UNDERSTANDING HOSPITAL INFORMATION SYSTEMS ADOPTION IN CHINA

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Abstract

The introduction of hospital information systems (HIS) into the hospital environment has brought profound changes to the healthcare system around the world. Through an in-depth case study with one of the model digital hospitals in China, this study explores some key factors impacting HIS adoption. To get a holistic view of the HIS adoption process, three different inter-connecting adoption phases were considered in the study, which include the adoption decision making stage, the system implementation stage and the system assimilation stage. The lessons learned from the HIS adoption experiences of the case hospital offer contributions to both theory and practice, particularly within the context of technology adoption within the healthcare sector

Keywords: Hospital information systems, China, Adoption Process.

1   INTRODUCTION

Hospital Information System (HIS) is one of the most widely adopted information systems in the hospital environment. Its definition varies across different studies, but in general it is regarded as an integrated information system designed to manage administration, financial and clinical activities of the hospital. It is believed that HIS is able to offer benefits such as increased operational efficiency, improved patient care quality, improved diagnostic decision making and reduced operational cost etc (Devaraj and Kohli 2000; England, Stewart and Walker 2000; Tomasi, Facchini and Maia 2004). However, the realisation of these benefits is contingent on the successful assimilation of HIS and its effective utilisation as part of daily operation routine.

So far, there is still a limited understanding of HIS adoption in the exiting literature. The literature review revealed three important observations. Firstly, the large majority of the existing studies concentrate on developed nations with developing countries receiving little academic attention. Secondly, the existing studies are mostly conducted with a single perspective, either focusing on one single user group such as the physicians, nurses (Anderson 1997; Chau and Hu 2002; Croteau and Vieru 2002; England and Stewart 2007; Schaper and Pervan 2007) or the organisational factors only (Ash 1997; England et al. 2000; Wholey, Padman, Hamer and Schwarts 2000). These types of studies neglect the complex human and system interactions in the hospital environment and consequently their influences on HIS adoption (Kimberly and Evanisko 1981). Lastly, there is also a lack of sound research model that can be used to guide HIS adoption studies. The adaptations of the diffusion of innovation model (DOI), technology acceptance model (TAM) and the technology, organisation, environment model (TOE) commonly employed by the existing studies have been found to be inadequate in addressing the characteristics of the hospital environment (Chau and Hu 2002; Schaper and Pervan 2007). As a result, the lack of holistic understanding of HIS adoption on the organisational level is the main knowledge gap in the current health informatics research field. This lack of knowledge is reflected in the frequent project failures and consequent financial losses suffered by hospitals worldwide (Ammenwerth, Iller and Mahler 2006; Goldschmidt 2005).

To address the knowledge gap in the area of HIS adoption, this paper aims to investigate the factors impacting HIS adoption in China through an in-depth single case study. The research question addressed is: *What are the key factors affecting each main stage of HIS adoption?* China has been identified as an appropriate context for the study since it has regarded HIS as the key to its modern hospital development. Despite its classification as a developing country, China's relentless effort in promoting HIS development has transformed Chinese hospitals from HIS late adopters to the pioneers of HIS adoption in the world. China has been regarded as the experimental ground for the development and adoption of cutting edge hospital information technologies and systems (Wang, Xu and Liu 2007). Therefore, the China's HIS adoption experience is valuable for both the developing and developed nations.

The findings of the study indicate that different factors affect different stages of HIS adoption process. For the decision making process, three factors have been identified to be crucial which include "government support/mandate", "Cost Justification" and "IT standard & regulation". For system implementation, "organisational size and slack resources" and "user involvement" are found to be important. "Organisational/peer support", "computer skill" and "perceived usefulness" are identified to be crucial for system assimilation.   In addition, "culture" and "executive commitment" have been identified to be influential in all stages of the adoption process. The understanding obtained in this study is valuable for assisting the hospitals to make more informed decisions and forming a logical framework for studying HIS adoption in the future. The paper is structured as follows. Firstly, a literature review is presented to synthesise the existing knowledge in the field and present a HIS adoption process model to guide the study. A detailed account of the research methodology is then provided followed by the study findings. Finally the results are discussed and the paper is concluded.

