Adoption Theories in Enterprise Resource Planning (ERP) of Health Service for the 21st Century

Sakonnan Huncharoen, Namon Jeerungsuwan

King Mongkut's University of Technology North Bangkok, Thailand

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Abstract

The research aims to synthesize the factors that affects the adoption behaviors of the enterprise resource planning system of Thailand hospitals. The process performed includes analysis of synthetic documents and related research to create an interview tool template to be used in interviewing with experts in hospital. Eight experts who have experience working in a university hospital have been interviewed with Semi-Structured Interview in order to conduct content analysis and define a conceptual framework for examining the adoption behavior of the enterprise resource planning system in Thailand hospitals in the further stage of the research study. The experts used in the examination must be a user of enterprise resource planning systems in hospitals under the Ministry of Education of Thailand. Various theories such as Technology Acceptance Models (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and Institutional Theory were used in the research. The research results show that all factors in Effort Expectancy factors, Performance Expectancy, Facilitating Conditions, Coercive Pressure, Normative Pressure, and Attitude toward using have effects on the acceptance and use of the system.

Keywords: Technology Adoption, Enterprise Resource Planning (ERP)

1) Introduction

From past to present, various information technologies have been developed to facilitate the daily lives of individuals, or increase accuracy and speed of business processes. In the health sector, the Ministry of Health has established a strategic plan (Strategic Plan No. 2) to develop Thailand as a center for international health (A.D. 2553-2557), with the aim to strengthen and increase competitiveness in the health business by focusing on and developing the country health care system to the international standard, both public and private sector (Thailand Medical Hub Ministry of Public Health, 2011). This plan has made Thailand a global leader in health care services and increased growth rate of health service in business sectors. These affect operations within hospital to adopt efficient information technology in its management in order to increase customer satisfactions, employees happiness and differentiation from competitors. It can be seen that information technology is an important variable in the development progress of the businesses. Information Technology refers to the adoption of computer technology and telecommunications knowledge via software tools and equipment for creativity, storage, retrieval, processing, and display the information in various forms to meet the needs of the user in companies, organizations and society through the process of selecting, applying, improving and managing (Chaleysub, 2008; Songkram, N. n.d.; Association for Computing Machinery and IEEE Computer Society, 2008). Information technology in hospitals has been divided into two types of Medical Informatics (Clinical) and Information Management (Administrative). Both forms of information must pass the integration process, instantly updated information and effective data (Accent Software, 2013).

Enterprise Resource Planning is a software system that was developed to improve work connectivity, by collecting and integrating internal and external management of information across an entire organization This increases the exchange flow of information across the enterprise, reduces the response time to customer needs, increases effectiveness in decision making and enhances business competitiveness (Kumar and Hillegersberg, 2000; Moon, 2007; Chang et al, 2008; Kwahk and Ahn 2010; Mueansrichai, 2012). ERP systems can help in various business regardless of business type process speed, company efficiency and effectiveness. Similar to other industries, ERP system grows rapidly in hospital sectors (Accent Software, 2013). However ERP is a large system, consists of several modules, requires huge investment in both time and capital. In the evaluation of incorporating ERP system to help manage the various processes within the hospital, it is interesting to research on the factors that affect the adoption behavioral of ERP in hospital in Thailand.

In general, Technology Adoption is a technology acceptance in a society, through a process of interaction between inventor and users in society, back and forth several times until the acceptance of the technology (Kumanbun, 2009). The benefits of the study on adoption and use of technology is to prepare employees facing the organizational change so that they can learn how to appropriate use the system, to develop a system that works from the start, and can lead to competitive advantage in individual and business which result in better understanding of why the system is used or not (Chang et al, 2008; Silva and Dias, 2007).

2) Objective of Research

The objective of the research study is to investigate the factors affecting the acceptance and use of ERP in Thailand hospitals and to present the study for the development of the factors that affects an acceptance behavioral model on enterprise resource planning system of hospitals in Thailand.

