

Implementation of Total Hospital Information System (THIS) In Malaysian Public Hospitals: Challenges and Future Prospects

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ABSTRACT

Total Hospital Information System (THIS) is a project by the Ministry of Health (MOH) of Malaysia that provide a complete and comprehensive Hospital Information System (HIS) by establishing integrated electronic information handling and processing in a hospital by means of Information and Communications Technology (ICT). Implementation of such rigorous system in a complex organization such as health services involves many challenges, and if they are not tackled appropriately, the system may fail and reject by the user. This paper analyzed and discussed on a few major challenges faced by the MOH on their implementation of THIS at 13 government hospitals nationwide. The challenges include digital gap, knowledge and skills, system quality, redundancy and data abundance. Initiatives taken to address the challenges were explained and some suggestions were also introduced. Furthermore, the article look into the future prospective of the system, on how the system could benefit further which eventually may go beyond its initial objective.

Author keywords: Hospital Information System, Computer applications, Information & Communications Technology

Introduction

Information technology (IT) has been identified as one of the major trends in shaping change in organizations. IT creates the term borderless world, in which the cyber world does not define geographical boundaries to organizations in doing business. Organizations equipped with IT knowledge and technology is perceived to have the advantage to compete in the globalization era. In Malaysia, investing in IT or a more frequently used term, ICT (Information and Communication Technology) has been the national agenda since year 1996. The government introduced the Multimedia Super Corridor (MSC) with the main aim is to transform the nation into a knowledge based society driven by the new economy through ICT via industry and capacity building and socio economic development (Ramasamy, Chakrabarty & Cheah, 2004). To accelerate the objectives of the MSC, a path has already been defined through several innovative Flagship Applications. These applications are engineered to start the MSC initiative and create a multimedia heaven for innovative producers and users of multimedia technology. The flagships are Electronic Government (E-government), MyCard, Telehealth, Smartschool, R&D Cluster, E-Business & Technopreneurs Development.

E-government is one of the initiatives by the government to jumpstart the implementation of MSC. The objective of E-government is to promote implementation of electronic information system by the government agencies in providing services within government agencies and to the public. It will improve how the government operates internally, as well as how it delivers services to the people of

Malaysia. Furthermore, seeks to improve the convenience, accessibility and quality of interactions with citizens and businesses. At the same time, it will improve information flows and processes within government to improve the speed and quality of policy development, coordination and enforcement. E-government initiatives range from providing state of the art ICT infrastructure to simple ICT applications that automate traditional manual work processes. There are many effective and established applications that have given big impact to the efficiency and quality of government services namely the Total Hospital Information System (THIS), e-Filing, e-Perolehan and Human Resource Management Information System (HRMIS).

This paper will discuss on the implementation of THIS by looking at the perspective of the challenges on the implementation of the system as well as its future perspective.

Total Hospital Information System

The Total Hospital Information System (THIS) is a project by Ministry of Health (MOH) with the objective to provide a complete ICT system in establishing a paper-less hospital environment in order to offer quality health services to the public. The term THIS comes from the industry's term - Hospital Information System (HIS). According to Borzekowski (2009) HIS is a technology that improve gathering, storage, transmission, and processing of information that would be a useful tool in hospital management. Giuse and Kuhn (2003) defined HIS as collection of hardware, software, procedures, and policies that would handle all aspects of information processing for a large health care organization. Hospitals in the U.S. began to adopt a variety of information technologies as early as 1960s with the goal of improving quality and operations, and reducing costs. From the eight year data analysis from 1987 until 1994, nearly 3000 U.S. hospitals with more than 100 beds have adopted HIS (Borzekowski, 2009). The number of hospital increases every year not only in the U.S. but also worldwide.

In Malaysia, MOH defined THIS as a system with an integration of clinical, administrative and financial systems. The clinical is made up of Hospital Information System (HIS) and Picture Archiving Communication System (PACS). The HIS is made up of various applications (Person Management, Scheduling, Order Management, Clinical Documentation, Pharmacy Information System, Laboratory Information System, Radiology Information System, and so on). The Administration & Finance system as back end is integrated with the HIS so that any chargeable procedures or tests performed on the patients will automatically trigger the generation of the bills. With PACS, the system is also interfaced with the various x-ray machines. The word "Total" that precedes the term HIS is to signify a complete and comprehensive system. THIS includes every transaction required for a patient to receive health services, ranges from patient registration, prescription collection, and ward admission to appointment follow-ups as well as internal administration process among health personnel. Health records were recorded electronically and tracking of information and equipments is through barcodes identifications and patients ID numbers. Before THIS was introduced, the processes in the hospital were manual transactions using oral and written interactions among health personnel. Records were stored in hardcopy forms and filed in a manual coded filing system. Although there were some prior initiatives to automate some of the processes using ICT, they were not comprehensive and usually are departmentalized and not integrated.