2   LITERATURE REVIEW

Using "Hospital Information System Adoption" as a keyword, a total of 353 articles were returned from the MEDLINE database maintained by the U.S. National Library of Medicine. The papers identified from the search include a wide range of studies varying from actual HIS adoption studies to discussions around computer standards and disease diagnoses. A consequent review of the abstracts determined 28 studies to be significant in their study contributions and relevant to the purpose of this project. In order to gain a comprehensive overview of the existing knowledge base, studies conducted in both the developed and developing countries were included. Articles that were excluded from the review are mainly studies that focus on HIS's impacts on a specific treatment; technical adoption of HIS and practitioner papers.
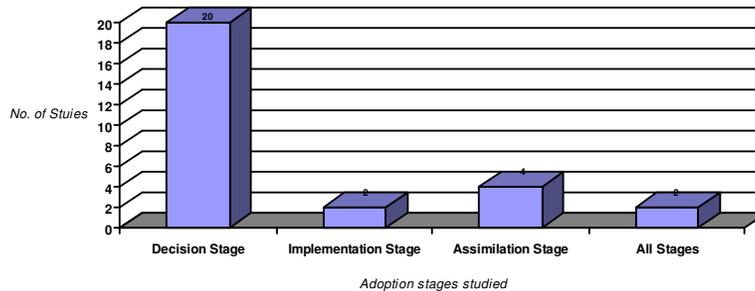

Figure 1:   No. of Studies Examined Each Stage of the HIS Adoption Process

Among the existing HIS adoption literature, the definition of HIS adoption varies from study to study. Some researches restrict their investigation to adoption decision making (England and Stewart 2007; Greenberg, Peterburg, Vekstein and Pliskin 2005), while others adopted a broader study scope, exploring issues related to system implementation and usage (Ammenwerth et al. 2006; Croteau and Vieru 2002; Kazley and Ozcan 2007). Due to the fact that the HIS adoption decisions alone do not constitute the full adoption of HIS system into the hospital's daily operations, it appears to be more appropriate to treat HIS adoption as a continuous process rather than an once-off event. Through a comparison and aggregation of existing study focuses, three main stages of HIS adoption processes have been identified, namely the Adoption Decision Making Stage, the System Implementation Stage and the System Assimilation Stage. As part of the effort to identify factors affecting HIS adoption, various studies identified in the literature have been classified based on the above three stages of the adoption process. Figure 1 depicts the number of studies that examined each of the HIS adoption stage based on their main study focus. As shown in figure 1, the majority of the existing studies focus on the Decision Making stage. Two studies (pizzi,suh et al, 2005; Poon & Blumenthal et al,2004) consider all stages of the adoption process as defined in this study.

2.2   Key Factors for HIS Adoption and the HIS Adoption Model

In the existing studies, five main factors stand out as the most well recognised determinants of HIS adoption. Although their specific impacts upon HIS adoption may vary according to the study context, but their importance has been well documented as shown in table 1. These main factors include: organisational size and slack resources; executive commitment; computer skills; cost justification and perceived usefulness. Table 1 maps the 28 studies reviewed and the key factors that have been identified in each stage of the adoption process. Each of these factors is discussed below.

Organisation Size and Slack Resources

Among the existing studies the size of the hospital and the slack resources available is commonly acknowledged to be a crucial determinant of hospital's ability to adopt HIS (Burke, Wang, Wan and Diana 2002; England and Stewart 2007; Sobol, Alverson and Lei 1999). It is believed that without a sufficiently complicated structure and work processes, the marginal improvements provided by HIS cannot justify the investments required (Burke et al. 2002; Furukawa, Raghu, Spaulding and Vinze 2008; Kimberly and Evanisko 1981; Schaper and Pervan 2007; Sobol et al. 1999). In addition, given

the time consuming and resource intensive nature of the HIS projects, it is important for the hospitals to ensure that they have adequate slack resources to fund not only the physical implementation of the HIS systems, but also the change management processes (Ash 1997; Burke et al. 2002; Shields, Shin, Leu, Levy, betancourt, Hawkins and Proser 2007). This factor appears in the existing studies that are most closely linked to decision making stage of the adoption process as shown in table 1.

