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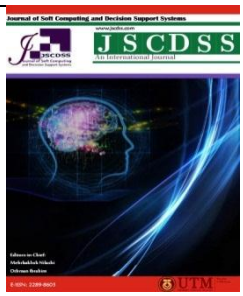

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Investigating a New Framework for Hospital Information System Adoption: A Case on Malaysia

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Abstract

Hospital Information System (HIS) has been designed to provide numerous values to the healthcare community and indirectly provide benefits to the patients. Despite this only a few hospitals in Malaysia have actually adopted it, thus this paper by relying on secondary data aims to provide more insight to the literature review of HIS adoption in the context of Malaysia. In light of this, the study introduces a new combination of three theories namely Technology Organization Environment (TOE) framework, institutional theory along with Human Organization Technology (HOT-fit) model to address the slow rate of HIS adoption by Malaysian public hospitals. We argue that each theoretical perspective has its own explanatory power and that a combination of these three facilitate a much richer interpretation of Information System (IS) implementation regarding the macro-level analysis. Thus, it is hoped, to represent some directions for future research to demonstrate the relationship existing in our new proposed research framework where hospitals by paying attention may take an action in order to achieve a better HIS adoption decision making.

Keywords: Public hospitals, HIS, Adoption decision, TOE framework, Institutional theory, HOT-fit model

1. Introduction

Healthcare in particular hospitals is regarded as an important determinant of national well-being (Ahmadi et al., 2014; Mackenbach et al., 2008). In order to achieve high national well-being, affordable, accessible and high quality healthcare is important (Ahmadi et al., 2014). Nevertheless, the use of Information Technology has been reported rather slow throughout the healthcare field (Ahmadi et al., 2013).

Malaysian healthcare system has been put under pressure as healthcare expenditures are expected to rise significantly in the coming years, mainly due to an increase in overall healthcare consumption (Lee et al., 2012). Besides, the Malaysian government faces an imposing pressure to enhance the healthcare quality (Lee et al., 2012).

Because of the aforementioned issues, several reformations have been started in Malaysian for promoting and maintaining the citizens' wellbeing.

One of the areas that have been aimed for sharp improvement is telemedicine (Abdullah, 2008; Lee et al., 2012). This is known as the Telemedicine Blueprint under the renowned Multimedia Super Corridor (MSC) Telehealth project, Telemedicine is a healthcare-reform initiative introduced to boost the Malaysian healthcare system. Moreover, these reformations heavily help the national vision of 2020 Malaysia toward becoming a developed country in the year 2020 through particular objectives. Hospital Information System (HIS) is introduced to kick starts the process of digitalization of the healthcare sector (Lee et al., 2012).

In this regard, three types of HIS was introduced including Total Hospital Information System (THIS), Intermediate Hospital Information System (IHIS), and Basic Hospital Information System (BHIS) (Hassan, 2004; Ismail et al., 2013; Lee et al., 2012; Mohan & Razali, 2004). According to Lee et al. (2012), "the choice of which hospital information system to implement is based on the number of beds that the particular hospital has." In contrast of these, only 15.2% of the public hospitals in Malaysia are referral hospitals to have fully integrated or partially integrated HIS since the Telehealth project was announced more than a decade ago (Ahmadi et al., 2015; Ismail et al., 2010; Ismail et al., 2013; Lee et al., 2012; MOH-Malaysia, 2014; Sulaiman & Wickramasinghe, 2014). Therefore, most of the hospitals are delaying in adopting the HIS technology.

2. Research Objective

Information and Communication Technologies (ICT) are regarded as a promising source to put forward innovative solutions in order to sustain the Malaysian

healthcare system. According to Lee et al. (2012), "Malaysia as a developing country has been invested a lot of resources in ICT in order to improve healthcare services, but unfortunately the level of ICT integration in healthcare in Malaysia is still not very promising." Therefore, this study investigates the suitable combination of theoretical model that can explain the adoption of HIS in particular to identify the potential barriers and facilitators.

Thus, the questions in this research raised as: what is the suitable theoretical model that can be proposed to facilitate the trend of HIS adoption in Malaysia?

3. Theoretical background

3.1 Technology-Organization-Environment (TOE) framework

The TOE framework, as presented by Tornatzky and Fleischer (Tornatzky & Chakrabarti, 1990), provides a useful analytical framework that can be used for studying the organisational adoption of different types of innovations (Oliveira & Martins, 2011a). In this regard, three contexts interact with each other, and influence decision-making about technological innovation.

