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CHALLENGES IN THE IMPLEMENTATION OF HOSPITAL INFORMATION SYSTEMS IN MALAYSIAN PUBLIC HOSPITALS

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ABSTRACT. Hospital Information System plays a significant role in supporting healthcare organization to improve their clinical processes, control cost and respond to the demand for quality care. Despite its importance, the level of implementation of such system in Malaysian public hospitals is still very low due to various issues. This papers reveals the findings from a study at four hospitals in the Northern Region of Malaysia. Data were collected from series of in-depth interviews involving eleven key personnel of the selected hospitals, and were analyzed using interpretive analysis approach. The analysis revealed four categories of challenges which are associated to human, technology and infrastructure, software limitation and support.

Keywords: Hospital Information System, IS project, IS implementation, IS success factor, IS failure factor

INTRODUCTION

Introducing a new information system (IS) into organization normally involves changes in policies, procedures, processes, infrastructure and also the way of doing job. These changes involve people, technology and processes which appear at various level of people within the organization including the top management, middle managers and other employees. Despite this fact, organizations are always looking for information technology (IT) in general, or IS in particular, as an enabler for them to improve their services and products. The use of IS in healthcare environment helps healthcare organizations to improve clinical processes, control cost and respond to the demand for quality care through systems such as clinical decision support, physician order entry, computerized surveillance and patient safety. These so-called Hospital Information System (HIS) have transformed the management of administrative, financial and clinical aspects of a hospital.

It is important that hospitals adopt HIS to improve their operations and services. However, only 15.2 percent of Malaysian public hospitals implemented the systems through total, intermediate or basic HIS (Ismail, Abdullah & Shamsuddin, 2015). Few hospitals adopted various types of HIS applications including Patient Management System, Pharmacy Information System (PIS), Radiology Information System (RIS), Picture Archiving and Communication System (PACS) and Clinical Access Information System. These systems are not only used to manage information efficiently and quickly. They are also used to provide a better access to the information, e.g. the patient's medical history. This is very helpful to healthcare

providers in making any decision, particularly in a critical situation where only small margin of errors is allowed.

Despite the significance of HIS in enabling a better quality health services, there always a risk that such HIS project would fail. Failure of IS projects is a worldwide issue. It happens at any stage in software development life cycle (SDLC); each is due to different reasons. The trend of software project for the last five years shows almost the same pattern, i.e. between 27 to 31 percent successful, 49 to 56 percent challenged and 17 to 22 percent failed (Standish, 2015). According to Bloch, Blumberg and Laartz (2012), 66 percent of the software projects faced with cost overrun, 33 percent faced schedule overrun, while 17 percent faced benefit shortfall.

RELATED WORK

The success and failure of IS implementation are extensively discussed in Kotter (1996) and Collins and Bicknell (1998). Listed in Kotter's are key factors leading to successful implementation which include sense of urgency, powerful coalition, creating and communicating the vision, empowering others, planning for short-term wins, consolidating improvements and institutionalizing new approaches. In contrast to Kotter's, Collin and Bicknell's focused on failures; over ambition, complacency, over reliance on IT professionals and consultants, undue confidence and trust in costly custom build software are the key factors. Previous studies conducted on Malaysia government agencies revealed that IS projects in these agencies are suffering from failure issues (Bindakheel & Rosnah, 2010; Handayani, Abdullah, Abdulgani, & Ahmad Dahlan, 2010; Maarop, 2011; Sutan Ahmad Nawi, Abd. Rahman, & Ibrahim, 2012; Ghanim, Munassar, & Ahmad Dahalan, 2013). A system might have been developed according to stakeholders' requirements within a specific scope, budget and time, yet there is no guarantee that it will be implemented successfully. IS implementation deals much with user attitude and acceptance and therefore requires careful implementation plan. Resistance to change is one of the common issues, as found in (Munassar, Ghanim, & Ahmad Dahlan, 2013; Bourda, 2013; Sutan Ahmad Nawi et al., 2012; Carpenter, Bauer, & Erdogan, 2012; Kornkaew, 2012; Levasseur, 2010; Al-Ahmad et al., 2009; Heeks, 2002). Adding to resistance to change are factors associated to project management, top management, organizational, complexity or size of project, as well as technology and process (Sutan Ahmad Nawi, Abd. Rahman & Ibrahim, 2012). Similar factors affecting user acceptance are also found in (Patanakul, 2014; Almajed & Mayhew, 2014; Huang, 2015; Ziemba & Oblak 2015).

Sustainability is found to be another issue in IS implementation. After a significant period of installation, there were cases where the system found not to be fully utilized. Examples are HIS named Teleconsultation (Maarop, 2011) and several HIS in University of Malaya Medical Centre (UMMC). Most of the processes at UMMC are automated, however, important application such as EMR has not been implemented (Bindakheel & Rosnah, 2010). Further reported in the literature are issues such as follows: sensitivity of healthcare environment (Abouzahra, 2011); lack of technical support (Bindakheel & Rosnah, 2010); lack of training (Bindakheel & Rosnah, 2010; Sood et al., 2008); high initial cost (Boonstra & Broekhuis, 2010); high initial physician time (Miller & Sim, 2004); technology and technical matters (Boonstra & Broekhuis, 2010); fundamental problems such as lack of computer skills, complex tasks, complex functions (Littlejohns et al., 2003); ethical issues such as certification, security, privacy and confidentiality (Littlejohns et al., 2003).