Study Focus		Organisational Size and Slack Resources	Executive Commitment	computer skill	Cost Justification	Perceived Usefulness
Stage 1	Kimberly and Evanisko (1981)	x	x			
	Sobol, Alverson et al. (1999)	x		x	x	
	Burke, Wang et al. (2002)	x				
	Croteau and Vieru (2002)	x				x
	Cutler, Feldman et al. (2005)				x	
	Gagnon, Lamothe et al. (2005)	x	x			x
	Greenberg, Peterburg et al.(2005)	x			x	x
	Bernstein, McCreless et al.(2007)	x	x		x	
	Davidson and Heineke (2007)		x		x	
	Kazley and Ozcan (2007)	x				
	Shields, Shin et al.(2007)	x				
	Xue and Liang (2007)		x			
	Mccullough (2008)	x				
	Wang, Wan et al. (2005)	x				
	Zheng, Padman et al. (2005)			x		x
	Goldschmidt (2005)	x			x	x
	Lu, Xiao et al. (2005)				x	x
Stage 2	England and Stewart (2007)		x			
	Wang, Xu et al. (2007)		x			
Stage 3	Anderson (1997)			x		x
	Chau and Hu (2002)			x		x
	Berner, Detmer et al. (2005)			x		x
	Schaper and Pervan (2007)			x		x
All Stages	Pizzi, Suh et al. (2005)		x		x	x
	Poon, Blumenthal et al. (2004)	x	x		x	x
	Total: 28	15	9	6	9	12

Table 1:   Key Factors of HIS Adoption

Executive Commitment
Like any major business initiatives, adopting IT requires significant investments and carries high-levels of risk especially for hospitals (Johnson 2001). The proper support and attention from the top management level therefore is found to be crucial for maintaining control over the project execution (Ash 1997; Chau and Hu 2002; Croteau and Vieru 2002; England and Stewart 2007; Gottschalk and Solli-Saether 2005; Xue and Liang 2007). The constant attention paid by the top management level will help safeguard the alignment between the HIS adoption initiatives and their organisational goal, which is crucial in obtaining a satisfactory outcome from the adoption of HIS. As shown in table 1, this factor is most commonly identified in studies that are focused on the adoption decision making stage as well as system implementation stage.

Computer skills

The lack of computer skills is regarded as the most common barriers to HIS adoption (Johnson 2001; Sobol et al. 1999). The unfamiliarity with IT and computer operations amplified the degree of difficulties experienced by the end users in the initial transition stage. The consequent loss in work efficiency and frustration over the foreign technology directly attribute to the negative attitude end user adopted towards the new system, which have been proven to be detrimental to the assimilation of the new system and may result in system adoption failure (Berner, Detmer and Simborg 2005; Davidson and Heineke 2007; Poon, Blumenthal, Jaggi, Honour, Bates and Kaushal 2004). Reflectively, the lack of computer skill factor is mostly cited in studies that focus on the system assimilation stage of the HIS adoption process

Cost-Justification
The ability to financially justify IT investments is a key factor to consider when studying HIS adoption(Cutler, Feldman and Horwitz 2005; Lu, Xiao, Sears and Jacko 2005; Pizzi, Suh, Barone and Nash 2005). By presenting a solid return-on-investment estimation, the hospital can be more easily convinced to commit the required resources for the adoption initiatives. However, as demonstrated in Sobol and Alverson's study (1999), HIS investments are difficult to cost-justify. Firstly the technology adoption itself is hard to be budgeted; its scale, complexity and ramifications to other work practices prevent direct costs to be assigned. Secondly, the benefit of technology adoption such as efficiency improvement is also hard to be measured in dollar terms, and some of the benefits from HIS will not realise until HIS adoption and diffusion reached a certain critical mass within the hospital. Nonetheless, cost-justifying technology is still an important factor to consider when deciding to adopt HIS and consequently its impact on hospital IT adoption is worth studying.
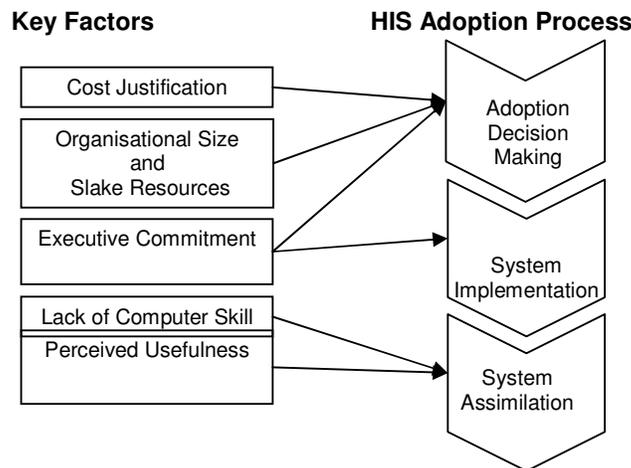