In year 2001 MOH claimed Hospital Selayang as the first in the world that provide comprehensive ICT paper-less system with THIS (Ministry of Health, 2009). Although the system used in Selayang Hospital was adopted and adapted from the system provider in the United States, implementation of the system as comprehensive as at the Selayang Hospital has never been done before in the US. This is due to the complex nature of the health services system in the US where the facilities in a hospital

are owned by different private entities that restrained a simple implementation of a THIS. Hence, to have one integrated system for the whole health services in a hospital in the US is highly complicated which requires extensive planning and integration. Implementation of such system in Malaysian government hospital is a lot simpler because the whole organization is owned by one entity – the government of Malaysia. The success of the THIS project at Hospital Selayang has led to further expansion of the project to 13 more new hospitals throughout Malaysia in year 2002. The projects were divided into three categories based on the size and the nature of the services provided by the hospitals. The categories were identified as Total Hospital Information System (THIS), Intermediate Hospital Information System (IHIS) and Basic Hospital Information System (BHIS). The term Total, Intermediate and Basic that precedes HIS was introduced to define the complexity and comprehensiveness of the system for the hospitals. However, the selection of the hospitals is more often based on the size of the hospital and the number of bed. The 13 hospitals were identified and the projects were completed in 2006. (Ministry of Health, 2009)

The deployment of THIS is to aim for significant transformation of many aspects of the traditional hospital work activities. The application of THIS however is complex and has brought new issues and challenges in the context of hospital work environment. Berg (2001) suggested that implementation of hospital information system has brought a new perspective in ICT applications development. He added that the complex nature of a hospital organization creates bigger challenge in the implementation compare to other organizations. Furthermore, being an organization that deals with human health and life add to more vulnerability of the ICT application implementation.

CHALLENGES

Challenges highlighted by the previous studies

ICT has proven in providing benefits to organization development in terms of its improvement on organizational efficiency, quality of services, productivity and accessibility to information. According to Borzekowski (2009) hospitals are highly information intensive organizations which spend substantial sums on information management and processing. A study by Woolhandler and Himmelstein (1997) indicated that administrative and coordination costs at U.S hospitals in 1994 averaged at 26% and over 30% at for-profit hospitals. A much earlier study, specifically focused on the costs of information handling in hospitals, found these costs to range from 22% to 25% of total hospital costs.

There are studies that explored on the implementation models and approaches, success factors and challenges of HIS implementation. The findings are important as reference for HIS project implementers to ensure the investments on the system are worthwhile. Berg (2001) identifies several challenges in information system implementation in health care organizations. According to him implementation of HIS requires dealing with challenges such as information ethics, data threats and organizational culture. Information ethics refers to the extent of control of the confidentiality of the patients' data. Data threats is the extent of by both accidental events and deliberate actions threats, which can severely damage health information systems' reliability and consequently discourage professionals of future use. Organizational that is risk adverse, reluctance to invest much in IT and resistance to change are some examples of the challenges on the organizational culture.

Challenges in Malaysia

In Malaysia, the capital cost in equipping a hospital with THIS ranges from 80 to 100 million Malaysian Ringgit which constitutes almost 40% of the total development cost of a 800-1000 beds hospital. On overall, the government has spent more than 600 million Ringgit for the project and that does not include operation and maintenance cost of the system. The investment on THIS is significantly high and any failure on the project will be huge loss to the government. During the implementation of the project, there are several challenges have been identified if they were not addressed appropriately; they may contribute to the failure of the project. The challenges include culture, knowledge and skills, system quality, redundancy and data abundance.

Culture

Culture has always been the main obstacles in IT application implementation (Haux, 2006). Culture and process changes are reported to be the barriers to the wider use of health care systems. Culture has always been referred to resistance to change either by the people of the the organization as a whole. Several studies have identified a number of barriers to health personnel use of HIS including low level of expertise, lack of acceptance and alteration of traditional workflow patterns. The digital gap between the young and the old generation is one of the main factors that contribute to the lack of acceptance of the technology among the old generation health personnel in a hospital. To the young, technology has been part of their life and they always perceive technology as a friendly tool. However, to the older generation, leaping from their daily routine that deals with traditional manual hardcopy forms of documents to electronic and softcopy forms is a huge transition. The consequences from this situation are low motivation and retraction in accepting change among the old generation and experienced health personnel. Although every implementation of HIS includes intensive training and continuous business process re-engineering (BPR) sessions to the users, these efforts alone may not solve this issue. Training setup does not really reflect the real environment setup. The user may accept the system during training session, but in real environment which involves other external factors, the system may be perceived as a burden to the health personnel. In year 2006, MOH introduced a so-called Buddy System that coupled young generation nurses with old generation and experienced nurses in their work routine that involve the use of THIS. The objective of this system is to create knowledge sharing culture among two generation of nurses and use its advantages in facilitating acceptance of THIS among users. The buddy system promotes the young generation to share their technological knowledge and skills, while the old generation to share their working experience.

