with data from the interviews.

3.1 Case Background

The case study was conducted at a military hospital (a pseudonym), a large 500+ bed that provides primary to tertiary care to military personnel and their families. The majority of the physicians and nurses are civilians, whereby the majority of high-level managers are military personnel.

In 2008, hospital management decided to modernise the hospital by implementing HIT and established a new IT department to develop its new HIT in-house. The first module was launched in 2010 and was very simple, as the system only issued patient's ID and stored a scanned version of doctors' notes under the patients' name. Physicians and nurses sent their notes to a scanning department, in which the notes were scanned and uploaded to the system that allowed physicians and nurses to retrieve the scanned notes. However, the system faced technical problems and was slow. Physicians and nurses were dissatisfied with the system and complained, as they did not find the system useful and it did not end their reliance on paper.

The hospital and the IT department continued to update the system, adding new features to the system. In 2018, the hospital implemented the latest update to the system which allowed physicians and nurses to write clinical notes and diagnoses in the system. Currently, the system is an automated workflow system that allowed physicians to enter, track, and retrieve notes and orders in the system: this included laboratory, X-rays, and pharmaceutical orders. The system represented a significant change from the first version of the system that was introduced in 2010. At one point, the system allowed physicians and nurses to remotely access the system which allowed them to access patient's information from home. However, this feature was later removed because of security breaches. Later, the hospital only allowed consultants to have remote access to the system.

4 Results

The results show that signs of resistance exist towards HIT among physicians and nurses in the military hospital. Various forms of resistance behaviour emerged during interviews,

such as sarcasm and scepticism of the usefulness of the system, compatibility with working style, and safety of the system. This scepticism can be considered as a negative behaviour and an overt form of resistance as some users were uncooperative and forcefully complained about the system [8]. Furthermore, this scepticism led some physicians and nurses to complain about HIT during department meetings. Then again, it was not easy to identify perceived threats because users often communicated indirectly during the interviews, such as by using humour or referencing others to describe the dissatisfaction with the system. However, the results of the study indicates that perceived dissatisfaction and perceived risk are the main perceived threats to HIT, and four core categories emerged, which are considered to be antecedents to perceived dissatisfaction and perceived risk: 1) Related knowledge; 2) Management support; 3) System incompatibility; 4) Trust; The findings are subsequently presented in more detail and with empirical chains of evidence.

4.1 Personal Factors: Related Knowledge

The findings show that related knowledge of physicians and nurses influence perceived dissatisfaction, Related knowledge, in this study, refers to previous user experience with HIT and understanding of HIT concepts. Physicians and nurses who are more familiar with HIT systems such as (EHR) felt more confident and comfortable using the system. One nurse said:

“In my previous work, we had a system similar to the one we have here {in this hospital}, so, for me, it was easy to learn how to use the system. I am happy that we have this system in the hospital.” (Nurse 6)

Some physicians and nurses who have not used HIT before or who have insufficient computer knowledge and skill were dissatisfied with the system.

“Whatever you do, some people will never change. Maybe, they are not quite familiar with the computer; they haven’t used it enough.” (Physician 2)

In this instance, the lack of related knowledge of HIT led physicians and nurses to perceive it negatively.

4.2 Organisational Factors: Management support

Management support, in this study, refers to the extent at which managers are willing to provide the necessary resources and authority or power that are important for a successful HIT implementation such as motivation and training. The results show that there is a link between lack of management support and physicians and nurses’ perceived dissatisfaction. In a large IT project such as HIT, managers play a vital role in the successful development and implementation of HIT. However, in this case study, physicians and nurses felt that managers were not supportive and did not prepare them for HIT.

“We are extremely busy. I needed some time to learn how to use it and I had to stay for extra hours to teach myself. They should have given us {physicians} time to adjust and not put us under pressure to start using it almost immediately.” (Physician 7)

The lack of support shown by the management caused physicians and nurses to be dissatisfied with the system, as they felt they did not have sufficient training, did not have

enough time to learn and adjust to the system, and there was a lack of open and honest communication; as one nurse explained:

“It will also be good if they tell us about any new changes and explain to us why they made those changes and how the changes will help us.” (Nurse 2)

This Lack of support shown by managers in the organisation lead physicians and nurses to have a feeling of irritation and frustration with HIT.