Figure 2:   HIS Adoption Model

Perceived Usefulness
Perceived usefulness is commonly identified as another important factor impacting healthcare professionals' technology acceptance behaviours (Ash 1997; Chau and Hu 2002; Croteau and Vieru 2002; Goldschmidt 2005; Johnson 2001; Tomasi, Facchini et al. 2004). Most of the existing studies agree that healthcare professionals, especially the physicians, base their technology acceptance decisions heavily on their perception of the new technology's ability to improve their current work practices (Croteau and Vieru 2002; Goldschmidt 2005; Tomasi et al. 2004). Such outcome-focused view of technology acceptance is reflective of the healthcare professionals' decision-intensive work style and tool-oriented view of information technologies (Goldschmidt 2005). As a result, training and user participation are frequently suggested as possible ways of improving perceived usefulness among the healthcare professionals (Croteau and Vieru 2002; Sobol et al. 1999; Tomasi et al. 2004). As shown in table 1, this factor is most relevant to the system assimilation stage of the adoption process.

The identification of above five factors in the existing literature helped the practitioners and academics to gain a general understanding of the complex forces impacting HIS adoption. In order to

further enrich the HIS understanding and provide a practical guide for HIS adoption, a model need to be developed to depict the relationship between the factors and different stages of the adoption process. According to the main study focus of the existing research shown in table 1 and the factors they identified, Figure 2 presents a preliminary mapping of the adoption factors to each of the adoption stages. This model serves as a general guideline for conducting this study and helps to develop the interview questions.

3   RESEARCH METHODOLOGY

In order to obtain a comprehensive and accurate understanding of HIS adoption in Chinese hospitals, it is imperative to study the phenomenon in the hospital context and take the characteristics of the healthcare industry into consideration. The single case study approach has been regarded as the most appropriate research approach for addressing these study requirements (Benbasat, Goldstein and Mead 1987; Yin 2003). It allows in-depth investigations of HIS adoption, while taking the environmental context into consideration. It enables the examination of relationships between factors on different levels and helps connect the human actions with macro structures and processes (Neuman 2006).

Semi-structured interviews are used as the main data collection method. It is chosen due to its ability to capture key data for set variables as well as contextual issues that were unanticipated by the researcher. Through face-to-face interactions with the interviewees, the researcher was able to effectively communicate the meaning of the questions, clarify any ambiguities and hence prevent any misunderstandings from occurring (Neuman 2006). In this study a total of 5 individuals were interviewed as shown in table 2 including the hospital director, IT manager, administration manager, head nurse, and physician each representing a user group for different functions of the HIS. Through semi-structured interviews, different interviewees present different perspectives to HIS adoption depending on their individual roles, forming a multi-layered view of the HIS adoption. Documentations detailing the hospital background, HIS functionalities and future development plans are also obtained for analysis. After applying cross case analyses and synthesising the results of different interviews, a more holistic view of the HIS adoption on the organisational level was obtained.

Interviewee	Responsibility	Duration
Hospital Director	Supervising, administrating and coordinating all HIT adoption projects	2 hours
IT Manager	Coordinating between the vendor and the hospital	35mins
Administration Manager	Quality control of all hospital operations	25 mins
Head Nurse	Coordinating, supervising all nurses of a the ward	38 mins
Physician	Deliver medical services, initiated telemedicine program	35 mins

Table 2   Interviewee Profile

Two sets of interview questions were generated to cater for the different knowledge level of the interviewees. However, the semi-structured nature of the interview means that the interview questions do not dictate the progress of the interviews. All factors that were regarded to be important by the interviewee were considered in this study. The hospital director took about 2 hours to interview and interviews with the other stakeholders lasted around 30 minutes. The interviews were recorded and transcribed into written-up field notes for data analysis.

