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Investigating the Barriers of Health Information System implementation in Malaysian Public Hospitals

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Abstract. The advent of information and communication technology (ICT) has shaped the world today. Due to the potential increase in technology, the introduction into the healthcare industry has been progressively investigated. In 1997, Malaysia introduced a health initiative called telehealth. However, progress in IT implementation is progressively slow. Although the global healthcare sector is increasing, the implementation of the Health Information System (HIS) in Malaysia has been slow-informed due to various barriers. These barriers are due to a series of problems related to end users and challenges for IT departments and vendors. This article therefore focuses on the current situation of HIS in selected Malaysian public hospital. In addition, an interview conducted with the end users, IT department and the system providers. The data from the interview was then converted into a summary of the table. In this context, the obstacles that delay the implementation of HIS in Malaysia have been identified primarily in terms of suppliers, financial, organizational and human aspects.

1. Introduction

The advancement of ICT has reshaping the current industry especially in the healthcare industry. ICT found to be playing important role in enhancing the patient care services. Throughout the years, tremendous inventions have been presented into the healthcare sector to enhance the hospital or clinics performance and quality services. Innovations such as Telemedicine, e-Health, m-Health, TeleHealth, Health Information System (HIS), mobile technology been employed to provide better health services to society [1]. For instance, the Electronic Health Record (HER), Health Information System (HIS) and Telemedicine are such ICT innovation that proven provide better health services to the society [2]. Healthcare industries emerged as technology grow rapidly. The evolvement is necessary to increase the quality of healthcare services and the efficiency of healthcare management. In countries such as the United Kingdom (UK), they have used the comprehensive healthcare system. This aims to improve the level of health management for people in their country. [19]

This research is conducted to provide a clear understanding of the barriers in HIS implementation, especially in the public sector. Throughout the research, there are several barriers by the Malaysian Government to successfully implement the HIS in the hospitals.

This research aims to explore the implementation of HIS in the public hospital in Malaysia, the barriers and thorough analysis of the results. The end of this study, the barriers that affecting the Malaysian HIS public hospitals can be used as a guidance to provide a successful HIS.

2. Methodology

To achieve the objective of this study, there are two phases undertaken to gather information to support the literature. The first is exploring the literature on HIS implementation in Malaysian hospital covering the challenges and issues. The focus is to identify multiple factors involved in success and challenges in the implementation of HIS. Several examples of HIS implementation in Malaysian hospital was taken. The difference among HIS implementation was gathered to differentiate between each system and vendor.

The second phase is the interview with the HIS users, vendor and healthcare practitioner. An interview was conducted to support the problem exist in the Malaysian healthcare system. It is the phase which qualitative research is being conducted and preliminary results are being achieved that support the problem statement for this research. The interviews were held with the end users, system developer and system provider. For the end users, the interview is to know the current status of HIS implementation on certain hospital and clinics in Malaysia in different background point of view. Then the interview with the system developer and system provider was conducted to investigate the current status of HIS environment in Malaysian hospitals. From the interview, it shows that hospitals in Malaysia have a different system provider and every system in the hospital conduct by different provider. This came out with the issues of the implementation of HIS in each hospital.

3. HIS Scenario in Malaysia

Implementation of the healthcare system in Malaysia has long been on the run. However, overall Malaysian health organisations is not fully implemented. Several factors contribute to this implementation delays. One of the factors is the lack of acceptance of the technology for the end users in the healthcare organisation. Besides, the system environmental factors, within organisations is hampering the implementation of the healthcare system. It also included the types of systems in the organisation, the system provider for the organisation and top management authorities.

The problem with the healthcare provider has faced today are high cost and lack of human resources. Therefore, to solve these problems, an effective and economical solution must be introduced. The solution to this situation can be the integration of information and communication technologies (ICT) in the health sector. The hospital information system is the most important ICT that is integrated in the healthcare system of Malaysia. The hospital information system claims to reduce medical error, increase efficiency, cost effectiveness and increase patient involvement in healthcare decision-making [3].

A proper HIS integration subcomponent is a major challenge facing medical information. With current network technology, it is no longer acceptable to implement standalone system subcomponents which do not communicate with one another. Connectivity and integration can eliminate duplication of data entry (for example, patient demographics are required by almost all subcomponents of HIS) and allow for the automated transmission of messages between the subcomponents (for example, transmission of the details of a laboratory test order from an order entry subsystem to a laboratory information subsystem). These benefits come at the price of network hardware and software, interface software, increased complexity of the overall system, and reliance upon network availability [4].

3.1. Malaysian HIS Implementation in the Public Hospitals

In a developing country like Malaysia, hospitals are the main healthcare providers whereby aiming HIS to be improved [5]. Starting with the Telemedicine flagship introduced in 1997 is the Malaysian initiative for providing better health care services to the society. There are three healthcare sectors in Malaysia which are public, private and Non-Government organizations (NGOs) [6]. Public hospital

places more complex systems due to the patients comes from various background [7]. Those patients afford higher cost, they preferred to get medication from private healthcare. Large numbers of patients especially in the public hospitals may leads to system ineffectiveness due to longer waiting time for medication. This issue has been reported between 2000 and 2008 previously in [8].