The buddy system is a sound approach that has given significant effect on the acceptance level of the older generation personnel to the technology. However, there were cases of total rejection of the technology which led to the young generation to take over the whole use of the system. There were complaints by young nurses in the buddy system that they were dictated by the older generation nurses to do data entry work while the latter continues with their traditional nurses work.

Knowledge and Skills

Chen, Miller, Jiang and Klein (2005) regard resistance as an important factor of system success. Resistance may be contributed by the complexity and lack of user friendly aspect of the system or due to the lack of knowledge and skill of the users. Knowledge in this aspect is concerned with computer literacy and skills.

An informal study by the contractor that implement one of the THIS projects indicated that the lack of acceptance of the system is actually contributed to the technology literacy and skills in using computers by hospital personnel and not so much of the complexity of the HIS application. They discovered during the HIS training sessions, some of the users especially the older generation personnel do not even know what computer mouse is for. This does not signify incompetency but it is due to the traditional nature of the hospital processes that do not require and expose them in using computers. The training approach shall start with basic knowledge on the technology itself before going into further detail on the application. Cost allocation for trainings and technology awareness shall be significant to the project cost. Several levels of training setup shall be identified targeted for different type of users with different level of expertise. Training should start even in the very beginning of the implementation of the project, Training such as HIS technology, system development theories and business process re-engineering should be conducted as early as during the planning stage of the THIS implementation. When the users' knowledge and technical expertise are developed earlier, it will provide the users with appropriate skills and knowledge as well as sufficient time to prepare in adapting to the new work process.

During the implementation of THIS of the 13 MOH hospitals, a group of health personnel with sound technical knowledge and interest in the technology were selected to be part of the so called "expert group". Members of this group were trained with detail and comprehensive knowledge and skill on several modules of the HIS application. They became the experts and as the first level reference point and support for any issues and problems related to their particular specialized modules. Having experts and support teams consist of members from within the organization creates some personal touch to the users. They understand more since they perceived the problems on perspective of the users rather than looking at purely on the technical aspects.

System Quality

The studies on system quality are often associated with system performance. System quality in a healthcare setting measures the inherent features of HIS including system performance and user interface. Examples of system quality measures are ease of use, ease of learning, response time, usefulness, availability, reliability, completeness, system flexibility, and security (Haux, 2006). Ease of use assesses whether healthcare professionals regard THIS as satisfactory, convenient and pleasant to use. Availability may refer to the up time of THIS while flexibility is concerned with the ability of HIS to adapt to a healthcare setting and integrate with other systems. Even systems that often work are often not used as anticipated. Thus, it is important to determine whether the system meets the need of the projected users, is convenient and easy to use, and fits the work patterns of the professionals for whom it is intended and the overall health system.

Although system quality is seen as a measurement factor of the success of the output of HIS application, the main contribution to the quality of the system is actually how much user involvement is during the system implementation and how much of their input is incorporated in the system. Factors such as ease of use, ease of learning, usefulness, completeness and flexibility have direct relationship to user acceptance. In system development implementation particularly to the health

care system, user involvement during the early stage of implementation is critical. HIS is considered as the technology intervention for a health care organization. With HIS, the organization shall be improved, processes shall be facilitated and efficiency and productivity shall be enhanced. In a

healthcare setup, the output is services provided to patients. No one could understand more these requirement other than the health personnel themselves. If the users' requirements were clearly understood during the very early stage of the implementation, to achieve system quality is at a very high probability.

Redundancy

Today, we observe a certain dominance of the computer-based part of hospital information systems, while however the paper-based part is still existing, among others due to ease of use and legal reasons and has to be maintained. So, there is a highly redundant co-existence of paper-based and computer-based information processing, often causing higher costs and higher efforts for health care professionals to access and to use data.

One of the biggest mistakes in an application development setup is to include paper-based information as part of the work process in system. In the very beginning of the era of IT application, the term paper-less was widely use which defined the state of paper-less (no paper) environment that the system would establish. However, nowadays, the paper-less term is seen as no longer relevant, since papers are still involved but with reduced amount. The term paper-less were then transformed to less-paper which for some, the term was introduced to condescend such phenomena. As an example in a ward of a THIS hospital, nurses were provided with a set of computer attached to a trolley that connects to the system through wireless. During regular ward rounds to measure patients' vital signs (body temperature, pulse rate, respiratory rate and blood pressure) the data were supposedly recorded directly into the system.