2) Research Methods

The research studies theories and related researches, analyze, and synthesize the factors affecting the adoption behavioral of the ERP system in Thailand hospitals and develop a research tool for interview template used to interview experts who have experience in enterprise resource planning systems in public hospitals under the Ministry of Education. In-depth Interview was conducted to eight experts from mid-April to mid-May 2013.

3) Concepts, theories, and research related

Researches, both locally and abroad, found that this type of technology adoption can be divided into two levels: personal acceptance level (Individual's adoption) such as Diffusion of Innovations (DOI), Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and organization adoption level (Organization's adoption) such as DOI, Technology Organization Environment (TOE Framework), and Institutional Theory.

Theories relevant to the research study include Technology Acceptance Models (TAM), theory of acceptance and use of technology (Unified Theory of Acceptance and Use of Technology: UTAUT) theory, and Institutional theory.

Technology Acceptance Theory was developed by Fred D. Davis in 1989, to explain the acceptance of Information Systems and to predict the acceptance of information technology and its use. TAM provides basic knowledge that the variable influencing Belief, Attitude, and Behavioral Intention to Use has an effect on the Actual System Use. There are two types of beliefs in this part; the perception on the benefits of the system (Perceived Usefulness: PU) refers to the individual's beliefs that the system can improve the performance of his or her and the perception that the system is easy to use (Perceived Ease of Use: PEOU) refers to the individual's beliefs that the system is free of physical and mental efforts. These two factors served as the basis of the attitudes toward using particular system. It determines the behavior intention to use and create the actual usage behavior (Marchewka and Kostiwa 2007; Davis, 1989).

Theory of acceptance and use of technology has been developed by Venkatesh et. al., in 2003. It aims to explain the willingness of users to use the system and usage behavior with four main structures including expectations of the effective performance (Performance Expectancy), expectations for the efforts of system user (Effort Expectancy), Social Influence and Facilitating Conditions. Performance Expectancy, Effort Expectancy and Social Influence are to be the factors that affect the behavior intention. Where as Behavior Intention and Facilitating Conditions are the two factors that affect the behavior of the user (Usage Behavior). In addition, secondary factors that affect to the primary factors were gender, age, experience and voluntariness in using the system. (Venkatesh et al, 2003; Williams et al, 2011).

Institutional Theory is the theory that William Richard Scott developed in 2008, which consists of three components: rules (Normative Element), cultural knowledge and understanding (Cultural-Cognitive Element), and regulations (Regulative Element). Normative Element is conducted through social expectations and obligations. The Cultural-Cognitive Element is conducted through the activities and resources that provide stability to the employees. Regulative Element is conducted through the mechanics, rules and regulations of the organization. This is consistent with the concept of DiMaggio and Powell in 1983 that discusses the three types of institutional pressure which consist of the pressure caused by the rules (Normative Pressures), pressure caused by emulating (Mimetic Pressures) and the pressure caused by the oppressed (Coercive Pressures). These three pressures are the essential part of the Institutions Theory that affects the adoption of new technologies in both enterprise and individual level (Scott, 2008; DiMaggio and Powell, 1983; Hoerndlein et al., 2012).

4) Results and Discussion

Three theories on technology acceptance (TAM), the theory of acceptance and use of technology (UTAUT) and Institutional Theory are used for the research conceptual framework as follows:

