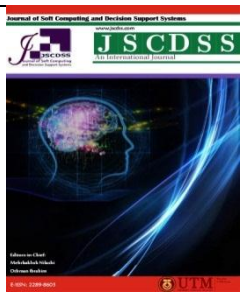
An International Journal
JSCDSS
http://www.jscdss.com
Vol.3 No.1 February 2016: 61-74
Article history:
Accepted 11 January 2016
Published online 17 January 2016

Journal of Soft Computing and Decision Support Systems



E-ISSN: 2289-8603

Multi-level Model for the Adoption of Hospital Information System: A Case on Malaysia

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Abstract

Hospital Information System (HIS) is an integrated Information System (IS) designed to enhance clinical, financial and administrative functions of a hospital. HIS is important in the healthcare industry as it supports a wide range of highly specialized health-care tasks and services. Previous research shows that the trend of HIS adoption is slow with respect to Malaysian public hospitals. In addition, there is small number of studies that have looked into the HIS adoption inside the context of Malaysian public hospitals. Hence, by relying on secondary data, the aim of this study is to provide a literature review of HIS adoption as well as to recommend the potential factors that affect the adoption of HIS. To this end, a conceptual multi-level model is proposed by integrating Technology Organization Environment (TOE) framework, institutional theory, and Theory of Planned Behaviour (TPB). Our conceptual multi-level model is proposed based on reviewing the existing literature of Information Technology (IT) adoption theories connected to studies of HIS innovation that consists of four dimensions and corresponding variables. Thus, this study provides a direction for future research to study the relationships of identified contextual factors in our proposed multi-level model that can have a major effect on the adoption of HIS innovation.

Keywords: Hospital information system, Malaysian healthcare, Technology-organization-environment framework, Institutional theory, Theory of planned behaviour

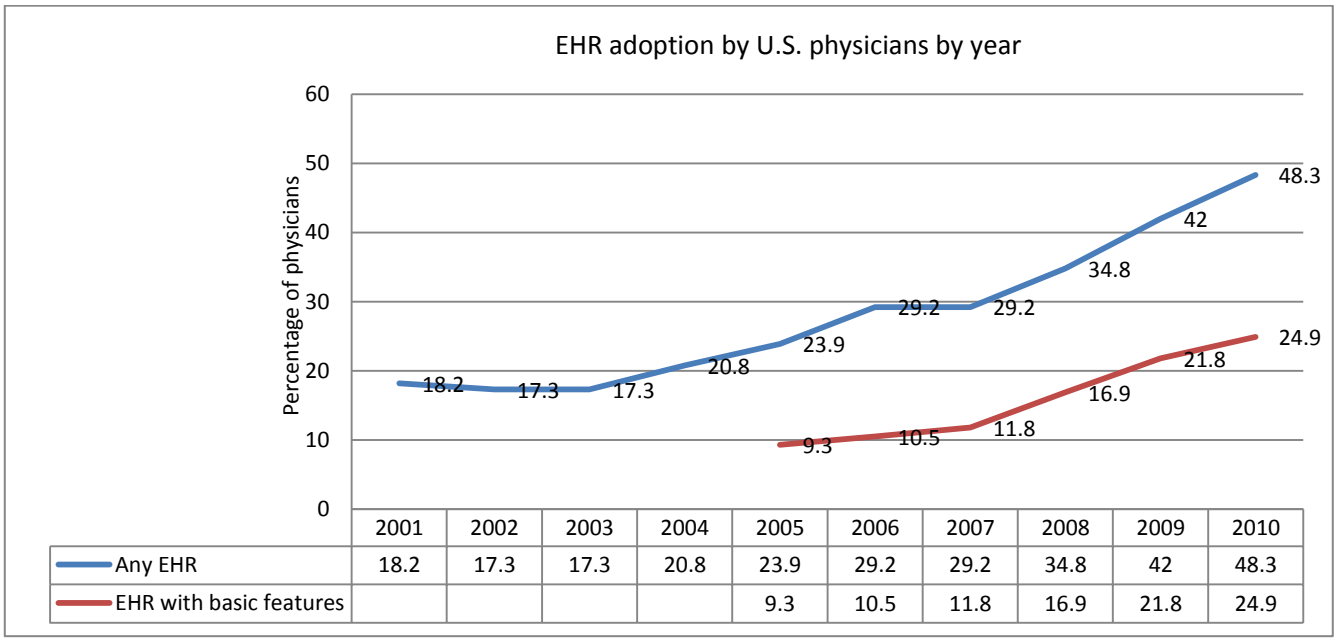
1. Introduction

There is a growing transformation of Information Technology (IT) into the healthcare industry (Wilson and Lankton, 2004; Ahmadi et al., 2014d). Hospitals by adopting IT applications would gain the great benefit, ranging from medical systems to administration systems. This is due to the fact that hospitals are an information intensive industry (Chang, Hwang et al., 2006). E-Health, Electronic Health Record (EHR), Hospital Information System (HIS) and Telemedicine are various initiatives that have established the usage of Information System (IS) which lead to enhance the efficiency, decrease medical error, cost effectiveness and boost the participation of patient in healthcare decision making (Lee, Ramayah et al., 2012). Furthermore, each country is implementing these initiatives according to the situation of its healthcare system that corresponding to the typical applications.

One of the advanced categories of HIS is Total Hospital Information System (THIS). THIS is a computerized hospital information system aimed at providing a paperless environment (Sulaiman, 2011). It integrates clinical and non-clinical information and its key features is that it includes all areas of clinical, financial and administrative. There are many benefits that THIS brings to the healthcare community and indirectly gives numerous values to the patients (Ahmadi et al., 2015c). These benefits include appointments and scheduling of patients, patient registration, admission, discharge and transfer as well as the management of clinical data documentation. Moreover, waiting time identified as one of the major issues in a non-computerized hospital that was the focus for betterment by a fully computerized hospital as was the reduction in patient admission waiting time (Salleh, 2003; Sulaiman, 2011; Ahmadi et al., 2014a; Ahmadi et al., 2014b; Ahmadi et al., 2015c). Nevertheless, the healthcare sector has also been reported to be slow in adopting the HIS (Stegwee and Spil, 2001; Sulaiman, 2011; Lee, Ramayah et al., 2012;

Ahmadi et al., 2015a). A review was conducted by Schoen et al. (2009), indicated that as of 2005-2007 the adoption trend of ambulatory EHR in United States ranged from 17% to 35%. Furthermore, Fig. 1 presents the adoption level of EHR as of 2001-2010 among ambulatory physicians.

Moreover, several authors (Ash, Gorman et al., 2004; Cutler, Feldman et al., 2005; Jha, DesRoches et al., 2009; Jha, DesRoches et al., 2010) suggest that among United States hospitals the adoption of Computerized Physician Order Entry (CPOE) as of 2003 ranged from 5% to 17% in 2008 and in 2009 was 34%. Hence, there seems to be a low adoption rate of IS in the U.S. which has become a challenge, nevertheless there is the trend of inspiration and encouragement and also the meaningful use policies that are predicted to improve this (Blumenthal and Tavenner, 2010). Moreover, according to the Rothstein (2011), in developing countries less than half of the medical staff used EHR and only a fraction of patients have Patient Health Record (PHR). Hence, according to Chang et al. (2006) "the issue of what factors promoting the adoption of IT in healthcare setting, becomes an important question for all healthcare administrators".



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Any EHR	18.2	17.3	17.3	20.8	23.9	29.2	29.2	34.8	42	48.3
EHR with basic features					9.3	10.5	11.8	16.9	21.8	24.9

Fig.1. EHR adoption by U.S. physicians by year (Theera-Ampornpunt, 2011).

2. Difficulty in Malaysian healthcare and the solution provided?

Healthcare system in Malaysia has been made mainly from the public and private sectors. Besides, the government health clinics and hospitals serve the rural areas (Unicef, 2006; WHO, 2006). In this regard, public health divisions in Malaysia are under the control of Malaysian Ministry of Health (MOH). In addition, indirect monitoring exists between the directors of general health from the federal government to the state health institute directors. This implies that the federal government by using its constitutional powers still dominate the health policy to intervene the practice of the states regarding the health functions (Chee and Barraclough, 2007; Sulaiman, 2011; Ahmadi et al., 2013b). Moreover, according to Sulaiman (2011), for acquiring and deploying of HIS there is two major groups of decision makers that include appointed staff from Malaysian MOH and senior management team inside each hospitals. Senior management team consists of IT managers, hospital chief information officers, and IT executives who are involved in acquiring and deploying of HIS.