However, in reality the nurses will write down the data in a piece of paper and at the end of the ward rounds, the data were then entered in the system at the nurse counter. This altered process gives big impact to the reliability of the data. The information written in the paper may not be correctly entered to the system. Data may get mixed up with the others during the process of data entry. Although the system gives the facility to allow the nurses to directly enter the data, it is not convenience enough for them to do so. One of the reasons is that nurses are required to bring an additional trolley along with them. One trolley with a computer attached to it and the other one is a trolley that caters other medical equipments for them to do the vital test. The redundancy issue can actually be solved but requires clear understanding of the whole work process. Some may acquire it from experienced and lesson learned in addition to creativity and innovatively.

For legal reason, which persistently require the hardcopy form of the documents, legal practitioner should explore alternatives if not remove but significantly reduce the amount of paper required. One suggestion may be to introduce a compressed hardcopy format which includes four pages of documents in a standard A4-size page, while the original format remains in the softcopy form.

Data Abundance

We could recognize that there has been a tremendous shift from paper-based processing and storage to computer-based processing and storage. Parallel to this development, there was an increase of data to be processed and stored, mainly due to the increase of diagnostic and therapeutic procedures, and due to new information technologies, allowing processing more data. A complete patient's health history can be assessed an analyzed. As a result, health professionals could give better diagnosis to their patients. Furthermore, data comparison of other patients with similar

symptoms can be easily accessed which allows professionals to refer to the previous successful diagnosis. This increase of data, however usually did not lead to a corresponding increase of health care personnel. Health care professionals of today usually have to deal with much higher amounts of data compared to the health care professionals before the implementation of HIS. With higher amount of data available, the amount of time reduced by HIS to find filed data the traditional way is transferred to increase of diagnostic and therapeutic procedures. Claims that HIS reduces time and workload of health professional is not valid, but it does increase the reliability and accuracy as well as the performance and efficiency of the health care services.

Future Prospective

Patients as Users

At the beginning, computer-supported health information systems were primarily intended to support health care professionals, mainly physicians, as well as administrative staff in hospitals. Later, there was a focus also on nurses. Since several years, we can recognize that health information systems now also will have to directly support patients, their relatives, respectively, all people with health questions and problems. For example in the recent outbreak of H1N1 virus, HIS may become the support system for the user for information gathering. The date gathered can be used to analyze the relationship among patients. The availability of the data would provide MOH with additional information in their effort to contain the virus spread. HIS will be the medium of communication between the patients and health professionals as well as patient to patient communication during the quarantine period. Furthermore, may become the one stop center for all health care services available that connects the public and private health organizations in providing services to the public. The prospective of HIS to focus more on the user can be explored further to give optimized benefits for all.

From patient care to research

Another shift that may be given by HIS is the use of data in such information systems. Even until the last decade, there was an almost exclusive use of HIS data for patient care and administrative purposes, with some use for quality management and controlling. Now we are having the ability to extend the possibility of using data, primarily used for patient care, also for health care planning and, above all, for clinical research. Patients' data and their diagnostic available in the database can be used for any type of analysis not only for general research statistics but also for clinical research. Availability of it online, makes research analysis much easier and faster. This possibility will have a continuous influence to medical statistics in terms of different study designs and methods for data analysis.

Conclusion

The aim of HIS was and is as simple as relevant to contribute to a high-quality, efficient patient care. This aim is primarily centered towards the patient, so it is a patient-centered approach and towards medical and nursing care, and the administrative and management tasks needed to support such

care. It is fair to say that the primary purpose of some modules is to collect management information as opposed to providing direct assistance to the user in the performance of their job.

In real-life projects, whether an information system is 'successful' or not is decided on the work floor, by the middle management, by top managers—and it is the outcome of all these interactions that in the end settles the system's fate. It is of course also possible to be less relativistic, and to set a success measure outside of an organization's own deliberations (for example, 'the percentage of professionals using the system for the majority of their patient contacts'). Only in this manner, after all, can one compare different implementation processes. System can be successful economically; the implementation project may not have exceeded its budget as for example, or management may have succeeded in reducing the administrative workforce by the target set in the implementation plan. 'Success' could also mean that the system is up and running on time for example, or it could mean that it is widely used. Alternatively, it could mean not so much the factual use of the system but the appreciation of this use by the users, or, the appreciation of the use by those users' managers. More specifically, for an order-entry system, a specific success measure could be a reduction in errors in medication deliveries; for a reminder system attached to an electronic patient record of hypertensive patients, the measure could be a reduction in the average blood pressure of these patients (Berg, 2001)

Success, in short, has many dimensions: effectiveness, efficiency, organizational attitudes and commitment, worker satisfaction, patient satisfaction—and not all parties in and outside of the implementing organization may agree about which dimension should be the most relevant. No matter, how success is perceived, it relates back to the extent challenges is addressed and problems are solved. If the challenges and their solutions are well-defined, success if viewed from any dimension can be achieved.

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