The technological context refers to the characteristics of innovation, such as relative advantage, compatibility, complexity and security concern (Gibbs & Kraemer, 2004; Lian & Wang, 2014; Thong, 1999).

The organizational context refers to the characteristics of the organization, such as its size, infrastructure, top management support and financial resources (Lee & Shim, 2007; Premkumar & Roberts, 1999; Zhu & Xu, 2003).

The environmental context includes the characteristics of environment, such as vendor support and business competition (Kuan & Chau, 2001; Premkumar & Roberts, 1999).

According to Low et al. (2011) the TOE framework is a much more useful and suitable analytical tool for explaining the adoption of innovation in an organizational context. Previous studies found that TOE frameworks are useful in understanding critical factors of new IT adoption in a given organization. This is not the exception for the health information system (Ahmadi et al., 2015).

Therefore, the TOE framework can be an appropriate and comprehensive theoretical guideline for studying the factors that affect organizational adoption of HIS innovation.

3.2 Institutional Theory

According to Currie (2012), healthcare is a highly institutionalized organizational field that three isomorphism including mimetic, coercive and normative play an important role to change the strategy, process and structure.

DiMaggio and Powell (1983) stated that organizations are embedded in institutional networks and they called for increased attention to be directed at understanding institutional pressures when investigating IT innovation adoption.

Moreover, institutional theory has been introduced as a potential lens to studying the implementation of IS in healthcare (Currie, 2012; Mekonnen & Sahay, 2008). It provides a comprehensive idea and concept regarding the environmental pressures within macro level of analysis specifically in IS field (Currie, 2012). On other words, institutional theory has been applied to analyse how institutions are changed.

Hence, the study at hand relies on institutional theory to cover broader factors which can affect the hospital's adoption of HIS.

One of the critical concepts embedded in institutional theory is isomorphism. This is useful to be applied when the focus is on the IS implementation as a social phenomenon (Currie, 2012; Jensen & Svejvig, 2009). The "isomorphism" has been placed in the organizational-level where mimetic, coercive and normative institutional pressures exist. These pressures are postulated to impact the assimilation of enterprise systems (Jensen et al., 2009; Liang et al., 2007).

Malaysian public hospitals have always been about their inefficiencies, red tape, lack of flexibility, ineffective accountability and poor performance (Siddiquee, 2006). Hence, there is requirement to redesign governmental processes with the aim of providing service excellence (Siddiquee, 2006).

Therefore, institutional theory seems to be suitable where it explains the outcomes of institutional pressures on the HIS adoption with respect to the macro-level. This also can enhance its legitimacy within the sector, and consequently it leads to the long term outcome of survival for hospitals.

Mimetic pressure forces organizations to imitate the behaviour of another organization. This emanates from the uncertainty as a strong encouragement for imitation behaviour (Currie, 2012; DiMaggio & Powell, 1983).

According to Currie (2012), "coercive isomorphism results from both formal and informal pressures exerted on organizations by other organizations upon which they are dependent by cultural expectation in the society within which organizations function."

Finally, normative pressure has been indicated as the assessment followed by endorsement of suppliers, customers, consultants, and professional associations in the organizational field (Jensen et al., 2009).

The aforementioned three institutional external pressures have been introduced by DiMaggio and Powell (DiMaggio & Powell, 1983) that lead organizations to adopt processes, structures and strategies.

Hence, with respect to the field of healthcare, institutional theory has been accentuated as useful by relying on three aforementioned concepts of institutional pressures. Thus institutional theory in our study is introduced potentially to lead a better and richer interpretation of HIS adoption in the organizational level of analysis (hospitals).

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3.3 Human-Organization-Technology (HOT-fit) model

In the healthcare domain, Yusof et al. (2008) recently developed a new framework based on Human, Organization and Technology-fit (HOT-fit) after having conducted a critical appraisal of the findings of existing HIS evaluation studies. This framework has great overlap with the TOE framework, except that it does not take into account the environmental context. Although this framework does include the organisational context, there are several studies in all industries that point out the importance of the environmental context upon the adoption of IT (Damanpour & Gopalakrishnan, 1998; Oliveira & Martins, 2011b). On the other hand, the TOE framework does not have an explicit category "human". However, this category may be included in the organizational context of the TOE framework. Hence, according to aforementioned discussion, HOT-fit model is deemed as a supplement model to be taken into consideration in the TOE dimensional framework for studying the HIS adoption in Malaysia.