One of the prolonged issues with Malaysian healthcare in government hospital's outpatient visit are the travel, waiting time and treatment time with respect to the patient setting (Chee and Barraclough, 2007). Furthermore, in Malaysia the revenue from general taxation was allocated to health services, hence it becomes quite essential to fulfil the equity obligation by the government which is to provide better healthcare services. To do so, it is necessary that the government takes its own strategy in achieving the equity obligation (Sulaiman, 2011). In Malaysia, in the reasonable prices the healthcare services are provided to people. But, according to Lee et al. (2012) "factors like changing pattern of death causing diseases from infectious diseases to chronic diseases, population structure, lifestyle, and healthcare service expectation from the people have distorted the status quo which consequently, application of advanced facilities and management systems has been forced to be adopted and used". Besides, healthcare expenditure has been grown up in every year. For example, in 2005, Malaysia healthcare expenditure was RM22 million, and was RM30 billion in year 2009, which indicates an increasing in every year. In addition to that,

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RM42 billion has been suggested in the year 2014, almost 91% increment in ten years times. Accordingly, healthcare cost making a big challenge to government whereas improving the quality should be improved as well.

Hence, to overcome and solve such challenges, several projects have been inaugurated by the Malaysian government for the purpose of also delivering higher access to healthcare information and improving the wellness of citizens. Such projects include the National Telehealth Policy (NTP) (Abdullah, 2008) that covers four intriguing initiatives for IS such as Telemedicine, Mass Customised/Personalised Health Information and Education (MCPHIE), Lifetime Health Plan (LHP), and Continuing Medical Education (CME) (Abdullah 2008; Li, 2010). Telemedicine is one of the domains that has been targeted for drastic improvement (Abdullah, 2008; Lee, Ramayah et al., 2012).

Telemedicine is a healthcare reform initiative that known as the Telemedicine Blueprint under Multimedia Super Corridor (MSC) Telehealth project, and has been launched to reform the Malaysian healthcare system. According to Abidi et al. (1998), "MSC began in 1996 to emphasize on the national vision of 2020 which can assist Malaysia toward becoming a developed country in the year 2020 through particular objectives". In addition, the LHP is amongst the four key projects which concentrates on fostering healthcare platform to permit the general hospitals to give personal LHP to the public. According to several authors (Abidi, Goh et al., 1998; Mohd and Syed Mohamad, 2005; Ismail, Abdullah et al., 2013), under the LHP project, HIS is introduced to commence the process of digitalization within the healthcare sector (Ahmadi et al., 2013a).

Moreover, according to Lee et al. (2012), "three types of hospital information system introduced under the Telehealth project in Malaysia: Total Hospital Information System (THIS), Intermediate Hospital Information System (IHIS), and Basic Hospital Information System (BHIS)". In this regard, number of beds in each hospital will determine the decision for HIS applications. THIS compared to IHIS and BHIS is the most integrated system whereas BHIS is the lowest and limited system. Moreover, THIS implementation is for tertiary hospitals with over 400 beds. According to Ismail et al. (2010), "the intention of the Ministry of Health (MOH) on implementing Total Hospital Information System (THIS) in tertiary hospitals above 400 beds is proven to be beneficial, even though, the task could be risky but the overall advantage of having extensive system is priceless".

In Malaysia, there are currently 141 public hospitals having more than 39000 beds (MOH-Malaysia, 2014). In this regard, only 22 out of 141 public hospitals are referral and tertiary hospitals equipped with either fully integrated or partially integrated HIS since the Telehealth initiative project was launched more than a decade ago. According to Lee et al. (2012), from 1996 to 2000 that was the plan of Seventh Malaysia suggested that there will be around 33 paperless public hospitals to be inaugurated by that time. On this subject, 8 hospitals will be using THIS, while the other 25 smaller hospitals will use the IHIS and BHIS. But as of 1998 that the economic crisis took place, those projects were suspended, and were supposed to be run during the eight Malaysian plan. But until the 2006-2010, which was the ninth Malaysia plan, the established paperless hospitals were only two in the country while in other hospitals has been put on hold (Sulaiman and Alias, 2006; Lee, Ramayah et al., 2012).

Out of 141 public hospitals in Malaysia, thirty of them are the tertiary level hospitals. In this direction, only 16% are fully equipped with THIS implemented the system all over their hospitals, and the rest are delaying in adopting the HIS technology (Central, 2004; Sulaiman and Alias, 2006; Ismail, Jamil et al., 2010; Sulaiman, 2011; Lee, Ramayah et al., 2012; Ismail, Abdullah et al., 2013; MMR, 2014; MOH-Malaysia, 2014). With the rapid developments in IS providing support for specialized healthcare tasks and services (Chen and Hsiao, 2012), and in recognition of the Malaysian government's plan for implementing HIS, many hospitals started the initiatives to adopt HIS to support clinical and administrative operations. However, instructions from the Malaysian MOH to automate all hospitals have yet to be complied with (Ismail, Abdullah et al., 2013; Zadeh Takhti, 2013; Ahmadi et al., 2014c). Hence, this indicates that HIS diffusion is still in its early stage and there is slow rate of adoption among public hospitals.

Hence, the aim of this study is three-fold: (a) to give insight about the technological innovation of HIS with respect to its current situation in Malaysia, (b) to identify influential factors including both barriers and facilitators in adopting HIS, and (c) to propose the conceptual multi-level model that can explain the HIS adoption.

It is noteworthy to mention that, we reviewed carefully the suitable IT innovation adoption theories to ensure the appropriateness of our proposed multi-level model in the context of Malaysia along with our suggestion of new variables to be inspired in the existing theories.

3. Methodology

The purpose of this study is to explore the influential factors that affect hospitals adoption of HIS with regard to Malaysian public hospital organization.

In our study, we follow the definition of HIS according to Ahmadi et al. (2015) as "a comprehensive, integrated information system designed to achieve the best possible support of patient care". According to the definition of HIS in our study, other technology innovations in the context of hospitals that have an equal and attributable definition as for HIS will be taken into consideration. Furthermore, the critical factors which have been found empirically in prior studies in the context of Malaysia and other countries that affect HIS adoption are carefully reviewed and looked for. We only include those studies that examined the HIS adoption with respects to theories of technology adoption including Technology-Organization-Environment (TOE) framework, institutional theory and Theory of Planned Behaviour (TPB). Moreover, to provide an in-depth

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understanding of HIS adoption decision in healthcare industry, the qualitative approach studies have been considered. As well, we include those studies which have quantitatively test relationships between variables which are related to those theories aforementioned above.

According to the definition of HIS, we confined our search to obtain the suitable research papers for our study. However, HIS is the specific types of healthcare initiative that has been implemented in Malaysia, and therefore other healthcare initiatives that have the equal definition as for HIS have been included in our search. Hence, the papers that was not contained our HIS definition was excluded from our review analysis. To obtain a comprehensive bibliography of research papers on HIS adoption the following electronic journal databases were searched:

- Science direct
- IEEEXplore Digital Library
- SpringerLink
- Emerald
- ProQuest
- JSTOR
- ProQuest
- Wiley Online Library

These online databases was accessible via University Technology Malaysia (UTM) library with the keywords "IS adoption", "IT adoption", "TOE framework", "institutional theory", "TPB", "healthcare", and "hospital" to limit the search to healthcare settings. However, there were some more online databases within the UTM library that could help in more obtaining the academic journals. Hence, the closely related papers were retrieved and read. Thus, it is hoped that this study can accentuate the importance of "hospital information system" and present researchers more insight about "HIS adoption" research.

4. Hospital information system in Malaysia

The HIS is one of the most widely used IT applications within hospitals (Hsiao, Chang et al., 2011). HIS plays an important role in the healthcare sector specifically in large tertiary and secondary level hospitals in which they require to serve the public with high quality healthcare treatments (Ahmadi et al., 2015). One of the Malaysian health priorities (9th Malaysia Plan, 2006-2010) for enhancing the healthcare delivery system is to increase access to quality care through strengthening information systems. In this regard, three types of HIS introduced in the Malaysian health industry, namely: Total Hospital Information System (THIS), Intermediate Hospital Information System (IHIS) and Basic Hospital Information System (BHIS). The HIS classifies hospitals according to their number of beds (Lee et al., 2011). Hospitals with more than 400 beds are grouped as THIS hospitals, hospitals with 200 to 400 beds are categorized as IHIS hospitals, and hospitals with fewer than 200 beds are categorized as BHIS hospitals (Mohd and Mohamad, 2005; Lee et al., 2011). THIS integrates clinical and non-clinical information, and its key feature is that it includes all areas of clinical, financial and administrative information, while also focusing on the patient care process (Ahmadi et al., 2015a).

Thus, the Malaysian healthcare system is experiencing substantial access to, adoption and use of HIS, and this is gaining increased importance with the continuous advances in IT.

Considering the current study and referring back to the problem background of this study as was discussed earlier, Malaysia is still in the early stage of innovation diffusion. According to Ahmadi et al. (2015), 15.2% of the Malaysian public hospitals are referral hospitals equipped with either fully integrated or partially integrated HIS since the Telehealth project was launched more than a decade ago. Thus, the study at hand made an effort to look at those contextual factors that have a potential and also could be used at the early stage of innovation diffusion to explain effectively and properly the hospital behaviour of HIS adoption.