4.3 HIT Related Factors: System Incompatibility

System Incompatibility, in this study, refers to users belief that HIT does not fit with their work style, needs, and work environment. Some physicians and nurses felt that the HIT was not compatible with their work style, needs, or work environment. The findings revealed that system incompatibility is the leading HIT-related factor which influences perceive dissatisfaction. Hospitals have a large number of departments, and every department requires a specific feature in the system. For example, a physician explained:

“The neurology department might need a whole body where he can make points indicating the weakness, etc. So, every department has its requirements. For example, the Otorhinolaryngology department might need an image of the nose, the throat, etc. These are requirements that you need in the clinic. The Dermatology {Department} needs, for instance, specific images.” (Physician 4)

The system was the same for all the departments. Hence, physicians and nurses working in departments with special requirements found the system to be limited and does not meet their needs. One nurse stressed this problem by saying:

“We have other papers that we fill. For every patient, there are 21 pages just for anaesthesia that we have to fill manually because it is not in the system.” (Nurse 2)

In addition, some physicians and nurses felt that HIT affected their relationship with patients because it reduced the eye-to-eye contact with the patients.

“I’ve noticed that it {the system} affects communication with the patient; my eyes are focused on the device. The patient is talking and, although physically with him, he feels that I am not with him because I’m looking at the device – as I can’t type without looking. So, in order to save time, I sacrifice the patient’s well-being.” (Physician 8)

“When you type like that {looking at the computer} and you just listen to what they say, you’re not interacting eye-to-eye.” (Nurse 11)

These issues caused physicians and nurses to be dissatisfied with the system as they have to work around the limitation of the system to perform their job correctly. Physicians and nurses thought the system was incompatible with their work as it did not have the charts, the forms, or the pictures they need to perform their job, and it had a negative impact on their relationship with their patients; as a result, they were dissatisfied with the system.

4.4 Interaction Factors: Lack of Trust

In this study, trust is referred to as physicians' and nurses' confidence in HIT and the organisation decisions. In this case, trust is strongly linked with perceived risk. The data analysis indicates that physicians and nurses did not have the complete trust of the

organisation and management ability to develop and implement a quality HIT, which influenced their perception of HIT. The lack of trust could be because of the earlier version of the implemented HIT, which some physicians and nurses considered to be a failure and thus lead to a lack of trust. A physician express his feeling by declaring:

“I cannot blindly trust the system. For example, if patients result show that he is improving and the previous visits show the same, but the system gave the visits before that when they were sick. So, of course, these things influence my decision.” (Physician 10)

As outlined in the aforementioned quotes, the failure of the system to show recent visits lead users to distrust the system, feel uncertain of new changes and resist new system updates because they felt that the organisation is unable to implement complex systems, and system failure could lead them to make a wrong decision.

4.5 Perceived Threats: Perceived Dissatisfaction

Perceived dissatisfaction, in the content of this study, refers to the frustration and irritation caused by HIT. Physicians and nurses were not happy with the system and felt that it was a source of irritation and displeasure. Data analysis reveals that physicians and nurses perceived dissatisfaction of HIT directly influences user resistance. Many of the physicians and nurses felt that HIT was causing them frustration and irritation and displeasure; thus, they were showing signs of resistance. This is exemplified in the following comments:

“The problem it has is that it did not end our reliance on paper documents and files. Sometimes we have to go back to paper note to review a patient file. We have to write a paper note on a daily basis.” (Physician 4)

Physicians and nurses must search both paper notes and notes on HIT to acquire complete information about their patients. This duality is compounded by the workload necessary to transcribe manual notes into the HIT.

“Because everyone knows the load of work among nurses, honestly. The nurse in inpatient... imagine she’s taking care of 6 patients and she has to leave patients to write all these 100 papers in the system.” (Nurse 2)

After the last version of the system was introduced, management issued a mandate requiring all employees to use the system. The order was not received positively among physicians and nurses and generated strong reactions. It was common for physicians and nurses, during department meetings and training sessions, to complain about the system and point in an objective manner any minor flaws in the system. Overall, most physicians and nurses reluctantly used the system after the mandate. However, the system used is not optimal, and considerable resentment and dissatisfaction persisted.

4.6 Perceived Threats: Perceived Risk

Perceived risk, in the context of this study, refers to physicians' and nurses' fear of the risk factor they associated with HIT, such as a fear that will pose risks to patients, loss of privacy, and reduce their work efficiency. Perceived risk can be considered as an element of perceived threats and it is directly linked with user resistance. Physicians and nurses are sensitive to the risk factors that HIT might cause because of the sensitive work environment that requires them to deal with people's lives . Such a risk could be the fear or belief that

HIT will harm their job performance. Also, physicians and nurses fear unauthorised use of their account in HIT. One physician said,

“They had to dismiss a physician and a pharmacist because of this issue; the doctor said that someone used his account and that it wasn’t him who made the order, whereas the pharmacist claimed that he has received the order from that person and that he carried up.” (Physician 9)

In the example above, both the physician and the pharmacist lost their job because of unauthorised use of HIT. According to one physician, sometimes physicians and nurses share their passwords with each other to speed up the work process, such as ordering medical exams, and this could lead to unauthorised use of HIT. Moreover, physicians and nurses felt the system does not protect the privacy of the patient.