4. Our conceptual research framework

The conceptual research framework for this study is proposed on the basis of aforementioned theories which is shown in Fig. 1. Following the description of the developed conceptual framework.

4.1 Decision to adopt HIS

The dependent variable in this study is the decision to adopting the HIS. A simple dichotomous variable, 'yes' or 'no' to the adoption decision, has been used in many prior studies (Jeyaraj et al., 2006). Hence, by doing so, the two groups of adopters and non-adopters of HIS can be determined out with respect to the Malaysian public hospitals.

4.2 Technical context

Relative advantage of HIS. According to Rogers (1995), relative advantage is "the degree to which an innovation is perceived as better than its precursor." Relative advantage refers to carefully considering the adoption of HIS technology whether diminish hospital operating costs and acquire the relative operational benefits for a given hospital. The study of Premkumar and Roberts (1999) indicated that relative advantages will affect businesses and push them to adopt new information technologies.

Compatibility of HIS. According to Rogers (1995), compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. Ahmadi et al. (2015) in their study of HIS accentuated if the sub-systems of HIS which are more compatible with the existing systems and/or the applications of the hospital, then it will be more hopeful and more feasible to adopt them. Compatibility is indicated as a crucial factor in the context of IT technology adoption (Lin et al., 2012; Thong, 1999).

Complexity of HIS. Complexity refers to the degree to which an innovation is perceived as difficult to use (Thong, 1999). It is also suggested that the perceived complexity of an innovation leads to resistance due to lack of skills and knowledge. Hence, complexity is key considerations for organizations deciding to adopt a new technology (Grover, 1993; Premkumar & Roberts, 1999).

HIS security concern. Luxton et al. (2012) noted that one of the most critical issues in the context of a distribute environment is security problem; hospitals are the most exposed organizations because healthcare data in the purpose of storage and retrieval needs a more secure environment. Accordingly, the security concern has been demonstrated in prior studies as a serious hindrance on the decision to organizational adoption of HIS (Chen et al., 2005; Khoumbati & Irani, 2006; Lian et al., 2014; Ting et al., 2011).

4.3 Organizational context

Hospital size. The size of an organization has been indicated as important by the previous literature. In this light, large hospitals have more resources for changing business strategy. Hence, hospital size contributed a significant influence on decision to adopt innovative technology (Ahmadi et al., 2014; Ahmadi et al., 2015; Chang et al., 2007; Thong, 1999).

Infrastructure. According to Grover (1993), IS infrastructure refers to "the existence of sophisticated telecommunication and database e facilities within the firm." Ross et al. (1996) accentuated that with IS infrastructure the importance of a sharable platform and technology is essential for integrating systems in the organization in order to make IS application more cost effective, especially in the area of operations and support (Ahmadi et al., 2015). Hence, increasing use of sophisticated IS infrastructure can lead to enormous advantage within clinical workflow (Bardach et al., 2009).

Top management support. Top management support refers to the extent of top management support for adopting HIS for increasing the performance (adapted by Grover (1993)). According to a recent review of IT adoption literature by Jeyaraj et al. (2006), top management support is one of the three best predictors for IT innovation adoption by organizations. Furthermore, prior HIS adoption studies find that an organization's decision to adopt the Internet is positively influenced by top management support (Chang et al., 2006; Lian et al., 2014; Lin et al., 2012).