5. Factors related to the HIS adoption based on selected theories

Table 1 presents the summary of studies of HIS adoption in healthcare. In this table, asterisks denote factors that were found statistically significant predictors of HIS adoption. Hence, Table 1 shows the prior empirical studies pertaining to HIS context that used the TOE framework, institutional theory and TPB to assess the effects of variables on adoption in the hospital setting. Thus, upon theoretically examining the empirical studies of HIS innovation in different studies of adoption in the context of both Malaysia and other countries pertaining to the hospital setting, it is believed that four contexts including technology, organization, environment and individual are well suited and can be as facilitators of HIS adoption.

6. Theoretical foundations

The two levels of individual and organization have extensively been studied with respect to the IT adoption. However, major IT adoption studies have focused on the individual level by explaining what influences their behavioral intention to use a particular technology. In this regard, Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), and Unified Theory of Acceptance and Use of Technology (UTAUT) are the most common theories that are used to predict and explain behaviour of individuals toward adoption and use of technology across many areas. For the latter, fewer studies have been conducted to identify what factors are crucial on organizational decision in adopting of specific innovative technologies. In this direction, the important theoretical perspectives include institutional theory (DiMaggio and Powell, 1983), and TOE framework (Tornatzky, Fleischer et al., 1990).

Since HIS innovation into the healthcare may be defined as a computerized hospital information system aimed at providing a paperless environment, it is fundamentally

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organizational innovations. Hence, the organizational innovation adoption theories can be potentially useful to the development of new HIS adoption model. Thus, organizational innovation adoption theories may provide a strong theoretical foundation for our new proposed multi-level model by reason of giving a valuable way to explain how IS innovation can be adopted throughout the hospital environment.

6.1 Technology-Organization-Environment framework

Tornatzky and Fleischer (Tornatzky, Fleischer et al., 1990) developed the TOE framework to study adoption of general technological innovations that contains three aspects of a firm's context that influence how it adopts and implements technological innovations; external environmental context, technological context, and organizational context. They suggest that in the context of organizational level, there are some influential factors related to those contexts which can affect the technology adoption.

Technological context. Innovation characteristics is covered in the technological context (Rogers Everett, 1995) that has also been extensively examined by prior IT innovation studies affecting the organizational adoption. In this regard, four innovation characteristics have been identified in the context of prior HIS adoption studies including relative advantage, compatibility and security concern. Furthermore, these factors were found to be significant to affect the intention of hospitals to adopt the HIS. Hence, by suggestion of Rogers (1995) as for the innovation characteristics and considering the prior studies regarding the organizational HIS adoption, four characteristics for HIS adoption in our studies will be taken. In addition to the technology characteristics, this study added another variable as security concern. This reflects prior HIS adoption studies that security concern has been identified as a significant barrier that inhibits organization from the adoption and development of HIS (Soliman and Janz, 2004; Chang, Hwang et al., 2007; Lin, Lin et al., 2012; Luxton, Kayl et al., 2012; Lian, Yen et al., 2014).

Compatibility. Compatibility occurs when an innovation has a consistency with the values, experience and needs of the adopting unit organizations (Rogers Everett, 1995). According to Thong (1999), "compatibility is an important consideration in an organization's IT adoption decision because with a high level of compatibility, the organization needs to make minimal adjustments and changes, which implies less resistance to adoption". In prior studies of IT innovation adoption, one of the critical factors that have been found to influence the decision to adopt organizational innovative technology is compatibility (Grover, 1993; Dedrick and West, 2003; Nelson and Shaw, 2003; Wongpinunwatana and Lertwongsatien, 2003).

With the new technology available today, more complex systems can be designed. Powerful software tools and hardware, at lower prices, reliable networking and standards add new prospects in this field (Tachinardi, Gutierrez et al., 1993). Radiology Information System (RIS), Clinical Information System (CIS), Laboratory Information System (LIS), Nursing Information System (NIS), Pharmacy Information System (PHS) and Picture Archiving and Communication System (PACS) are examples of sub-systems of HIS that are slowly being incorporated into fully integrated systems (Tachinardi, Gutierrez et al., 1993; Ismail, Abdullah et al., 2013; Ahmadi et al., 2015b). Therefore, one of the key factors in the technical dimension is the level of system compatibility.

Complexity. Complexity is the extent to which innovation is perceived as relatively difficult to understand and use (Tornatzky and Klein, 1982; Rogers, 1983). In the context of public healthcare sector with respect to hospitals, there is an intense complexity of the system and workflows compared to other healthcare providers (Ismail, Abdullah et al., 2013). The modern medical environment is now experiencing major transformation in its IT base with increasing in technological complexity and handling more patients with fewer resources, and resulting in higher demands on medical practitioners (Hajdukiewicz, Vicente et al., 2001). Furthermore, in many prior IT innovation studies, it suggests that the system complexity causes to be reluctant due to lack of skills and knowledge and also has been a key consideration in adopting decision process (Grover, 1993; Thong, 1999; Beatty, Shim et al., 2001).

Security concern. Data security is one of the major concerns in adopting Information and Communication Technology (ICT) in the healthcare industry (Tyrrell, 2002; Ting, Kwok et al., 2011). According to Lin et al. (2012), "medical behaviour or process is closely related to a patient's personal life, safety and privacy, in which the healthcare provider should pay special attention to information security and accuracy, striving the rule out any possible errors". Huge evidence is being issued regarding the computer systems that in many organizations are subject to frequent and persistent abuse (Goodhue and Straub, 1991).

Considering the IT innovation adoption, the security of information and network reliability are key factors (Ratnasingham, 1997; Soliman and Janz, 2004). Study conducted by Khoumbati et al. (2006) examining the factors affecting Enterprise Application Integration (EAI) in the context of healthcare stated that, security is the issue that requires immediate consideration. Furthermore, according to case study conducted by Sulaiman (2011) in the public hospitals of Malaysia, the level of security concern was high in HIS due to the fear of breach of patient's privacy during the data transaction. Moreover, according to Luxton et al. (2012) "security problems are the most important issues in the context of a distribute environment". Hospitals are the obvious example of this environment where the storage and retrieval of healthcare data needs a very secure environment. In addition to other studies of technological innovation in the healthcare, security concern has been one of the critical factors that inhibit the process of organizational adoption decision

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(Chen, Jan et al., 2005; Khoumbati, Themistocleous et al., 2006; Lian, Yen et al., 2014).

Organizational context. Characteristics of an organization would affect the technological innovation adoption of an organization (Tornatzky, Fleischer et al., 1990). According to the TOE framework, it suggests three factors affecting the adoption of technological innovation with regard to organizational dimension (Tornatzky, Fleischer et al., 1990). Furthermore, the prior studies of IT adoption identified organizational characteristics as presence of champions (Zmud, 1984; Beath, 1991; Grover, 1993; Tan and Teo, 1998), IS infrastructure (Tan and Teo, 1998; Chau and Tam, 2000; Zhu, Kraemer et al., 2003; Bardach, Huang et al., 2009), and top management support (Premkumar and Roberts, 1999; Kambil, Kamis et al., 2000; Beatty, Shim et al., 2001) that significantly influence the organizational adoption of technological innovation.

Presence of champions. According to Meyer (2000), "champion is defined as a management level person who recognizes the usefulness of an idea to the organization and leads authorities and resources for innovation throughout its development and implementation". This factor has been emphasized by Lee and Shim (2007) studied the Radio frequency identification (RFID) in the hospital setting. They suggested that the characteristic of management who ultimately make the adoption decision is more important than any other factor in the adoption process. In their study, they found that presence of champions is the critical factor affecting the adoption of RFID. Moreover, in prior studies presence of champions was frequently found as a crucial factor to facilitate the adoption of a new technology by providing the necessary drive and effort to initiate the adoption (Beath, 1991).

Table 1

Summary of reviewed studies of HIS adoption in healthcare.