“Honestly... look, any patients file can be reached, and their privacy violated.” (Physician 12)

These factors lead physicians and nurses to perceive the system as a threat and a risk, consequently, leading to resistance.

5 Discussion and Conclusions

The purpose of this study was to investigate the circumstances that lead physicians and nurses to perceive HIT as a threat. To this end, a case study of a military hospital that uses HIT is presented. This study provides insights into how physicians and nurses may perceive a new HIT implementation negatively. Second, the study investigates the role of the organisation, personal user traits, and HIT on physicians and nurses’ perception of HIT. While previous research showed the effect of user perception on user resistance to HIT (e.g. [7,9,12]) this study went further to investigate the antecedents of perceived threats. The main findings of the study explain that perceived dissatisfaction and perceived risks of HIT are the main perceived threats for physicians and nurses. Furthermore, four factors that influence perceived dissatisfaction and perceived risks are identified: related knowledge, management support, system incompatibility, and lack of trust. The study explained how these factors could influence physicians and nurses perception of HIT.

The results of this research indicate that trust influences perceived risk, which influences user resistance. Some physicians and nurses expressed their concerns regarding inaccurate results in HIT, as well as privacy issues with HIT. This lack of trust expressed by physicians and nurses could be because of an internal organisation which could be due to the different background between hospital managers who have mostly military background and between employees who are mostly civilians. One way to increase physicians and nurses' trust in HIT is by providing management support. In large IT projects such as HIT, managers are responsible for supporting and ensuring a successful implementation by providing the required training to use the new system , and by allowing HIT users sufficient time to familiarise themselves with the functionality of the new system .

Many physicians and nurses felt that HIT was incompatible with their work. Most of the work that is done in hospitals follow routinised paths [31]. The introduction of HIT to physicians and nurses’ work will influenced their practices and disrupted their work routines. The military hospital decided to develop and implement HIT in-house, which had

some advantages and disadvantages. One of the advantages was that the system was very simple, and most physicians and nurses were happy that the system was easy to use. Nevertheless, due to lack of experience in HIT development, many felt that HIT was incompatible with their work requirements and was, therefore, dissatisfied with HIT, as it did not end their reliance on papers to complete the work requirements. Managers and HIT developer should seek to develop HIT that's customisable and compatible with physicians' and nurse's needs. Furthermore, they should consider how HIT can affect the relationship between physicians, nurses, and their patients. HIT reduces eye-to-eye contact between physicians, nurses, and their patients because physicians and nurses turn to face the computer to write their notes or order exams and medications, rather than facing the patient.

The results of this study differ from other researchers that suggested that HIT implementation could lead physicians and nurses to perceive loss of autonomy [32], loss of power [3,8], and loss of control [8]. This could be due to the unique characteristics of a military hospital that inherited some military culture. In general, military organisations are bureaucratic, hierarchical, and meritocratic [33]. Thus, it is less likely that physicians and nurses will have significant autonomy, power, and control even before system implementation. Most of the physicians and nurses interviewed in this case were civilians but have been working in the hospital for many years, hence, it is possible that they have conformed to the bureaucratic and hierarchical culture of a military organisation. Therefore, the fear of loss of autonomy, loss of power, and loss of control was not a factor of user resistance in this case study.

5.1 Implications

This study extends the scope of existing user resistance literature (e.g., [7-9,15,6]) by investigating the antecedents of perceived threats. Little research has been done to examine the antecedents of user perception. This research provides the foundation and highlights the need to further examine the core reasons of user perceptions that lead to user resistance, especially in healthcare settings. For practitioners, this study provides a better understanding of user resistance and user perception in the healthcare sectors. This understanding will help hospital managers responsible for developing and implementing HIT to design resistance mitigation plans. Such plans should consider perceived dissatisfaction and perceived risks as a cause of user resistance; hence, it could be a cause of failure to HIT implementation. First, managers should develop HIT that is compatible with physicians' and nurses' needs while considering that each department in the hospital could have different needs. Second, managers should provide the required support to physicians and nurses to help them adapt HIT, such as providing training and quickly resolving any HIT problem. Third, trust is a crucial factor in determining the usage of HIT. Therefore, managers should seek to develop trust between physicians and nurses and HIT. Such a belief will reduce the adverse effects of perceived risk, dissatisfaction, and user resistance behaviours. It is envisioned that explicit attention paid to the factors presented in this study will reduce HIT resistance among physicians and nurses.

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