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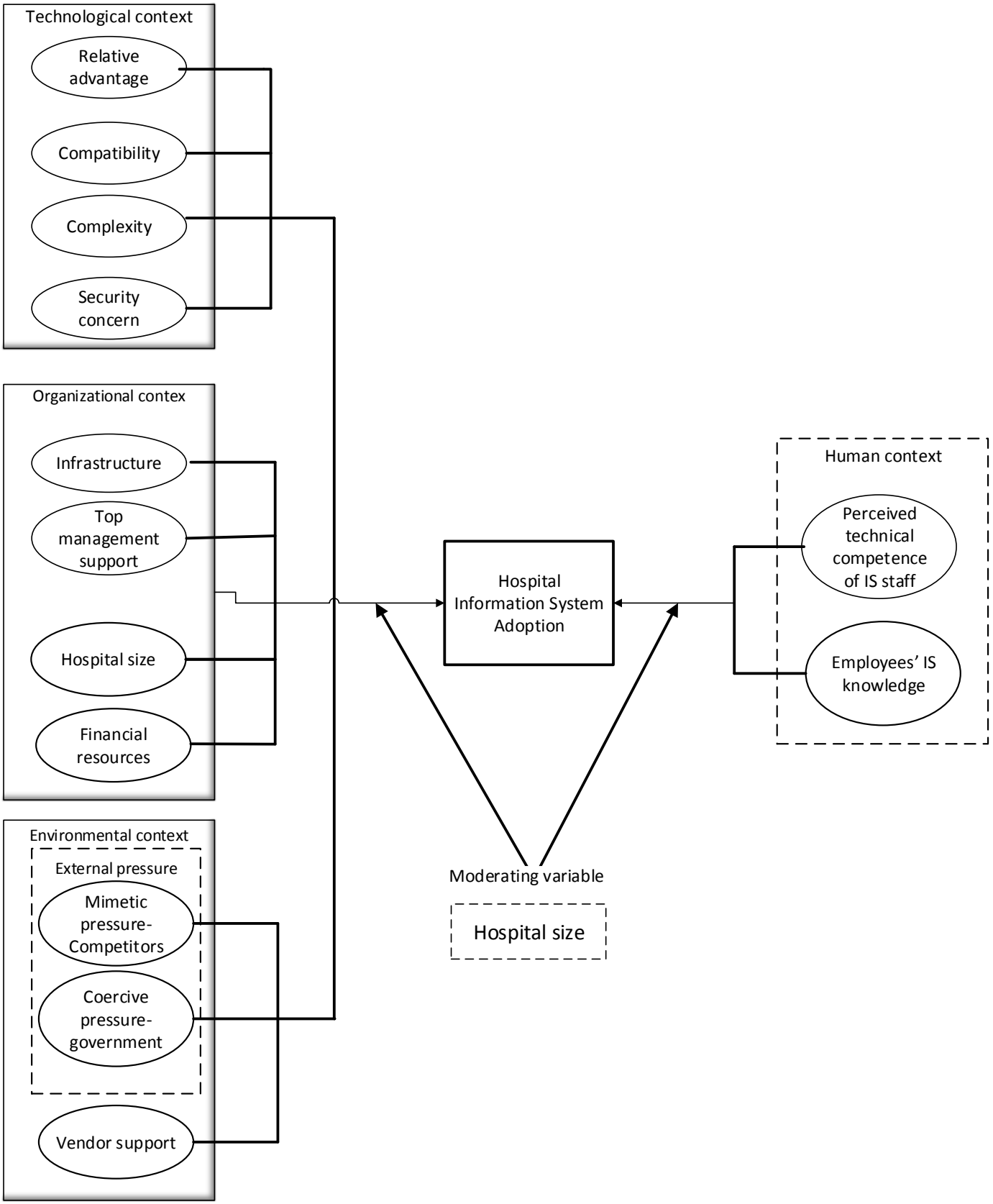

Fig.1. Conceptual research framework.

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Financial resources. Financial resources refers to the financial resources available to pay for installation costs, implementation of any subsequent enhancements, and on-going expenses during usage strongest predictors for successful adoption and implementation (Aron et al., 2011). Prior studies of organizational IT adoption find that financial resources positively influences organizational adoption of the IT innovation (Kambil et al., 2000).

4.4 Environmental context

Mimetic pressure-competitors. Institutional theory proposes that an organization faces high levels of mimetic pressures as increasing numbers of organizations in its environment adopt a practice (DiMaggio & Powell, 1983). Also, if the organization perceives that a practice adopted by other organizations is beneficial or successful, the organization faces high levels of mimetic pressures to imitate the practice (Haveman, 1993). Mimetic pressure has been emphasized as the competitive environment raises. Several previous studies of IS in healthcare stressed the importance of mimetic pressure on the adoption and implementation of health information system (Currie, 2012; Jensen et al., 2009; Klöcker et al., 2014).

Coercive pressure-government. An organization's stakeholders can exert coercive pressures 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 & Powell, 1983). Currie (2012) studied the effects of institutional pressures on the implementation of national programme for IT in hospitals in particular EHRs. She believes that coercive pressure can have a strong influence on the implementation of EHRs. Moreover, some former studies of IS in healthcare, highlighted the critical role of coercive pressure on the adoption of IS innovations in healthcare (Ahmadi et al., 2014; Jensen et al., 2009; Mekonnen & Sahay, 2008).