Author (s)	Hospital innovation/Technology studied	Theories/Models/Contexts/Variables
Yang et al. (2013)	Vital signs monitoring system	Technology: Relative advantage*, Compatibility*, Complexity*, Organization: Top management support*, Environment: Vendor support, TOE
Hsiao et al. (2009)	Mobile Nursing Information System (MNIS)	Technology: Compatibility, Organization: Presence of champions, Top management support, Environment: External pressure-competitors*, External pressure-government, Vendor support*, TOE
Lin et al. (2012)	Health Level Seven (HL7)	Technology: Compatibility, Security concern, Organization: Top management support*, Environment: External pressure-competitors*, External pressure-government, Vendor support, TOE
Chang et al. (2007)	E-signature	Technology: Complexity, Security concern, Environment: Vendor support*, TOE
Hill, 2000	Hospital costing systems	Environment: External pressure-competitors*, External pressure-government*, Institutional theory
Chang et al. (2006)	Picture Archiving and Communication System (PACS)	Technology: Relative advantage*, Compatibility, Organization: Top management support*, Environment: External pressure-government*, TOE
Lee and Shim, (2007)	Radio Frequency Identification (RFID)	Technology: Relative advantage*, Organization: Presence of champions*, Environment: External pressure-competitors*, TOE (need pull & technology push)
Gagnon et al. (2004)	Telehealth	Environment: External pressure-competitors*, Institutional theory
Li et al. (2005)	Mobile nursing technology	Technology: Compatibility, Organization: Presence of champions, Top management support, Environment: External pressure-competitors*, TOE
Hung et al. (2010)	Hospital CRM system	Technology: Relative advantage*, Complexity, Organization: IS infrastructure*, TOE
Liu et al. (2011)	Telecare	Technology: Relative advantage, Compatibility, Organization: Top management support, Environment: Vendor support*, TOE
Ahmadi et al. (2015)	HIS	Technology: Relative advantage*, Organization: Hospital size*, Environmental: Government policy*, Human: Perceived technical competence*, TOE and HOT-fir model
Egea and González, (2011)	Electronic Health Care Records (EHCR systems)	Attitude toward usage*, perceived institutional trust*, usefulness perception*, perceived ease of use, information integrity, perceived risk, TAM, TRA and TPB
Hung et al. (2012)	Evidence-based Medicine (EBM)	Attitude*, Perceived behavioural control*, subjective norm*, perceived usefulness, interpersonal influence, self-efficacy, personal innovativeness in it, perceived ease of use, facilitating conditions, TPB
Melas et al. (2011)	Information and Communication Technology (ICT)	Attitude toward usage*, perceived usefulness*, perceived ease of use, physician specialty*, ICT knowledge*, ICT feature demands*, TAM
Terzis and Economides, (2011)	Computer Based Assessment (CBA)	Attitude*, perceived ease of use*, perceived playfulness*, perceived usefulness, computer self efficacy, social influence, facilitating conditions, content and goal expectancy, TPB, TAM, Unified Theory of Acceptance and Usage of Technology (UTAUT)
Wu et al. (2011)	Mobile healthcare	Perceived behavioural control*, subjective norm*, attitude*, perceived usefulness*, perceived ease of use, perceived service availability*, personal innovativeness in IT*, TAM and TPB

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According to Sulaiman (2011), the person who has more power is able to have control over the adoption and implementation of the IS. She further noted that the champion who is a chief surgeon and the IT coordinator, is an integral player in the success of HIS adoption and implementation.

IS infrastructure. Existence of sophisticated telecommunication and database facilities within the firm are the important foundations for IS infrastructure (Grover, 1993). According to IT innovation literature, firm's technological strengths have been indicated as a crucial facilitator for the technological innovation adoption (Rogers and Shoemaker, 1971; Maidique and Zirger, 1984; Huang, Ou et al., 2006). IS infrastructure includes the tangible resource which includes infrastructure components such as hardware and software. According to Ross et al. (1996), with IS infrastructure the importance of a sharable platform and technology is essential for integrating systems in the organization in order to make IS applications more cost effective especially in the area of operations and support. In addition, increasing use of sophisticated IS infrastructure can lead to enormous advantage to clinical workflow (Bardach, Huang et al., 2009).

According to Zhu et al. (2006), within the technological context, firm in developing countries have less developed IS infrastructure. In Pakistan they faces barrier of IT infrastructure which find difficulty in obtaining a suitable software and hardware (Malik and Khan, 2009). Moreover, Ismail et al. (2013) surveyed several tertiary public hospitals in Malaysia to identify the critical issues and challenges in the development of HIS technology. They found out infrastructure is one of the critical issues in the country that needs immediate consideration.

Top management support. According to Lian et al. (2014), "top manager's support refers to whether or not the top managers understand the nature and functions of HIS technology and therefore fully support the development of it". In the recent review of IT adoption literature by Jeyaraj (2006), top management support possesses a strong empirical support for IT innovation adoption by organizations. Moreover, Thong and Yap (1995) argued that the adoption of an innovation technology is affected by top managers' attitude, wonderfully when they own enough IT-related knowledge and have the ability of understanding the IT advantages and disadvantages.

In the healthcare domain and context of HIS, the support from top management found to be crucial for the introduction of PACS technological innovation (Chang, Hwang et al., 2006). They emphasized that top manager's support critically affect the decision for the PACS adoption. Further, in investigating the adoption of vital sign monitoring system, Yang and Lim (2013) stressed on the important role of top management in providing the adequate resources (financial and other sources). Furthermore, this echoes the result of prior IT adoption studies (Beath, 1991; Premkumar and Ramamurthy, 1995; Tan and Teo, 1998; Premkumar and Roberts, 1999; Kambil, Kamis et al., 2000; Wongpinunwatana and Lertwongsatien, 2003).

Environmental context. According to Tornatzky et al. (1990), factors in the context of environment can affect organizational adoption of technological innovation. By reviewing the organizational adoption of HIS studies, two important aspects regarding the organization external environment were found. First, it contains the pressures of external environment of the organization with regard to competitors and government policy and second includes the support from the vendors. Hence, these two aspects were identified from the organization external environment that has major effects on the HIS innovation adoption.

Recently, institutional theory has been applied by some IT innovation studies to better understand the effects of external environmental pressures on organizational adoption of IT innovation. They strongly propose that there are three types of external environmental pressures that can affect the organizational adoption of IT which are coercive pressure, mimetic pressure and normative pressure (DiMaggio and Powell, 1983). According to Gagnon et al. (2004) "among the theoretical models that have been used to investigate the characteristics influencing technology adoption by organizations, institutional theory (DiMaggio and Powell, 1983) proposes relevant concepts to analyse the relationship between hospitals' organizational structures and the process of technological health integration". In addition to that, Prasad and Prasad (1994) accentuate the adoption of IS by healthcare professionals can be the main impact of the ideology of professionalism. Moreover, they emphasized that in healthcare organizations, technology adoption is not only influenced by efficiency, performance, and profitability which are as instrumental considerations. Institutional theory perspective has been adopted (DiMaggio and Powell, 1983) to looking at non-instrumental factors covering the symbolic, cultural and political aspects involved in the processes of work computerization in hospitals.

Subsequently, Gagnon et al. (2004) and Lin et al. (2012) indicated the importance of institutional theory to improve the understanding of HIS adoption in the context of hospitals. Furthermore, most of the studies of organizational adoption of HIS stressed the two pressures outside the organization that consist of mimetic pressure by competitors and coercive pressure by government as the most frequently external pressures. Hence, this study motivated to consider the mimetic and coercive pressures as two applicable external pressures for our study of HIS adoption. Nevertheless, the normative pressure will not be included since there was no any important relevancy or connection between normative pressure and those prior studies of HIS adoption.

6.2 Institutional theory

Teo et al. (2003) stated that "organizations are embedded in institutional networks" and they accentuated that to investigate organizational IT innovation adoption, understanding of the institutional pressures should be taken into a serious consideration. Institutional theory believes in institutional isomorphism. This is a consequence of

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external institutional pressures that penetrates firms where resides in organizational field and leads to substantially resemble each other. These external institutional pressures was introduced by DiMaggio and Powell (1983). They proposed that three external institutional pressures include mimetic, coercive, and normative pressure can push organizations to adopt an innovation. These pressures come from the organizations that have already adopted the innovation and therefore lead another organization to be in the same direction.

Mimetic pressure refers to those that cause organizations to copy or imitate the behaviour of other organizations in their environment that are perceived to be similar (for instance operating in the same industry) (Palmer, Jennings et al., 1993; Porac, Wade et al., 1999); closely connected by ties, including resources, information, and board interlock; have high prestige; and are more successful. If such organizations adopt a practice, then it exerts mimetic pressure on other organizations to do so as well.

The second pressure suggested by DiMaggio and Powell (1983) is coercive pressure, which is defined as formal or informal pressures that will be exerted on organizations by other firms upon which these organizations are dependent. An organization's stakeholders can exert coercive pressure to conform to their demands or expectations. These stakeholders include: customers, suppliers and formally established agencies, such as governments, trade associations and other bodies with regulatory power over the firm (DiMaggio and Powell, 1983).

The final institutional pressure is normative pressure. Institutional theory suggests that when values and norms are taught from a variety of sources in organizations regarding the new business practices, organizations are conquered by normative pressure to adopt these new practices (DiMaggio and Powell, 1983; Chiravuri and Ambrose, 2002). This is due to the fact that organizations perceive adoption of new business practices that will bring them into the benefits and thus they are simply pushed by normative pressure (Richard, 2003).