METHODOLOGY

Four government hospitals in Northern Region of Malaysia were selected to be involved in this study. These are Hospital Tuanku Fauziah (HTF) in Perlis, Hospital Pulau Pinang (HPP) in Penang, Hospital Sultanah Bahiyah (HSB) and Hospital Kulim (HKulim), both are in Kedah. HSB is classified as IT enabled hospital and is one of the hospitals chosen for Total Hospital Information System (THIS) project. The other 3 hospitals are non-IT enabled hospitals but use specific types of HIS to support some aspects of their operation.

A series of in-depth face-to-face interview with individuals representing the top management, IT practitioners and users from the hospitals were conducted to elicit their view of the HIS projects implementation. The selected individuals have served the hospital for more than five years. At the end of the interview session, respondents were given a survey questionnaire to be completed. The constructs employed in the questionnaire were gathered through extensive literature review.

Data collection was conducted from June to August 2016. A total of eleven respondents were interviewed. The recorded interviews were transcribed and analysed using interpretive analysis approach in order to identify factors that created challenge to HIS projects implementation in government hospitals in the Northern Region of Malaysia. Convenience sampling was used in selecting the samples because researcher has working experience in government hospitals, involved with IS implementation and has good contact with personnel in other hospitals.

This study also proposed a prevention model for HIS projects implementation failure, however, discussion on the model is beyond the scope of this paper.

FINDINGS AND DISCUSSION

The four hospitals in this study use different types of HIS. The system being used by HSB covers a broad scope as it is not only managing patient records, but also integrated with Laboratory Information System (LIS) and other systems used by Radiology Department. Its scope covers all disciplines in the hospital. HTF has been using Tele-primary Care (TPC) since 2008. HPP uses *Sistem Pengurusan Pesakit Dalam (SPPD)* while HKulim uses an Electronic Health Information System (eHIS). Only the total HIS used in HSB holds a smooth implementation since it was introduced in 2007. The other systems suffer from partial failure, i.e. not being fully utilized by their intended users. The TPC is being utilized by a small group of users as the system is not integrated with the other systems such as LIS and financial system. During the early years of its implementation, TPC is used by ENT specialist clinic, medical department, Radiology department and some wards. Other departments such as Obstetrics & Gynecology, Orthopedic and Surgical department did not use it. Since early 2016, ENT specialist clinic no longer use TPC in their operation. The SPPD which is being used by HPP to manage in-patient records is only used by certain wards. The system offers several benefits such as it can be for registration of in-patients, and doctors or nurses can also use it to enter their treatment records. Besides, it also enables nurses to order patient's diet to the Dietetics and Food Services Department through its Diet Order module. At the Revenue Collection Counter, the system is used to collect hospital bill payment. The Diet Order module has finally been abandoned. The eHIS covers both in-patient and out-patient records. The system is used at every specialist clinic within HKulim including the Emergency Department to register patients. Doctors use it to enter patient's treatment information. Similar to SPPD, eHIS is also used by the Revenue Collection counter to collect hospital bill payment. One major drawback of this system is it is not integrated with other systems in the hospital.

It is learned from the interviews that government hospitals only concentrate on user training, then directly followed by the implementation of HIS. No emphasis had been given on the team preparation and ongoing monitoring process. User resistance is only realized during the implementation where it is too late to change users' negative mindset and perception towards HIS. It is also learned that resistance occurs due to numerous reasons such as lack of understanding about the IS, the need for the IS implementation and the impact of the IS to them and organization as a whole. In the case of Pharmacy Information System (PHIS), failure of the system to reduce waiting time has caused pharmacist to go for manual process. The feedback received from HKulim emphasis on the role of managers in ensuring HIS is fully utilized as the challenges in implementing HIS is mostly related to lack of invisible support and monitoring from the middle managers and top management.

Analysis of the data collected from this study revealed various challenges in HIS implementation. The challenges were then categorized into four main factors, i.e. human issues; technology and infrastructure issues; software limitations; and support issues, as illustrated in Figure 1.