4   KEY FACTORS OF HIS ADOPTION IN CHINA

Through careful analysis of the data collected from Hospital Alpha, some unique characteristics of HIS adoption in China have been identified. For brevity, this section only presents the key HIS adoption factors identified in this study and refines the HIS adoption model developed earlier based on the experience of the case organization.

4.1   Adoption Decision Making Stage

Government support/mandate instrumental to HIS adoption

As a communist state ruled by a central government, the Chinese government's support/mandate has been named as instrumental to HIS adoption by the majority of respondents. Chinese government's ability to influence every aspect of the country facilitates HIS adoption in two main ways. Firstly, as the central planning authority, it has the power to dictate the direction of future hospital development. By including HIS adoption as a key part of hospital system development plan and setting HIS adoption goals for hospitals to work towards, the government became the most important promoter of HIS. As the hospital director revealed in his interview:

"… the government is very serious about it (HIS adoption), we used to only have one national HIS meeting every year, now, we already had more than 5 this year. That's why the development is so quick in the recent years…"

Ability to cost justify HIS investment facilitates adoption decision making
Given the amount of investments required and the demand to remain profitable, cost justifying HIS investments was found to be a key determinant of the HIS adoption process. The decision makers' ability to recognise the benefits of the HIS and justify the HIS investments in financial terms are crucial in influencing their decisions regarding how to adopt HIS. The hospital director revealed in his interview:

"… currently, there are still some hospitals think that HIS adoption is just throwing money away, as a result, they are not doing their best to adopt HIS…"

This kind of negative attitude towards the potential offered by the HIS caused them to do the bare minimum when approaching HIS projects. Without proper implementation planning and support from the hospital, these projects usually fail to become functional.

National IT standard and regulation essential for healthy HIS development
The other adoption key factor identified in this study is national IT standards and relevant regulation. The existence of sound national IT standard and regulation was found to be essential for healthy HIS developments. Although the Chinese government are investing heavily into the development of relevant standards and policies, the current explosive IT development in Chinese hospitals have outpaced the development in standards and legislations. The IT manager, administration manager and the director all expressed their frustration on having to work with out-dated legislations and standards, which can be especially risky when conducting some pioneering research in the field. Without a solid legislative foundation to base upon and national standards to guide the development, hospitals are constantly taking the risk of adopting systems that may be rendered obsolete due to future regulations and standards updates.

4.2   System Implementation Stage
Organisational size and slack resources critical for successful implementation
It is interesting to note that instead of echoing the common belief in the existing literature that the "organisational size and slack resource" factor is closely linked with the adoption decision making; it was found to be more critical to the implementation stage of HIS adoption process in this study. Due to the strong mandate imposed by the state government, the availability of resource to support the implementation and operation of the HIS system plays a very minor role in the adoption decision making stage. It is only in the implementation stage, the full impact of organisational size and slack resources came into effect. The attempts to adopt HIS without meeting these criteria can cause significant financial damage to the hospital. As highlighted by the following interview excerpt:

"… The gap (HIS adoption) is huge between the large and small hospitals...they (small hospitals) adopted the system without considering their economic capability, and the system is not functional at the end of the day, there is a lot of resource wasted there…"(Hospital Director)

User involvement facilitates smoother system implementation and better user acceptance
Extensive user involvement in the HIS adoption process was found to directly facilitate a smoother system implementation experience in Hospital Alpha, which reflects the findings of some existing studies (Bernstein, McCreless and Cote 2007; Lagrew, Stutman and Sicaeros 2008). By involving the end users in software development and system implementation, Hospital Alphas is able to develop a

system that is both useful and user-friendly to the end users. In addition, allowing the end user extensive participation in the system implementation stage, Hospital Alpha was able to forge a strong sense of ownership among and end-users and hence improve user acceptance of the system. As observed during the interviews, all interviewees demonstrated great enthusiasm and pride towards their HIS system, and were eager to showcase their system functionalities of their own accord. Their positive attitude is instrumental in facilitating successful system implementation and assimilation.

4.3   System Assimilation Stage

Strong perceived usefulness improves user acceptance

The case study conducted in Hospital Alpha also confirmed the existence of positive relationships between perceived usefulness and user acceptance. When asked about the main reasons for their support or even enthusiasms about HIS; "convenience"," easy to use" and "improved work efficiency" were frequently mentioned by all respondents. HIS's drastic simplification of medical practitioners' work routine and its user friendly design have won praises all around. As the hospital staff got increasingly used to the new technology and operation methods, the HIS system demonstrated clear advantage over that of the manual system. Consequently, the value perceived usefulness improves which directly lead to widespread user acceptance of the HIS.