Several previous studies of organizational IT innovation in the adoption context examined the effects of those institutional pressures described above, and found them statistically have a significant impact on adoption of IT innovation (Silva and Figueroa, 2002; Tan and Fichman, 2002; Teo, Wei et al., 2003; Gibbs and Kraemer, 2004; Son and Benbasat, 2007). Thus, it can be proved that, institutional theory has been used in IS research to demonstrate organizational technology adoption can be a result of mimetic, coercive, and normative forces of the institutional environment.

Mimetic pressure-competitors. According to the institutional theory, organizations in the same network can be influenced by mimetic pressure to copy the action or strategy of other organizations in their environment (DiMaggio and Powell, 1983). According to Haveman (1993), in two ways organizations can be influenced by mimetic pressure. First, growth of organizations that have adopted the same business practices in their environment and therefore this mimetic pressure establish the bandwagon (Abrahamson and Rosenkopf, 1993). Second, mimetic pressure can penetrate the organizations when they perceive that the business practices taken by other organizations in their environment are successful. Hence, organizations imitate or copy the business practices of other organizations that arise from the mimetic pressure. This is due to the fact that organization would avoid to be seen as laggard to its stakeholders or competitors (Yoon, 2009). Furthermore, according to institutional theory (DiMaggio and Powell, 1983), "an organization will imitate the actions of other structurally equivalent organizations because those organizations occupy a similar economic network position in the same industry and thus, share similar goals, produce similar commodities, share similar customers and suppliers and experience similar constraints".

Kimberly and Evanisko (1981) investigated the HIS adoption and reported that hospitals when see, other hospitals in the same chain using the HIS in their operations, they feel pressure to adopt HIS innovation. Although institutional theory has not been used explicitly in prior studies of HIS adoption, some former studies implied that competitive pressure positively influence organizational adoption of HIS, which are similar to mimetic pressure exerted by competitors (Hill, 2000; Gagnon, Lamothe et al., 2004; Li, Chang et al., 2005; Lee and Shim, 2007; Hsiao, Li et al., 2009; Lin, Lin et al., 2012).

Coercive pressure-government. Institutional theory suggests that when stakeholders such as suppliers, customers, and government regulatory bodies can be influential to take over the action practiced by the organizations, there will be a pressure that exerts by stakeholders on the organization to adopt new action or strategies, or business practices. Hence, this pressure are known as coercive pressure (DiMaggio and Powell, 1983). Moreover, government can be simply an example of coercive pressure that could pursue or promote the IT technology innovation in the context of organizational adoption. This can considerably influence the IT adoption of an organization (Moon and Bretschneider, 1997; Kuan and Chau, 2001; Gibbs and Kraemer, 2004). Gibbs and Kraemer (2004) examined the role of government policy factors included government promotion and legislation barriers on the intention to adopt and use of e-commerce. They strongly emphasized the important role of government policy including promotion in several aspects from government to impact the process of e-commerce adoption and use. Therefore, government policy specifically with the aim of promotion has been found in prior IT adoption studies to positively affect the organization adoption (Chen, 2003; Palacios, 2003; Wong, 2003).

In line with prior studies of organizational adoption in HIS as was reviewed in earlier, except few, the rest did not explicitly use the institutional theory. They found the government policy as a driving force or environmental pressure positively related in the adoption of HIS in hospitals which is similar to coercive pressure. In addition to that, government set related policies that covering

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different set of rules or rewards, or promotion program to pursue the adoption of HIS which consequently will eventuate in the institutionalized adopted HIS in hospital setting (Hill, 2000; Inamura, Kousaka et al., 2003; Chang, Hwang et al., 2006; Chee and Barraclough, 2007; Lin, Lin et al., 2012).

6.3 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) proposed by Ajzen in 1985 is designed to predict human behaviour in various contexts, and is applicable to IS use (Mathieson, 1991).

TPB is a theory that has seeped its way into the discipline of behavioural science, and is used mainly to assess and comprehend people's behaviour in a variety of situations. TPB is widely used to examine different kinds of intentions and behaviours in particular contexts (Lim et al., 2011), and is well tested in the field of IT in terms of describing the individual's acceptance and use of technology (Hsu and Chiu, 2004; Hozhabri, Nor et al., 2012). Therefore, three antecedents of intention in TPB including perceived behavioural control, attitude and subjective norm may provide a clearer representation of the healthcare professionals' behavioral intention to use HIS in the hospital working process.

Attitude toward behavior. It is defined as "an individual's positive or negative feelings (evaluative effect) about performing the target behaviour" (Fishbein and Ajzen, 1975b). It indicates the positive or negative feelings of a person towards carrying out the target behaviour. In other words, on the appraisal of some behavioural values, attitudes are identified that reflect the subjective possibility that behavioural intention will result in probable occurrence.

subjective norm. It refers to "the person's perception that most people who are important to him think he should perform the behaviour in question" (Fishbein and Ajzen, 1975b). Subjective norm is the perception of an individual about what others think of his or her behaviour in question. In fact, subjective norm contends that individuals can be influenced to do or not do an activity or behaviour in a given situation by referent others considered important to them.

Perceived behavioural control. It is a construct unique to TPB, and it has increased the explanatory power of TPB (Lean et al., 2009). This component is defined as "the perceived ease or difficulty of performing the behaviour" (Ajzen, 1991). Accordingly, if an individual perceives that he or she is more capable, and that the difficulty of a certain behaviour is relatively less, his or her perceived behavioural control will be greater. An understanding of perceived behavioural control increases the explanatory power of predicting behavioural intention, by including deficiencies, or strengths, in the user's abilities and resources for using an IS (Hung et al., 2012). This theory is one of the more relevant cognitive models for the prediction and interpretation of behaviour, as it can provide a useful theoretical framework for the adoption of IT (Yaghoubi and Bahmani, 2010). The theory centres on the assumption that people act according to their intentions, which are basically affected by their thoughts, personal standards and their seeming behavioural controls.

Behavioural intention. According to prior researches, behavioural intention plays a critical role in predicting usage behaviour (Ajzen and Fishbein, 1980; Ajzen, 1991; Davis 1986b; Venkatesh and Davis, 2000a; Taylor and Todd, 1995a; Venkatesh et al., 2003a) and has been well-established in IS (Venkatesh et al., 2003b). Given that the

most proximal antecedent to IT use is behavioural intention to use it (Holden and Karsh, 2010), this study tries to investigate the behavioural intention of healthcare professionals to use of HIS in the hospital working process. The behavioural intention of performing a particular behaviour is determined by three key constructs, namely attitude toward behaviour, subjective norm and perceived behavioural control.

7. Discussion

The current study looked at identifying the crucial factors including the important contexts and corresponding variables which can have a major and critical effect in determining the hospitals' adoption of HIS innovation. Clearly, HIS has a complex nature. Therefore, Oliveira and Martins (2011) in their review of IT organizational adoption theories suggested, for more complex new technology adoption in the organizational level, the combination of more than one theoretical model is important that can lead to a better understanding of the IT adoption phenomenon. Based on existing literature of both IT and HIS innovation adoption, our study considered and followed the TOE framework, institutional theory, and TPB. In this regard, extant research has demonstrated that the TOE framework has a broad applicability and possesses explanatory power across a number of technological, industrial, and national/cultural contexts. Moreover, TOE framework alone has been used by numerous authors to understand different IT innovations adoption, nevertheless some others applied the TOE framework with other relevant theories to make a powerful prediction of IT innovation adoption. As was presented earlier in this study, the TOE framework has been used to explain the adoption of variety of IS innovations with regard to healthcare industry. Furthermore, prior studies of HIS applied TOE to achieve more understanding the adoption process of HIS technology.

In addition, institutional theory was used to foresee the impact of external pressures that could have on IT innovation adoption in the organizational context. Hence, institutionalized environment would spread the institutional pressures that may increase the propensity of organizations and/or push them to adopt interorganizational system. Moreover, in several previous studies, the TOE framework has been combined with institutional theory to give a more understanding of IT innovation adoption (Soares-Aguiar and Palma-dos-Reis, 2008; Yu-hui, 2008). In this regard, the environmental context of the TOE framework was

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added by external pressures related to institutional theory, consists of pressure from competitors and pressure that can be exerted by stakeholders as government. With respect to the context of HIS, although institutional theory has not been used explicitly in prior studies of HIS adoption, several studies suggested that HIS adoption is affected by competitive pressure in a positive manner, which is similar to mimetic pressure in the institutionalized environment that is exerted by competitors. By the same token, prior HIS adoption research found that the government policy as a driving force or environmental pressure positively related in the adoption of HIS in hospitals which is similar to coercive pressure. With respect to TPB, it is widely used in identifying predictor of health behaviour and also health behaviour change interventions like breast self-examination, mammography intention, intention to use condoms, exercise, parent-infant feeding, and smoking cessation program (Lee et al., 2012). According to Lee et al. (2012), "TPB has been applied in many types of technologies and the model itself also has been decomposed and modified to encompass other constructs to increase the predicting power; application of TPB in healthcare explains an average of 41% of the variance in intention and 31% in behaviour in prospective studies". Therefore, this study introduced the technological, organizational, environmental and individual context of TPB (Fig. 2) in order increase the level of variance explained on HIS adoption.