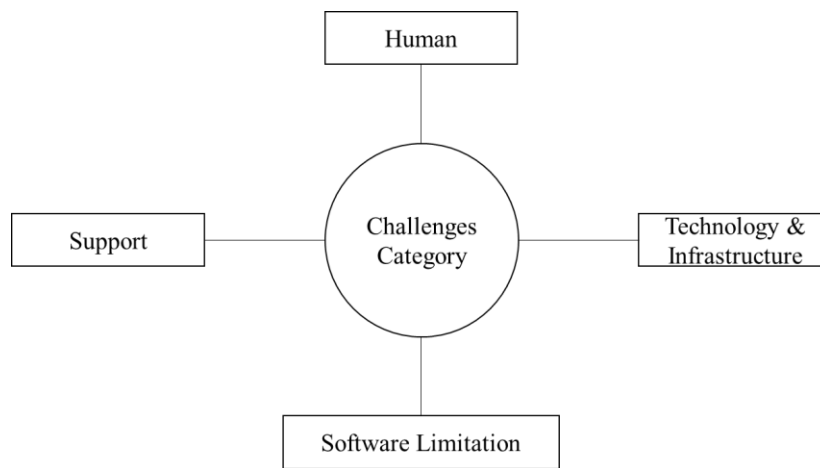


Figure 1. Four Main Categories of Challenges in HIS Implementation

Human Issues

Human issues involve several groups of practitioners such as doctors, nurses, medical assistants, pharmacists, radiologists, scientists, dieticians, as well as the clerks who did the registration at the counter. Fourteen sub-issues that impede them from successfully implementing HIS were identified, as listed in Table 1.

Table 1. Challenges Related to Human

1	Workload	8	Impression
2	Readiness	9	Initiative
3	Priority	10	Understanding
4	Skill	11	Commitment
5	Mentality	12	Awareness

6	Preference	13	Self-interest
7	Attitude	14	User dependency

Only readiness issue is faced by one hospital, i.e. HSB. The other issues are faced by at least two or more hospitals. All hospitals are facing at least half of these issues. Some users are found not ready to change from the existing system, have little knowledge about HIS and its benefits and not interested to utilize the system. Heavy workloads always being their reason as the priority is given to their core duty to treat the patients. The attitude “let the juniors do” among the seniors also affected the success of HIS implementation because each level of staff has different task or role to be carried out. Some have a mindset that the implementation of HIS is a burden to them.

Technology and Infrastructure Issue

Issues such as compatibility, readiness, availability and network stability were issues raised by the respondents during the interviews. All four hospitals are having problems in terms of the availability of the appropriate infrastructure to operate the HIS. In some cases the hardware supplied to these hospitals suffer from compatibility issue. For example, the HIS which has been used since early 2000s cannot be operated on the new Windows 10 computers. Furthermore, all HIS used in these hospitals are either running on web platform or client-server based. Thus, its operation is highly dependent on the stability of the network in the hospital.

Software Limitation Issue

Some HIS being installed at these hospitals have limitations such as compatible with limited type of browser, or not compatible to be integrated with other systems in the hospital. Thus, practitioners felt reluctant to use the HIS since they failed to see the impact and efficiency of the system as patient’s data is unable to be shared between related systems. Twelve sub-issues related to software limitation were identified and listed in Table 2.

Table 2. Software Limitation Issues

1	System’s complexity	7	System ownership
2	Compatibility	8	Data sharing
3	Wrong workflow	9	Efficiency
4	Suitability	10	Reliability
5	System integration	11	System’s limitation (e.g. not editable)
6	Redundancy	12	No replication

It is learned that HTF and HPP suffers from more than half of these issues while HSB only suffer from redundancy issue. Some users felt that the HIS is too complex and it takes a long time to adapt which resulted from improper training. This problem is faced by two hospitals. System ownership is another issue that should not be omitted because it led to data sharing issue. Clear understanding of who is the owner of the system is very important because some department claimed that the system is theirs and they are not willing to share the

data due to confidentiality of the data. Only the workflows applied in the system are in respect to the respective department. For example, Pharmacy Department hold the workflows related to the processes in pharmacy, while Nursing Unit hold the workflows of the processes in wards. There is one system which was developed based on the requirements of the other hospital. Thus, users argued its suitability to be implemented in their hospital, as some of the workflows were incorrect. In order to fulfil the implementation needs, they need to change the way they work. Redundancy issue created a conflict among users as they have to use different systems with similar functions. This added more burden to their workload and found to have affected their utilization of the HIS.

Support Issue

Six issues related to support that have been discovered from this study are financial, technical, moral, peer influence, enforcement and monitoring. All four hospitals are having financial constraint and lack of support in terms of enforcement. HTF, HPP and HKulim suffer from 5 out of those 6 issues. HTF and HPP need more moral support, not only from their top management but also from the middle managers such as the head of department/unit and their immediate supervisor as this might boost their desire to get involve and support the implementation.. Staffs at HPP and HKulim do not have peers who can spark their interest to utilize HIS while in HTF, only one doctor and person at the registration counter utilized the HIS as its use is not made mandatory by the Head of Department. It is found that failure of some HIS implementation at HTF, HSB and HKulim is also due to lack of monitoring. The progress of the implementation is not monitored accordingly to solve issue or remove obstacles that block the implementation.

CONCLUSION

The challenges revealed from this study indicate the complexity of HIS implementation process. These challenges need to be studied and HIS implementation model or failure prevention model has to be developed. Future work of this study focuses on the development of IS prevention model based on the four categories of issues being discussed in this paper and the existing issues being identified from the literature.

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