Strong organisational/peer support improve user acceptance

One of the main reasons behind Hospital Alpha's HIS success is its ability to secure high user acceptance rate. By providing comprehensive training courses and effective technical support, the hospital staff quickly learned to use the HIS system as a part of their daily routine. The collective Chinese culture also contributes by reducing the level of initial resistance and establishing a peer support network, which facilitates a much easier learning process for Hospital Alpha. As the head nurse recounts the initial stage of HIS adoption:

"… I started from learning to type and using word, now I think I know most of computer stuff. Sometimes, if we don't know something, we just ask each other, even the older nurse in my ward knows how to use computer now…"

Computer skills determines user resistance

Despite having relatively cooperative staff and a collective value system within the hospital, Hospital Alpha was not immune to user resistance as experienced in other health organisations (Kimberly and Evanisko 1981; Sobol et al. 1999). All interviewees conceded the existence of user dissatisfaction and rejection of the new technology at its initial transition stage, and regarded it to be one of the major barriers to HIS's successful adoption. The main reasons for the users' resistance include reduction in work efficiency due to the unfamiliarity with computers and difficulties in typing. The strongest user resistance came from the old physicians with limited or no computer skills, which significantly increased difficulties for system dissemination across the organisation. As the head nurse recounts the initial stage of HIS adoption:

"… of course there were a lot of problems, in the beginning the system was not accepted by the physicians…they have no idea how to use the keyboard and the mouse, let alone being able to type…It was really difficult."

4.4   Fundamental HIS Adoption Factors

Culture underlies HIS adoption experience

The examination of interview transcripts yielded an important factor in HIS adoption which was not recognised in the existing studies of health informatics. It appears that the notion of culture is very important in shaping the HIS adoption in China. When inquired about their success in HIS adoption, all respondents pointed to the Chinese culture as one of the main reasons for their accomplishment. As demonstrated in table 3 the collectivism, obedient to managerial orders and the eagerness to save face are the three main culture values that were commonly mentioned by the interviewees.

The collective nature of Chinese culture is the most frequently mentioned factor by the interviewees. Being raised in a collective culture, the hospital staff are more ready to work towards a collective goal

with personal sacrifices (Hofstede 1983). The physician, nurse and IT manager all attributed their success to hospital staff's willingness to work together.

Interviewees	Culture Values		
	Collectivism	Respect the superiors	Eagerness to save face
Physician	√		
Head Nurse	√	√	
IT Manager	√		
Admin. Manager			√
Director			√

Table 3.   Culture values important to HIS adoption

 "Respect the superiors" is another common value found in the Chinese culture. The common respect hospital staff have towards the hospital managers ensures the correct and timely execution of the managerial orders. The "eagerness to save face" on the other hand, was identified by the administration manager and the director as one of the main driver for HIS adoption decision making among the Chinese hospitals. In order to be regarded as superior hospitals or at least on par with other advanced hospitals in China, HIS adoption is frequently adopted in an attempt to improve the hospital ranking. As a result, the "eagerness to save face" factor reaffirms the hospital executive commitment to adopt HIS and as the director put it:
"… once you have something, they all want to copy your success. We have hundreds of hospitals come over to study our systems every year because they want to have the same thing. They do not want to lose face…"

Strong executive commitment critical to HIS adoption
When enquired about the drivers of HIS adoption in China, the interviewees unanimously named executive commitment as the most important factor in driving HIS adoption. Given the hospitals are responsible for making the HIS investments, the decisions of whether and how to adopt HIS solely rest on the hospital executives. Strong commitment from the executives ensure the deployment of adequate financial and human resources as well as the careful implementation of the HIS adoption plan. It is also able to influence the other adoption factors such as "User acceptance" to improve the chance of successful system adoption. As a result, HIS adoption projects are commonly nicknamed the "executive's project" in China and as the IT manager revealed:
"… If one hospital failed to adopt HIS, there must be some problem with their hospital executives, if you have strong executive commitment, you normally will be able to do this…"

4.5 The Model of HIS Adoption in China
According to factors identified above, the HIS adoption model presented previously is revised to provide a more complete and accurate picture of HIS adoption in China as shown in figure 3. According to their extent of impact and importance, these factors were classified into two main categories: the Primary Factors category and the Fundamental Factors category. Primary Factors category contains factors that directly influence HIS adoption stages, while the Fundamental Factors category comprises factors that are instrumental to the entire adoption process.