By integrating TOE framework, institutional theory along with TPB, important contribution would be given to the theory to understand specific type of IT innovation in the healthcare industry and also providing theoretical contribution in the context of medical informatics as to study the HIS technological innovation specifically in a hospital setting. Future study is appreciated to strengthen and validate the conceptual multi-level model that was proposed in the current research by using survey method with the purpose of testing the potential relationship among technological, organizational, environmental and individual factors on the decision of Malaysian hospitals to adopt the HIS. In addition, the respondents could be the top managers as the key decision makers and healthcare professionals as the intended users. This can be due to the fact that this study constructed the multi-level model where individual context has been added into the TOE framework. Thus, this research provides a research novelty by introducing the individual context into the multi-level model, which has not been considered by prior studies of organizational technology adoption (Faber, 2014).

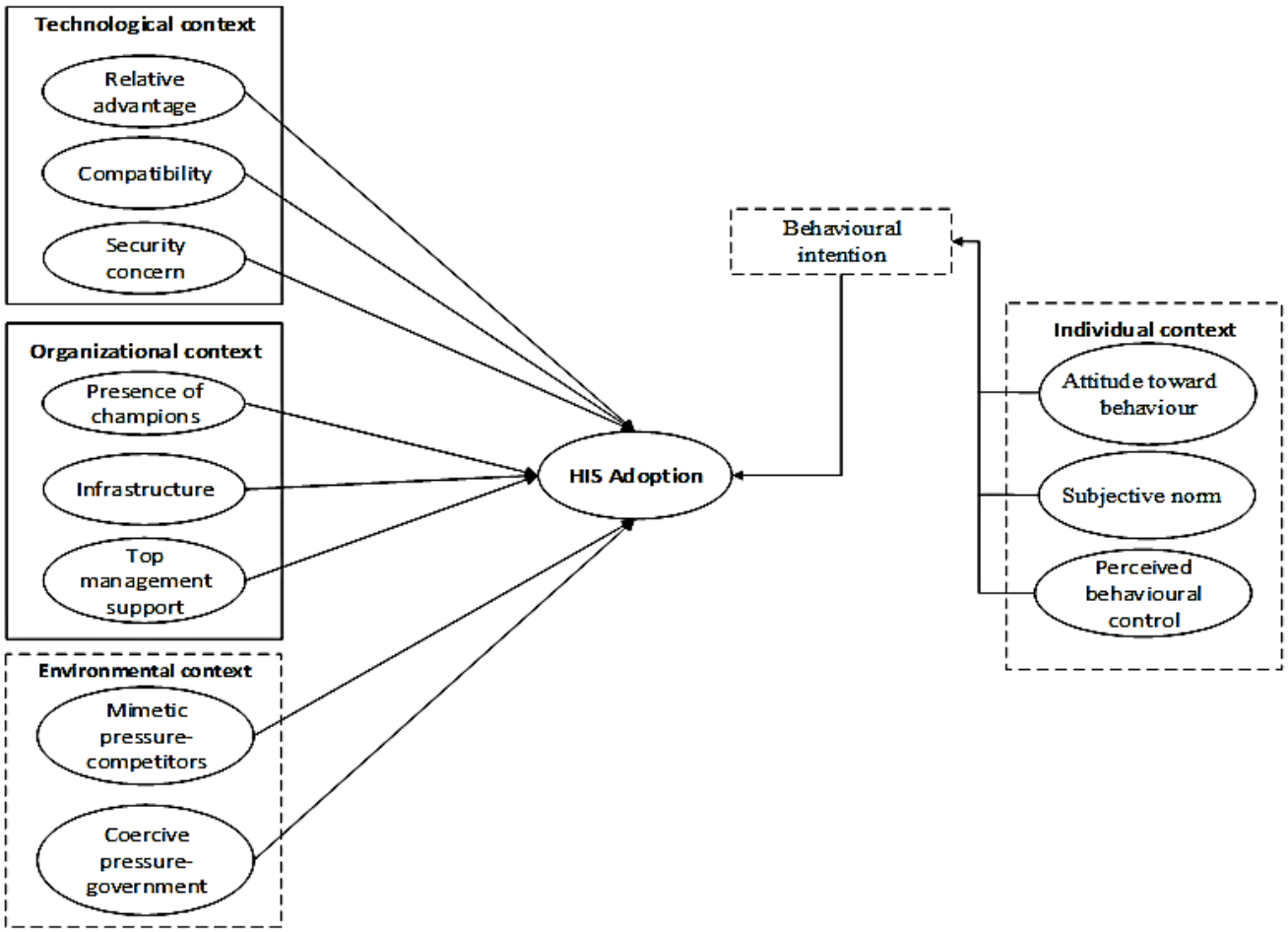

Fig.2. Research Model

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8. Conclusion

There are many benefits that HIS brings to the healthcare community and indirectly gives numerous values to the patients. Hospitals implemented HIS to improve the efficiency and effectiveness of their healthcare professionals (Hung et al., 2012), as well as to meet requirements for high-quality patient care. In addition, HIS as an information storing and information processing subsystem of the patient care process, makes it possible to manage clinical information, thus allowing physicians and nurses to better manage patients and support them in their daily activities by providing the required medical data for a patient's treatment (Haux et al., 2004). Furthermore, there are other advantages in the development of HIS as to serve for ordering drugs and supplies, ordering tasks and tests, entering results of procedures and tests, and viewing results and referral of patients. Additionally, one of the major issues in a non-computerized hospital that was identified is waiting time. This was the focus for betterment by a fully computerized hospital as to decrease the waiting time in the process of patient admission. Moreover, another purpose for the computerization of the HIS was to decrease the duration time that patient has to stay, reduction of processing time for patient discharge, viewing x-rays in the short period of time, and to make faster seeing and retrieving of the patient's information. Thus, the significance of adopting HIS in hospitals is even more considerable where people and services will be the target of the future healthcare system, in which using the technology will be as a key enabler and act to support a high quality, accessible, integrated, and affordable healthcare system to be acknowledged as one of the world's best.

References

Abdullah, B. (2008). Impact of Teleradiology in Clinical Practice: A Malaysian Perspective. "Teleradiology, Springer: 203-215.

Abidi, S., A. Goh, et al. (1998). Telemedicine and medical informatics in the multimedia super corridor: the Malaysian vision. Studies in health technology and informatics(2): 1282-1286.

Abrahamson, E. and L. Rosenkopf (1993). Institutional and competitive bandwagons: Using mathematical modeling as a tool to explore innovation diffusion. Academy of management review 18(3): 487-517.

Anand, A. and S. Kulshreshtha (2007). The B2C Adoption in retail firms in India. Systems, 2007. ICONS. Second International Conference on, IEEE.

Ash, J. S., P. N. Gorman, et al. (2004). Computerized physician order entry in US hospitals: results of a 2002 survey. Journal of the American Medical Informatics Association 11(2): 95-99.

Bardach, N. S., J. Huang, et al. (2009). Evolving health information technology and the timely availability of visit diagnoses from ambulatory visits: A natural experiment in an integrated delivery system. BMC medical informatics and decision making 9(1): 35.

Barlow, J., S. Bayer, et al. (2006). Implementing complex innovations in fluid multi-stakeholder environments: experiences of 'telecare'. Technovation 26(3): 396-406.

Beath, C. M. (1991). Supporting the information technology champion. MIS quarterly: 355-372.

Beatty, R. C., J. Shim, et al. (2001). Factors influencing corporate web site adoption: a time-based assessment. Information & Management 38(6): 337-354.

Blumenthal, D. and M. Tavenner (2010). The "meaningful use" regulation for electronic health records. New England Journal of Medicine 363(6): 501-504.

Central, M. (2004). Information Directory Malaysia Central.

Chang, I., H.-G. Hwang, et al. (2007). Factors affecting the adoption of electronic signature: Executives' perspective of hospital information department. Decision Support Systems 44(1): 350-359.

Chang, I., H.-G. Hwang, et al. (2006). Critical factors for adopting PACS in Taiwan: Views of radiology department directors. Decision Support Systems 42(2): 1042-1053.

Chau, P. Y. and K. Y. Tam (2000). Organizational adoption of open systems: a 'technology-push, need-pull'perspective. Information & Management 37(5): 229-239.

Chee, H. L. and S. Barraclough (2007). Health care in Malaysia: the dynamics of provision, financing and access, Routledge.