In Malaysia, we have 139 hospitals with 18 referral and tertiary hospitals. However, not all the hospitals fully implementing the HIS [9]. The implementation of HIS in Malaysia has been carried out since 1993 under the Sixth Malaysia Plan [10]. Currently, Malaysia have three type of hospitals which categorized based on the number of available beds, specialties and the budget [11][12]. Basic Hospital Information System (BHIS) is a small size hospital, while medium size Intermediate Hospital Information System (IHIS). Meanwhile, larger size hospital known as Total Hospital Information System (THIS) where placing paperless healthcare systems in all departments. Table 1 summarizes the public hospital in Malaysia implementing HIS by its classification.

Hospital Selayang and Hospital Putrajaya was the early hospital equipped with THIS since the launched of Malaysian Telehealth Flagship Application starting with Hospital Selayang in 1997 followed by Hospital Putrajaya in 2000 [14].

Table 1. Summary of classification of Malaysian public hospital based on number of beds

Type of HIS	Name of Hospitals	Component of HIS used	Number of beds
THIS (large size)	Hospital Sultan Haji Ahmad Shah, Hospital Pandan Hospital Putrajaya, Hospital Selayang, Hospital Sedang, , Hospital Sg. Buloh, Hospital Sungai Petani, Hospital Ampang, Hospital Sultanah Zahirah, Hospital Alor Setar, and Hospital Bintulu	PMS, CAIS, LIS, PIS, RIS, PACS, AIS, FIS, SIS, PIS	> 400 beds
IHIS (medium size)	Hospital Lahad Datu and Hospital Keningau	PMS, CIAIS, LIS, PIS	> 200 beds
BHIS (small size)	Hospital Tunku Ja'afar , Hospital Kuala Penyu, Hospital Kuala Batas, Hospital Pitas, Hospital Kunak, and Hospital Setiu, Hospital Port Dickson	PMS and CAIS	< 200 beds

PMS: Patient Management System, CAIS: Clinical Access Information System, LIS: Laboratory Information System, PIS: Pharmacy Information System, RIS: Radiology Information System, PACS: Picture Archiving and Communication System, AIS: Administration Information System, FIS: Financial Information System, SIS: System Inventory System, PIS: Personal Information System

3.2. HIS Revolution in Malaysian Public Hospital

Hospital Selayang was the first paperless THIS hospital in Malaysia which managed by the Cerner Malaysia Sdn. Bhd. [13]. Hospital Selayang has implemented EMR to improve the provision of health services focusing on the management and information system of patients at the organization level. THIS was also implemented at Putrajaya Hospital and Pantai Medical Center by Kompakar eHealth Tech Sdn. Bhd. Three different THIS hospital in Malaysia where Hospital Serdang, Hospital Selayang and UKM Medical Centre as shown in Table 1. Starting in 2002, Syarikat Permodalan Kebangsaan (SPK_ Bhd had initialize the development of HIS in several hospital such as Hospital Kepala Batas, Lahad Datu and Serdang. Upon the successful achievement, SPK then continue the HIS development

for remaining hospitals. Table 2 shows the hospitals in Malaysia that implemented HIS developed by SPK system vendor.

Table 2. HIS Project completed by SPK system vendor

Name of hospitals	**Year completed**
Hospital Kepala Batas	Dec 2004
Hospital Lahad Datu	April 2005
Hospital Serdang	June 2006
Hospital Tentera Lumut	Nov 2006
Hospital Pandan	Dec 2006
Hospital Keningau	Sept 2007
Hospital Setiu	Sept 2007
Hospital Kunak	Oct 2007
Hospital Kuala Penyu	Oct 2007
Hospital Ampang	March 2008
Hospital Sg. Buloh	May 2008
Hospital Sg. Petani	May 2008
Hospital Pekan	July 2008
Hospital Alor Setar	July 2008

On the other hand, the health system in Hospital Putrajaya also operates fully using THIS. THIS was started since 1998 with the cost of RM282 million using a system called PutraCare. PutraCare system developed by the local vendor, Kompakar Sdn. Bhd [14].

A further investigation the characteristics in three public hospitals shown in Table 3. Among three hospitals compared, Hospital Serdang required the highest budget with 80 million ringgit for implementing HIS followed by Hospital Serdang with RM64 million and UKMMC with only 6.3 million ringgit. There are several criteria of the THIS in Malaysia. One of the criteria is the budget funded for implementing the HIS. HIS in Hospital Serdang and Hospital Selayang was funded fully by the Federal Government while UMKMC funded from their organisation itself. In-house development by the UKMMC only requires RM6.3 million.