Underlying all activities in the Chinese HIS adoption process, "culture" and "executive commitment" were classified as fundamental factors. This study revealed that Chinese culture exerts significant influences over the actions of all hospital staff, which is hence capable of determining the path of HIS adoption, the barriers and drivers in each adoption stage. This finding highlights the important role that culture plays in HIS adoption which is rarely recognised in the existing studies. The executive commitment, on the other hand, was found to influence HIS adoption process by impacting the making and execution of the HIS adoption plan which spans the entire HIS adoption process. The degree of executive commitment was found to be directly linked to the success and failure of HIS adoption projects in China. This finding extends the impact of executive commitment from the first two stages as shown in figure 2 to all stages of the HIS adoption process, which further highlights the uniqueness of the Chinese culture system. Due to their collective nature and respect for superiors, the

influence of executive commitment not only has direct effect on whether or not to adopt HIS and how HIS is adopted, but also influences how the technology is perceived by the end users and consequently their attitude towards HIS adoption. As a result, the Chinese executives are able to take advantage of this situation and positively influence HIS adoption projects.
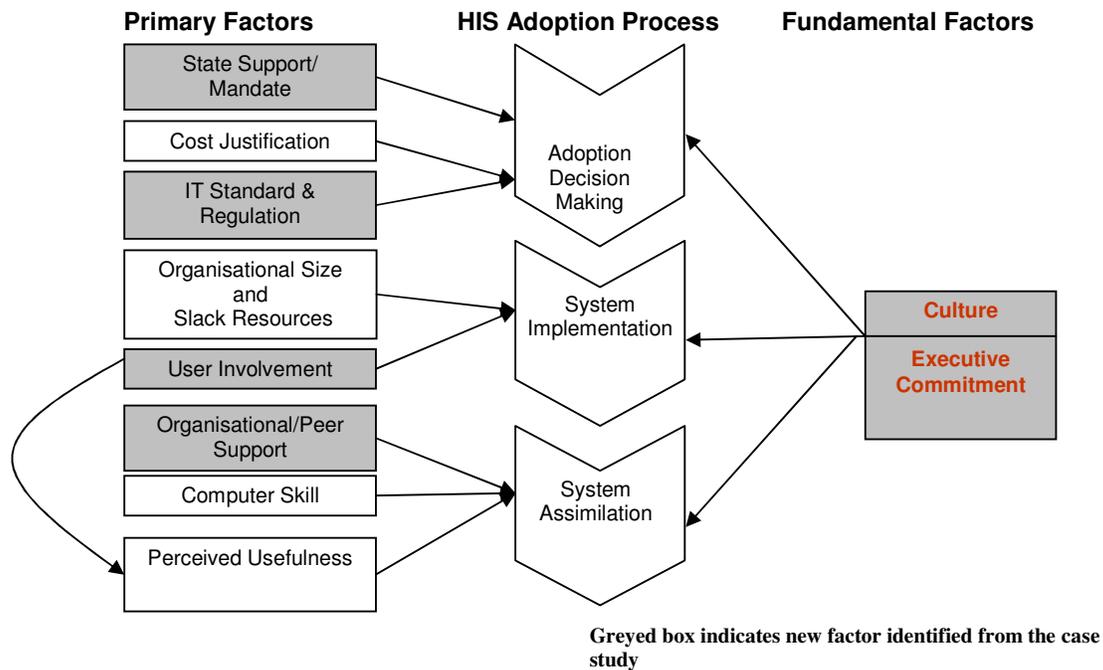
Primary Factors **HIS Adoption Process** **Fundamental Factors**