Chen, R.-F. and J.-L. Hsiao (2012). An investigation on physicians' acceptance of hospital information systems: a case study. International journal of medical informatics 81(12): 810-820.

Chen, T.-J. (2003). E-commerce to protect the network relationships: the case of Taiwan's PC industry. The information society 19(1): 59-67.

Chen, Y.-Y., J.-K. Jan, et al. (2005). A fair and secure mobile billing system. Computer Networks 48(4): 517-524.

Chiravuri, A. and P. Ambrose (2002). The critical examination of organizational downsizing and its effects on is organizational learning, memory, and innovation.

Coiera, E. (2003). Guide to health informatics, CRC Press.

Cooper, R. B. and R. W. Zmud (1990). "Information technology implementation research: a technological diffusion approach." Management science 36(2): 123-139.

Cutler, D. M., N. E. Feldman, et al. (2005). US adoption of computerized physician order entry systems. Health Affairs 24(6): 1654-1663.

Dedrick, J. and J. West (2003). Why firms adopt open source platforms: a grounded theory of innovation and standards adoption. Proceedings of the workshop on standard making: A critical research frontier for information systems, Seattle, WA.

DiMaggio, P. J. and W. W. Powell (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American sociological review: 147-160.

Egea, J. M. O. and González, M. V. R. (2011). Explaining physicians' acceptance of EHCR systems: An extension of TAM with trust and risk factors. Computers in Human Behavior. 27 (1), 319-332.

Fichman, R. G. (2000). The diffusion and assimilation of information technology innovations. Framing the domains of IT management: Projecting the future through the past: 105-127.

Friede, A., H. L. Blum, et al. (1995). Public health informatics: how information-age technology can strengthen public health. Annual review of public health 16(1): 239-252.

Gagnon, M.-P., L. Lamothe, et al. (2004). The impact of organizational characteristics on telehealth adoption by hospitals. System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on, IEEE.

Gibbs, J. L. and K. L. Kraemer (2004). A Cross Country Investigation of the Determinants of Scope of E-commerce

An International Journal JSCDSS E-ISSN: 2289-8603

Use: An Institutional Approach. Electronic Markets 14(2): 124-137.
Goodhue, D. L. and D. W. Straub (1991). Security concerns of system users: a study of perceptions of the adequacy of security. Information & Management 20(1): 13-27.
Grover, V. (1993). An Empirically Derived Model for the Adoption of Customer based Interorganizational Systems. Decision Sciences 24(3): 603-640.
Hajdukiewicz, J. R., K. J. Vicente, et al. (2001). Modeling a medical environment: an ontology for integrated medical informatics design. International journal of medical informatics 62(1): 79-99.
Haveman, H. A. (1993). Follow the leader: Mimetic isomorphism and entry into new markets. Administrative Science Quarterly: 593-627.
Hill, N. T. (2000). Adoption of costing systems in US hospitals: An event history analysis 1980–1990. Journal of Accounting and Public Policy 19(1): 41-71.
Hong, W. and K. Zhu (2006). Migrating to internet-based e-commerce: factors affecting e-commerce adoption and migration at the firm level. Information & Management 43(2): 204-221.
Hozhabri, A. A., K. M. Nor, et al. (2012). Online Shopping Research over the last two decades: A Literature Analysis. New Marketing Research Journal: 17-26
Hsiao, J.-L., H.-C. Chang, et al. (2011). A study of factors affecting acceptance of hospital information systems: a nursing perspective. Journal of Nursing Research 19(2): 150-160.
Hsiao, S.-J., Y.-C. Li, et al. (2009). Critical factors for the adoption of mobile nursing information systems in Taiwan: the nursing department administrators' perspective. Journal of medical systems 33(5): 369-377.
Huang, S.-M., C.-S. Ou, et al. (2006). An empirical study of relationship between IT investment and firm performance: A resource-based perspective. European Journal of Operational Research 173(3): 984-999.
Hung, S.-Y., W.-H. Hung, et al. (2010). Critical factors of hospital adoption on CRM system: Organizational and information system perspectives. Decision Support Systems 48(4): 592-603.
Hung, S., Ku, Y. and Chien, J. (2012). Understanding physicians' acceptance of the Medline system for practicing evidence-based medicine: A decomposed TPB model. International Journal of Medical Informatics. 81(2), 130-142.
Inamura, K., S. Kousaka, et al. (2003). PACS development in Asia. Computerized medical imaging and graphics 27(2): 121-128.
Ismail, A., A. T. Jamil, et al. (2010). The implementation of Hospital Information System (HIS) in tertiary hospitals in malaysia: a qualitative study. Malaysian Journal of Public Health Medicine 10(2): 16-24.
Ismail, N. I., N. H. Abdullah, et al. (2013). Implementation Differences of Hospital Information System (HIS) in Malaysian Public Hospitals. Technology 20(21): 22.
Jeyaraj, A., J. W. Rottman, et al. (2006). A review of the predictors, linkages, and biases in IT innovation adoption research. Journal of Information Technology 21(1): 1-23.
Jha, A. K., C. M. DesRoches, et al. (2009). Use of electronic health records in US hospitals. New England Journal of Medicine 360(16): 1628-1638.
Jha, A. K., C. M. DesRoches, et al. (2010). A progress report on electronic health records in US hospitals. Health Affairs 29(10): 1951-1957.
Kambil, A., A. Kamis, et al. (2000). Influences on the corporate adoption of web technology. Communications of the ACM 43(11es): 9.
Kaplan, B. (2001). Evaluating informatics applications—clinical decision support systems literature review. International journal of medical informatics 64(1): 15-37.
Khoumbati, K., M. Themistocleous, et al. (2006). Evaluating the adoption of enterprise application integration in health-care organizations. Journal of management information systems 22(4): 69-108.
Kim, C.-y., J.-S. Lee, et al. (2002). Early stage evolution of a hospital information system in a middle income country: A case study of Korea. International journal of healthcare technology and management 4(6): 514-524.
Kimberly, J. R. and M. J. Evanisko (1981). Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. Academy of management journal 24(4): 689-713.
Kuan, K. K. and P. Y. Chau (2001). A perception-based model for EDI adoption in small businesses using a technology–organization–environment framework. Information & Management 38(8): 507-521.
Lee, C.-P. and J. P. Shim (2007). An exploratory study of radio frequency identification (RFID) adoption in the healthcare industry. European Journal of Information Systems 16(6): 712-724.
Lee, H. W., T. Ramayah, et al. (2012). External factors in hospital information system (HIS) adoption model: a case on malaysia. Journal of medical systems 36(4): 2129-2140.
Lee, S. and K.-j. Kim (2007). Factors affecting the implementation success of Internet-based information systems. Computers in human behavior 23(4): 1853-1880.
Li, J. (2010). Building a healthy Malaysia. Asia-Pacific Future GOV.
Li, Y.-C., I.-C. Chang, et al. (2005). The critical factors affecting hospital adoption of mobile nursing technologies in Taiwan. System Sciences, 2005. HICSS'05. Proceedings of the 38th Annual Hawaii International Conference on, IEEE.
Lian, J.-W., D. C. Yen, et al. (2014). An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. International Journal of Information Management 34(1): 28-36.
Lin, C.-H., I.-C. Lin, et al. (2012). Critical Factors Influencing Hospitals' Adoption of HL7 Version 2 Standards: An Empirical Investigation. Journal of medical systems 36(3): 1183-1192.
Liu, C.-F. (2011). Key factors influencing the intention of telecare adoption: An institutional perspective. Telemedicine and e-Health 17(4): 288-293.
Luxton, D. D., R. A. Kayl, et al. (2012). M-Health data security: The need for HIPAA-compliant standardization. Telemedicine and e-Health 18(4): 284-288.
Maidique, M. A. and B. J. Zirger (1984). A study of success and failure in product innovation: the case of the US electronics industry. Engineering Management, IEEE Transactions on(4): 192-203.
Malik, M. A. and H. R. Khan (2009). Understanding the implementation of an electronic hospital information system in a developing country: a case study from Pakistan. Proceedings of the Third Australasian Workshop on Health Informatics and Knowledge Management-Volume 97, Australian Computer Society, Inc.
Marques, A., T. Oliveira, et al. (2011). Medical Records System Adoption in European Hospitals. Electronic Journal of Information Systems Evaluation 14(1).

An International Journal JSCDSS E-ISSN: 2289-8603

Melas, C. D., Zampetakis, L. A., Dimopoulou, A. and Moustakis, M. (2011). Modeling the acceptance of clinical information systems among hospital medical staff: An extended TAM model. Biomedical Informatics.

Meyer, M. (2000). Innovation roles: from souls of fire to devil's advocates. Journal of Business Communication 37(4): 328-347.

MMR (2014). Malaysian Medical Links and Blogs by Malaysia Doctors.