Table 3. Characteristics of HIS in three Malaysian Hospitals

Variable	**Hospital Serdang**	**Hospital Selayang**	**UKMMC**
System Provider	IBA health	Cerner	C-Hets
Country Origin	UK	USA	Malaysia
No. of beds	630	960	1050
Staff	1900	2600	3500
Development	2005	1999	2004
Budget	Turnkey project RM80 mil	Turnkey Project RM 64 mil	In-house development RM 6.3 mil
Human resource	IT department - 1 IT Manager, - 4 IT programmer	IT department - 1 IT Manager, - 6 support staffs	IT department - Head of IT unit - 40 technical staff - 40 domain expert

According to the study conducted by [7], [12], there are only 15.2% of the Malaysian hospitals are system-based and less than 10% of 139 public hospitals are classified as HIS. This indicates the majority of the public hospitals in Malaysia remain using a paper-based method and shows slow

progress on HIS reformation. Several factors have been studied the impact of implementation of the healthcare system.

4. The Challenges in Malaysian HIS

HIS implementation in a public hospital in Malaysia is still low due to various issues. Support, human, technology and infrastructure and software limitation issue are four major challenges has been identified in HIS implementation [16]. The human context in Malaysian Public Hospitals had the highest effect of HIS adoption. This could imply the importance of human skills, experience, expertise, satisfaction and quality of information for successful adoption of HIS [17]

The issue of HIS integration has been addressed by researchers and, unfortunately, is still one of the key issues for HIS's success, which remains relevant and unresolved [18]. With so many vendors developing specific applications for different medical departments and hospitals, there are challenges as hospitals try to integrate data to enable interoperability and communication between different systems [19].

The integration of the medical system between different hospital organizations (local and regional) has been claimed to be a significant step in creating a complete HIS and provides benefits to clinicians who need inter-department collaboration in solving patient's cases [20], [21]. To ensure the successful integration of the system, organizations need the necessary financial and technological resources. However, in developing countries, poor maintenance or lack of personnel in charge of these resources is exceptionally common, and that causes information systems projects to fail significantly. In support of this argument [15], it is proposed to establish a dedicated coordination unit to act as a reference for all IT or system developers (vendors) and to provide a platform for improving future HIS integration.

5. Findings and Discussion

Results from the preliminary analysis and clarification used to stimulate an overall picture of the research domain and its proposed implications for HIS integration in Malaysian hospitals.
The preliminary result is a test that conducted for pre-case study research to support the problem statement of the research. In this research, the preliminary study was done by using unstructured interview approach with the end users and system developer in different organisations and background. The result of the interview shown in Table 4.

Table 4 shows the summary of the case study healthcare system in selected hospital and clinics that is obtained from the initial interview. The interview was conducted among users in hospital and clinics of the government sector. The respondents consist of physicians, nurse, therapist and also system developer. Four different organisation from government sector have been chosen as the case study; Hospital Tunku Jaafar Seremban (HTJS), Negeri Sembilan, Hospital Sultanah Aminah (HSA) Johor, Klinik Kesihatan Gombak (KKG) Selangor and Klinik Kesihatan Masjid Tanah (KKMT) Melaka. From the table, seven criteria have been analyzed where include the knowledge about Health Information System (HIS), implementation of HIS, health system used, system developer of the health system, health data achieved, health data saved and integration of the health system (within the organization or other organisation).

From the interview, it is shown that most of the organisation using a different system and platform. Also, most of the system has no integration. In Klinik Kesihatan Taman Ehsan Gombak, they use Teleprimary Care system (TPC).

Table 4. Summary of healthcare system case study in selected public hospitals and clinics

Respondent	HIS	System Used	System Vendor	Data Achieved	Data Saved	System Integration
Physiotherapist Hospital Tuanku Jaafar Seremban (HTJS)	No	Sistem Pengurusan Pesakit (SPP)	Heitech Padu	From System and Manual	System and Manual	No
		Sistem Maklumat Pesakit	KKM			

Physician Klinik Kesihatan Taman Ehsan Gombak	Yes	TPC (Teleprimary Care)	KKM	System	System	Partial (Medication still need to do manual)
System Developer Hospital Sultanah Aminah	No	Sistem Pengurusan Pesakit Dalam (SPPD)	KKM	From System and Manual	System and Manual	No
Nurse Klinik Kesihatan Masjid Tanah	No	Rekod Pesakit	KKM	Manual from patient card /book	Manual in Patient Card	No

Based on initial findings collected from the preliminary investigation, several issues can be highlighted. These issues are:

- Different vendors. One hospital may have different vendors that developing the health system for each department. Incompatibility for other systems to communication due to a different platform, database format and programming language.

- Multiple middleware. To achieve integration of the health system, SPP was integrated with the middleware on each of the systems. The middleware is responsible for translating the data that can be read by the SPP. Since each of the system in every department was different architecture, multiple middleware required that may lead to system complexity.

- Duplication of data. Due to achieving data from a different system using a middleware, duplication of data may exist. This is due to; previous data remain in the origin database server.

6. Conclusion

As a conclusion, the healthcare system in public Malaysia is partially implemented with most of the systems are not fully integrated. Due to some reasons such as human, financial, and different vendors make the healthcare systems have isolated each other. Hence, these factors supported by the preliminary interview from selected public clinics and hospital. After a few polite preliminary studies, it can be a guideline and starting point to the ideas and intentions for effective HIS integration for future development.

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