Effort Expectancy was found on respondents from all eight experts. All indicated that the ease of use affects the acceptance of ERP system in the hospital. An ERP system can cause frustration to user in the initial stages. It is a complex system that links together several modules. Each process in a module can always affect other related modules. The fifth interviewee said, "At the beginning of the ERP system employment, it will be more difficult to use ERP system than the old system. But as the result in the end, we can get more detail information when browsing for information or report". The second interviewee said, "User should understand various work processes to make working with ERP system simpler." The eight interviewee said, "talking about the convenience of the system, as earlier survey, user starts using the system with difficulty and dislikes the system, but after using the system for some time user will accept and satisfy with the system. This might be for its clear procedures and standard process." This finding is consistent with the results of the interviews on UTAUT theory which is the basis of this research. The expectations factor on the user efforts toward the system is the comfort level involved in the use can be considered from three aspects of Perceived Ease of Use, Complexity and Ease of Use. This is consistent with the research of Bandyopadhyay and Barnes (2012) and the research of Gumussoy et al (2007) which found that this factor affects the acceptance of the system significantly. In addition, research of Gumussoy et al (2007) also found that Perceived Ease of Use can result in positive Perceived usefulness. Hence, to learn system in the beginning user must put effort in learning the various processes of the system and understanding the business processes in each module. If one can deeply understand the process of the system, he will be able to comfortably and quickly work through ERP system. Even though the system is complex at the initial state, most users satisfy with ERP system in hospitals because of the better results in the performance expectations.

Performance Expectancy found that ERP systems can increase internal work output and individual work performance. It is also suitable to use with the original work model which will result in a reducing work time spent and increase report clarity and accuracy. The forth interviewee said, "This system can help in historical data, preparation of reports with error free data, and shorten work time because of the

systematic process." The seventh interviewee said, "ERP systems can improve work performance. In the old days, the system is available in the Manual practice. In order to make a report to the management, we recorded data in Excel manually. This is error prone and time consuming, unlike ERP systems which can produce report automatically." This is consistent with the research of Venkatesh et. al. (2003) and Marchewka & Kostiwa (2007) which says that the Performance expectancy is a user's believe level of a better performance when using the system. The research of Gumussoy et al. (2007) said that the Perceived Usefulness has a positive impact on the intention to use ERP systems. The issue of motivation, which plays a part in determining the expected performance of the UTAUT, found that if the ERP user is in same workplace and position he will not receive extra compensation or salary adjustments but what get more trust of his manager. In case of relocating or repositioning, the ERP user will have a better opportunity than those who have never worked in the ERP system before. Even user who only uses the system for a short period confirmed impact factor of Performance Expectancy. This results in user expectation for better incentive after using ERP system. This is consistent with Motivational Model which says that the motivation to the worker who can use the ERP system will get better things than those who cannot.

Facilitating Conditions found that trainings and operation manuals ownership prior to the use of ERP system are facility to worker that has huge effect on the acceptance and use of ERP system. In Thailand public hospitals, the public relations can help all those involved to understand the changes within the organization. This effort can result in the user attitude towards learning systems in the long term. Channels of discussion and quality equipment will foster the acceptance and use of the system. The eighth interviewee said, "The system setup procedure is very important. The procedure must include providing information, communicating, intensive training, clear communication manual and testing the system before actual use. Consultants and users must ensure that the organization has tested every situation that may arise on the job to be able to solve all problems of ERP systems, so that at the time of actual operation, user will enjoy using ERP." This is consistent with the research of Fillion et al (2012) which found that facilities are factors that have a significant impact on adoption of the system.

Social Influence found that those who have the highest influence on the acceptance behavior of the ERP system in Thailand hospitals are the hospital chief executives because they set the policy for the system. This is consistent with the research of Koukis et al. (2009) which found that the support from Top management affects ERP system adoption in hospitals significantly, and consultant has important role in assisting practitioners in real situations. As for the image of the End User within the organization, there are only four interviewees agreed with the image observation. The other interviewees, who agreed with the image comment, think that people around him will view him as an intelligent expert if he is able to do the job. The second interviewee who does not agree with the image observation said, "I don't think that it promotes a positive image to the user because people who understand the change will not have any opinions but people who do not understand or do not like computers or is not able to work through the system will not use the system. This will cause inequality in work load. The worker who can use the system will have more work load than the one who cannot." The issue of the image of a person or organization that uses that system may or may not affect the acceptance and need to be proved in the next step.