MOH-Malaysia. (2014). Ministry of Health Official Website. Retrieved 07 July 2014, from http://www.moh.gov.my/english.php.

Mohan, J. and R. Razali Raja Yaacob (2004). The Malaysian Telehealth Flagship Application: a national approach to health data protection and utilisation and consumer rights. International Journal of Medical Informatics 73(3): 217-227.

Mohd, H. and S. M. Syed Mohamad (2005). Acceptance model of electronic medical record. Journal of Advancing Information and Management Studies 2(1): 75-92.

Moon, M. J. and S. Bretschneider (1997). Can state government actions affect innovation and its diffusion?: An extended communication model and empirical test. Technological Forecasting and Social Change 54(1): 57-77.

Nelson, M. L. and M. J. Shaw (2003). The adoption and diffusion of interorganizational system standards and process innovations. Urbana 51: 61801.

Oliveira, T. and M. F. Martins (2011). Literature Review of Information Technology Adoption Models at Firm Level. Electronic Journal of Information Systems Evaluation 14(1).

Palacios, J. J. (2003). The development of e-commerce in Mexico: A business-led passing boom or a step toward the emergence of a digital economy? The information society 19(1): 69-79.

Palmer, D. A., P. D. Jennings, et al. (1993). Late adoption of the multidivisional form by large US corporations: Institutional, political, and economic accounts. Administrative Science Quarterly: 100-131.

Porac, J. F., J. B. Wade, et al. (1999). Industry categories and the politics of the comparable firm in CEO compensation. Administrative Science Quarterly 44(1): 112-144.

Prasad, P. and A. Prasad (1994). The ideology of professionalism and work computerization: An institutionalist study of technological change. Human Relations 47(12): 1433-1458.

Premkumar, G. and K. Ramamurthy (1995). The Role of Interorganizational and Organizational Factors on the Decision Mode for Adoption of Interorganizational Systems. Decision Sciences 26(3): 303-336.

Premkumar, G. and M. Roberts (1999). Adoption of new information technologies in rural small businesses. Omega 27(4): 467-484.

Ratnasingham, P. (1997). EDI security: a model of EDI risks and associated controls. Information Management & Computer Security 5(2): 63-71.

Richard, S. W. (2003). Organizations: Rational, natural, and open systems, Prentice Hall, USA.

Rogers, E. (1983). "M. (1983). Diffusion of innovations. New York.

Rogers, E. M. and F. F. Shoemaker (1971). Communication of innovations: A cross-cultural approach.

Rogers Everett, M. (1995). Diffusion of innovations. New York.

Ross, J. W., C. M. Beath, et al. (1996). Develop long-term competitiveness through IT assets. Sloan management review 38(1): 31-42.

Rothstein, M. A. (2011). Physicians' Duty to Inform Patients of New Medical Discoveries: The Effect of Health Information Technology. Journal of Law, Medicine and Ethics 39(4).

Salleh, A. (2003). The Working of a Paperless Hospital. Selayang Hospital, Selayang, Malaysia.

Schoen, C., R. Osborn, et al. (2009). A survey of primary care physicians in eleven countries, 2009: perspectives on care, costs, and experiences. Health Affairs 28(6): w1171-w1183.

Silva, L. and E. Figueroa (2002). Institutional intervention and the expansion of ICTs in Latin America: The case of Chile. Information Technology & People 15(1): 8-25.

Soares-Aguiar, A. and A. Palma-dos-Reis (2008). Why do firms adopt e-procurement systems? Using logistic regression to empirically test a conceptual model. Engineering Management, IEEE Transactions on 55(1): 120-133.

Soliman, K. S. and B. D. Janz (2004). An exploratory study to identify the critical factors affecting the decision to establish Internet-based interorganizational information systems. Information & Management 41(6): 697-706.

Son, J.-Y. and I. Benbasat (2007). Organizational buyers' adoption and use of B2B electronic marketplaces: efficiency-and legitimacy-oriented perspectives. Journal of management information systems 24(1): 55-99.

Stegwee, R. A. and T. A. Spil (2001). Strategies for healthcare information systems, IGI Global.

Sulaiman, H. (2011). Healthcare Information Systems Assimilation: The Malaysian Experience, RMIT University.

Sulaiman, H. and N. Wickramasinghe (2014). Assimilating Healthcare Information Systems in a Malaysian Hospital. Communications of the Association for Information Systems 34(1): 66.

Sulaiman, S. and R. A. Alias (2006). Information Ethics in Malaysia Paperless Hospital.

Swanson, E. B. (1994). Information systems innovation among organizations. Management science 40(9): 1069-1092.

Tachinardi, U., M. Gutierrez, et al. (1993). Integrating Hospital Information Systems. The challenges and advantages of (re-) starting now. Proceedings of the Annual Symposium on Computer Application in Medical Care, American Medical Informatics Association.

Tan, M. and T. S. Teo (1998). Factors influencing the adoption of the Internet. International Journal of Electronic Commerce: 5-18.

Tan, S. and M. Fichman (2002). Adoption of web-based transactional banking: Efficiency-choice and neo-institutional perspectives.

Teo, H.-H., K. K. Wei, et al. (2003). Predicting intention to adopt interorganizational linkages: an institutional perspective. MIS quarterly: 19-49.

Theera-Ampornpunt, N. (2011). Thai Hospitals' Adoption of Information Technology: A Theory Development and Nationwide Survey, University of Minnesota.

Thong, J. Y. (1999). An integrated model of information systems adoption in small businesses. Journal of management information systems 15(4): 187-214.

Thong, J. Y. and C.-S. Yap (1995). CEO characteristics, organizational characteristics and information technology adoption in small businesses. Omega 23(4): 429-442.

Ting, S., S. K. Kwok, et al. (2011). Critical elements and lessons learnt from the implementation of an RFID-enabled healthcare management system in a medical organization. Journal of medical systems 35(4): 657-669.

Tornatzky, L. G., M. Fleischer, et al. (1990). The processes of technological innovation, Lexington Books Lexington, MA.

Tornatzky, L. G. and K. J. Klein (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. Engineering Management, IEEE Transactions on(1): 28-45.

An International Journal JSCDSS E-ISSN: 2289-8603

Terzis, V., Moridis, C. N. and Economides, A. A. (2012). How student's personality traits affect Computer Based Assessment Acceptance: Integrating BFI with CBAAM. Computers in Human Behavior. 28(5), 1985–1996.

Tyrrell, S. (2002). Using information and communication technology in healthcare, Radcliffe Publishing.

UNICEF, M. (2006). "Unicef".

WHO (2006). Malaysia - building foundations for e-health', Global Observatory for eHealth, World health organization."

Wilson, E. V. and N. K. Lankton (2004). Interdisciplinary Research And Publication Opportunities In Information Systems And Healthcare. Communications of the Association for Information Systems 14.

Wong, P.-K. (2003). Global and national factors affecting e-commerce diffusion in Singapore. The information society 19(1): 19-32.

Wongpinunwatana, N. and C. Lertwongsatien (2003). E-commerce adoption in Thailand: an empirical study of small and medium enterprises (SMEs).

Wu, I. L., Li, J. Y. and Fu, C. Y. (2011). The adoption of mobile healthcare by hospital's professionals: An integrative perspective. Decision Support Systems 51 (3), 587-596.

Yang, Z., A. Kankanhalli, et al. (2013). Analyzing the enabling factors for the organizational decision to adopt healthcare information systems. Decision Support Systems 55(3): 764-776.

Yoon, T. (2009). An Empirical Investigation of Factors Affecting Organizational Adoption of Virtual Worlds.

Yu-hui, L. (2008). An empirical investigation on the determinants of e-procurement adoption in Chinese manufacturing enterprises. Management Science and Engineering, 2008. ICMSE 2008. 15th Annual Conference Proceedings., International Conference on, IEEE.
International journal of medical informatics 77(6): 386-398.

Yusof, M. M., A. Papazafeiropoulou, et al. (2008). Investigating evaluation frameworks for health information systems. International journal of medical informatics 77(6): 377-385.

Zadeh Takhti, H. K. (2013). Technology acceptance model for nursing process in hospital information system, Universiti Teknologi Malaysia, Faculty of Civil Engineering.

Zhu, K., K. Kraemer, et al. (2003). Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. European Journal of Information Systems 12(4): 251-268.

Zhu, K., K. L. Kraemer, et al. (2006). The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business. Management science 52(10): 1557-1576.

Zmud, R. W. (1984). An examination of "push-pull" theory applied to process innovation in knowledge work. Management science 30(6): 727-738.

Zhu, K., K. Kraemer, et al. (2003). Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. European Journal of Information Systems 12(4): 251-268.

Zhu, K., K. L. Kraemer, et al. (2006). The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business. Management science 52(10): 1557-1576.

Zmud, R. W. (1984). An examination of "push-pull" theory applied to process innovation in knowledge work. Management science 30(6): 727-738.