Vendor support. According to Castro (2007), vendors have a tendency to invest in larger healthcare organizations due to issues concerning recovery of costs. Vendor support has been identified statistically as a significant factor which contributes to the adoption of IS innovation (Sulaiman, 2011).

According to Hsiao et al. (2009), sufficient support from the vendors will facilitate the smooth and efficient adoption of HIS in the Taiwan's hospitals setting.

4.5 Human context

Perceived technical competence. Ettlie and Yap (1990) found that in order to utilize more innovative IT, staff must hold some knowledge of IT innovation. According to Thong (1999), the IS knowledge of staff and the information intensity in the hospitals can be seen as the IS capabilities. According to Lian et al. (2014) cited by Ahmadi et al. (2015), if the IS staff have sufficient knowledge and the adequate skills to adopt IT innovation technology, hospitals will undoubtedly posit more confidence all over the process of adoption.

Employees' IS knowledge. In every organization, human are playing the critical role and considered as the most important asset. For the organization to achieve the fair performance, the proper monitoring and management of human resources has both strategic and legal importance (Ahmadi et al., 2013; Sulaiman, 2011). According to Hung et al. (2010), "because of the obstacle lack of skill and technical knowledge required in the development process, many organizations delay innovation adoption, and tend to wait until they have sufficient technical expertise." Furthermore, the computer or IT experience of personnel within the hospitals has been noted as crucial that need to be considered when evaluating the HIS adoption (Ahmadi et al., 2013).

4.6 Moderator: hospital size

By following Lee and Shim (2007), the current study aims to use the hospital size that may have a moderating effect on the relationship between Technology, Organization, Environment, Human factors and HIS adoption. This attempt to explain the organizational adoption decision process more clearly and provides new insight into IS adoption research (Lee & Shim, 2007).

5. Methodology

The purpose of this study is to identify the influential factors that affect hospitals adoption decision of HIS with regards to Malaysian public hospitals.

In our study, we follow the definition of HIS according to Kim et al. (2002) as "a healthcare information system that integrates computer systems throughout the hospital which was developed to enhance the clinical and administrative function of a hospital; Additionally, it integrates clinical and non-clinical information and its key features include all areas of clinical, financial and administrative". To the best of researchers' knowledge, as of now, there are lack of studies that investigate imperative factors that can affect the adoption of HIS based on combination of three potential adoption theories in IS domain, including TOE framework, institutional theory along with HOT-fit model concerning Malaysian hospitals. Furthermore, the review is conducted in the domain of Malaysia and other countries in the context of health information system in particular HIS adoption.

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

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These online databases were accessible via University Technology Malaysia (UTM) library with the keywords "IS adoption", "organizational decision", "IT adoption", "TOE framework", "institutional theory", "HOT-fit model", "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.

6. Discussion

Previous research explored the TOE perspective as a comprehensive lens to identify the potential factors on health information system in the early stage of diffusion at the firm level by encompassing and focusing on the characteristics of technology, organization, environment (Chang et al., 2007; Chang et al., 2006; Hsiao et al., 2009; Hung et al., 2009; Lian et al., 2014; Liu, 2011). However, the explicit role of human has not been considered in former studies which we have strengthened in the study at hand by providing some insight on HOT-fit model.

Moreover, institutional theory which has been proven to be a central analytical perspective was introduced for future investigation regarding the role of social and historical structures of IS adoption in the organizational-level. In addition, the hospital size has been introduced that may have a crucial role in moderating the effect of four main aforementioned factors of Technology, Organization, Environment, Human and HIS adoption. In other words, there may be significant differences of factors influencing the different sized hospitals.

7. Conclusion

This study on the basis of secondary data provided a literature review and proposed a new conceptual framework which is consisted by the combination of three theories to successfully adopt the HIS innovation. Hence, this would give a better understanding of the HIS and address issues pertaining to its adoption in the hospital level. Thus, four major contexts of Human, Technology, Organization, and Environment were highlighted to have significant effect on the overall adoption decision of HIS.

Finally, on the basis of this study finding, it is suggested for future research to study the relationship of factors in the new proposed framework to contribute in fostering and motivating the trend of HIS innovation diffusion in public hospitals of Malaysia.

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