State Support/ Mandate

Cost Justification

IT Standard & Regulation

Organisational Size and Slack Resources

User Involvement

Organisational/Peer Support

Computer Skill

Perceived Usefulness

Adoption Decision Making

System Implementation

System Assimilation

Culture

Executive Commitment

Greyed box indicates new factor identified from the case study

Figure 3:   Model of HIS Adoption in China

The adoption decision making stage was found to be susceptible to the impacts of environmental and organisational elements. Factors such as "state support/mandate", "cost justification" and "IT standard and Regulation" determine the benefit, cost and difficulties of HIS adoption, which in turn influence the decision makers' perception of project feasibility. The identification of "state support/mandate" and "IT standard and regulation" as two new key factors is reflective of the HIS adoption environment in China. The recent explosive growth in HIS adoption is largely driven by state mandate, while as a late adopter; China suffers from the lack of up-to-date IT standard and regulation to match such development. However, despite China's unique situation, these two factors' ability to significantly sway the HIS adoption process in China also demonstrated the potential impact they can have in other countries.

It was also discovered that in order for system implementation to be successful, the hospital need to have sufficient organisational size, slack resource to support the project and involve the end users in the implementation process. Contrasting the original HIS adoption model in figure 2, the "organisational size and slack resource's" close association with the system implementation stage instead of the commonly recognised adoption decision making stage is reflective of how adoption decision is made in China as discussed above. Furthermore, "User involvement" represents a key success factor behind Hospital Alpha's achievement in HIS adoption. Despite being a less known factor among the existing literature, "user involvement" was found to be critical to achieving smoother HIS implementation and assimilation in this study.

Finally, the last stage of the HIS adoption process focuses on system's assimilation in the organisation. Factors such as "organisational/peer support", "computer skill" and "perceived usefulness" were found to be closely linked with users' acceptance towards new technology and consequently affects the degree of system assimilation in the organisation. "Organisational/peer support" factor is rarely acknowledged in the existing literature, its identification in this study highlights the important role it can play in facilitating better system assimilation. This finding is valuable to the hospitals as it

presents a new tool for improving HIS acceptance by the end users. In addition, the perceived usefulness is also influenced by user involvement in the system implementation stage as suggested by the study finding as well as some of the existing literature (Bernstein et al. 2007; Lagrew et al. 2008).

5   DISCUSSION AND CONCLUSION

By studying HIS adoption in three different stages, a clearer and more logical picture was drawn regarding the HIS adoption situation in China. The involvement of multiple stakeholders in this study allowed a more complete and unbiased view of HIS adoption process to be obtained which was difficult to achieve through a single stakeholder study commonly conducted in the previous studies. Despite the fact that this study is generated based on the experience of one single Chinese hospital, the lessons learnt not only improves understanding of HIS adoption in developing countries, but also have practical implications for the developed nations as well.

As revealed in the model of HIS adoption in China, in order to facilitate smooth and successful HIS adoption, the state government need to first create a favourable environment that would help trigger the adoption process.   By offering assistance and incentives for HIS adoption and establishing satisfactory IT standard and regulations, the state is capable of initiating and determining the outcome of the first stage of the HIS adoption process. Findings of this study also highlight the necessity for the hospitals to consider HIS adoptions in its entirety. The decision makers have to consider the feasibility of the HIS projects with a full evaluation of the hospital's capabilities and resources.

In addition, the significant role Chinese culture played in shaping HIS adoption in Hospital Alpha emphasises the importance of managing culture as part of HIS adoption process. This study demonstrates the profound impact that deep-rooted culture system can have on HIS adoption and highlights its positive influences on overcoming user resistance. For the countries that possess favourable culture values such as collectivism, hospitals should try to leverage this advantage and reinforce the development of collective thinking and community membership. Once the hospital staff are able to regard themselves as a part of the whole hospital, it becomes more likely for them to accept the new technology despite the possible personal sacrifices when the collective is set to benefit. For the western countries with strong individualist culture, the study findings open up a possible new avenue in promoting HIS adoption. The development of a more change-friendly and cooperative culture within the hospital may be useful in managing physician's resistance to new technology and consequently beneficial to the adoption of HIS.

For future studies, more focused studies about a specific adoption stage or influencing factor can be carried out to facilitate more in-depth understanding of HIS adoption. Multiple case studies or quantitative surveys to involve more hospitals in the study to further improve the generalisability of the findings can also be conducted. Through contrasting the responses received from large number of hospitals, the HIS adoption situation can be explored more fully and new insights into the HIS adoption practices and behaviours can be acquired.

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