Institutional Pressures found that the pressure caused by need to be accepted by others (Normative Pressures). All interviewees said that this part can affect the acceptance of the system because the characteristic of the system that interconnects many modules. Hence, there should be certain rules as a standard in each step of the process. The forth interviewee said, "The rules and requirements reflect on the outcome. Our hospital is a government agency, so the rules are most likely accepted by people." The sixth interviewee said, "There is an effect on the acceptance, for example, when request information between agencies, we must have Appeal Form as a proof for monitoring and investigation process." The eighth interviewee, said, "This system has made the hospital a more standardized and we can say that we have a system that can monitor, follow up, reduce tricky or corruption activity." This is consistent with the research of Koukis et al. (2009) which said that the nature of ERP systems have been used mainly in response to the customer pressure to work quickly with accuracy and often faced with pressure from regulations such as communication between the group, meeting which is mostly unavoidable. But there are seven interviewees agreed with Coercive Pressures which come from legal mandates or influence from those associated with the system. The forth interviewee said that "We take care of the debt issue. The information our customer requested must be delivered on time. I think the pressure has the effect." There is one interviewee who does not agree, the eighth interviewee, said "I'm not sure, but think not. I've talked to my vendors. Some said that there is some change; he notice the shorter waiting time. It's faster, but some vendor complained of the slowness and I was not sure if the system caused the problem, or the problem caused by the employee's process itself." The researcher views that the factors have effect on the adoption system because the people who involved with the system always want to work with accuracy, speed. This is consistent with the research of Koukis et al. (2009) which noted that in the case of ERP systems, the coercive pressures may appear to be the demand from the distribution unit and customer for quality of service and performance. There are only four people who agreed with the pressure of emulating people / agencies that successfully use the system (Mimetic Pressures). They viewed the agencies that use the system successfully influence their agencies to start using ERP systems which is in line with the research of Rafa Kouki, Diane Poulin and Robert Pellerin [23], but there are three interviewees who disagree and viewed that the person himself or his agency is more successful than others. This contradicts the research of Koukis et al. (2009) which is supposed to be proved in the next step.

The attitude toward using the user system, In Intrinsic Motivations issue the user can feel challenging in the ability of the user because the organizations constantly faces with a new situation. Feature of these systems increases the work efficient and productivity. As a result, user becomes satisfy with ERP System Adoption in the hospital. This is consistent with theories of technology acceptance (TAM) which states that the perceived usefulness of the system is the basis to build a positive attitude towards the system.

The study results were shown in Table 1 below.

Table 1: Research Summary on Factors of Adoption of Enterprise Resource Planning System of Hospitals in Thailand.

Theory	Interviewee Factor	1	2	3	4	5	6	7	8	Remark
UTAUT	Effort Expectancy									8:8
	Performance Expectancy									8:8
	Facilitating Conditions									8:8
	Social Influence	👎	👎	👎		👎				4:8
Institutional pressures	Mimetic Pressure	👎	👎	👎		👎				4:8
	Coercive Pressure								👎	7:8
	Normative Pressure									8:8
TAM	Attitude toward Using									8:8
	Intrinsic Motivations									8:8

5) Conclusion

The research study concludes that the expectations on the efforts of the system user (Effort Expectancy), the expectations for performance (Performance Expectancy, Facilitating Conditions in UTAUT theory, Normative Pressure in the theory of institutions, Attitude toward Using in TAM theory have significant effect on the acceptance and use of ERP systems in Thailand hospitals. However, it is not conclusive in Coercive Pressure, Mimetic Pressure and Social Influence, and this will need to be studied in the further step. We also found that the factors those impact other factors such as Effort Expectancy, Performance Expectancy and Normative Pressure in the Institutional Pressures, have effects in supporting each other. Also, Facilitating Conditions affect the attitudes of the users toward learning of the system in the long run.

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