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Applying the Technology Acceptance Model to the introduction of healthcare information systems

Fan-Yun Pai [a,*], Kai-I Huang [b]

[a] Department of Business Administration, National Changhua University of Education, No. 2, Shi-Da Road, Changhua City, 500, Taiwan
[b] Department of Business Administration, Tunghai University, No. 181 Section 3, Taichung Harbor Road, Taichung, Taiwan

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ABSTRACT

With the rapid development of information systems and advances in healthcare technology paired with current concerns arise over patients' safety and how to cure them efficiently, the healthcare information systems are attracting the attention of more and more people. The purpose of this study is to propose a conceptual model, appropriate for the intention to use healthcare information systems, by adopting the system, service, and information qualities covered in the Information System Success Model proposed by DeLone and Mclean [1] as the external variables and integrating the three dimensions of perceived usefulness, perceived ease of use, and intention to use — referred to in Venkatesh and Davis' updated Technology Acceptance Model, TAM [2]. This study first analyzes relevant researches on the intention to use such systems as the basis for the questionnaire design, then conducts questionnaire survey among district hospital nurses, head directors, and other related personnel. After the questionnaires are collected, SEM is used to analyze the data. The analysis shows that the proposed factors positively influence users' intention to use a healthcare system. Information, service and system quality influence user's intention through the mediating constructs, perceived usefulness and perceived ease-of-use. Managerial implications are provided accordingly. Suggestions for introducing healthcare information system are then provided as well.

1. Introduction

Currently, with the rapid development of information systems and the advancement of healthcare technologies, nurses are often required to learn how to operate relevant care assistance equipments while providing clinical care for patients. As the severity of patients' illnesses increase, nurses must spend more time taking care of them, therefore, lots of scholars assert that how to apply current information technology in assisting healthcare to effectively improve the quality of healthcare service and promote electronic case history has currently become an important subject in healthcare information management [3,4].

In recent years, regarding the factors which may impact the implementation of a healthcare information system, the questionnaire surveys conducted by Hsiao and Chang [5] among a total of 85 regional hospitals found that such factors include among others, the support from the senior management level, the skills of the special committee, and the coordination of organizational resources and user participation. However, Choe [6] claims in research that those factors are among others, user participation, support from the senior management level, training, background of the special committee, and task type. In addition, other scholars point out the following factors also have to be considered while implementing the system, including the nurses' preparation, the coordination among each department and the evaluation on continuous supervising, the acceptance of computers by nurses, and organization and management support. Therefore, how to use information technology to develop healthcare systems is an important subject that deserves lots of attention [7–9].

* Corresponding author.
E-mail addresses: fypai@cc.ncue.edu.tw (F.-Y. Pai), kai@thu.edu.tw (K.-I. Huang).

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In the past, most researches on healthcare information were about the planning and discussion of hospitals as an entire unit, for example, Tsai et al. [10] studied the factors that influence the information systems in hospitals; or about the brief introduction of healthcare information systems, for example, Chang et al. [3] introduced the system and how to use it, in the context of a specified hospital. None of them focused on the study of users' actual use of the system, while those that come close mainly included qualitative descriptions with a lack of quantity analysis. At the same time, systems concerning patients' safety also deserve more attention, such as the alerting system on patients' life safety, recording system on vital signs and accident notifying system. Therefore, by adopting the system, service and information qualities covered in the Information System Success Model proposed by DeLone and Mclean [1] as the external variables and integrating the three dimensions of perceived usefulness, perceived ease of use, and intention to use referred in Venkatesh and Davis' [2] updated Technology Acceptance Model, TAM, this study is expected to propose a evaluation model appropriate for healthcare information systems, in order to identify the cause and effect relationships between the relevant factors affecting the intention to use information systems and provide reference for hospitals equipped or unequipped with the system to evaluate, improve, and plan.

2. Literature review

2.1. Healthcare information system

This system is known as the healthcare planning system or hospital information system. Its development can be dated back to 1960 when its major functions were limited to administrative management only. After 1970, sizable hospitals gradually set up internal information sectors, and private information companies started to develop high commercial value computer information systems, which contributed to the prosperous development of the healthcare information system [10]. The creation of this system is mainly a set of standards based on healthcare diagnosis, symptoms, cause, healthcare target and measurements. Such computerized programs provide nurses with the necessary contents, healthcare plans, and additional functions including addition, revision, inquiry and printing [11]. In order to get a more efficient system, Simpson and Weaver [12] believes that by integrating the healthcare information system with the hospital system, clinical care and administrative management can be combined to enhance the efficiency of the system.

To appropriately evaluate the efficiency of such systems, many scholars adopt different methods. For instance, Hortman and Thompson [13] carried out open Q&A in both questionnaires and forms to identify users' satisfaction and opinion, while Lee et al. [14] used one-to-one or one-to-many quality interviews to analyze in depth the users' opinion on a system. Lising and Kennedy [15] mainly verified the quality of case history to figure out whether a healthcare process has been recorded completely as they also used the behavioral observation method to get a better idea of the time allocation during the healthcare process. In the recent 5 years, healthcare information system use has mainly been evaluated in the forms of questionnaire surveys, in-depth interviews, individual case studies, material collections. The questionnaire survey method is most widely used, generally targeted at system use satisfaction and attitudes relevance with its major components as the nurses' age, seniority, education, and user satisfaction [16,17]. These researches show that nurses feel positively on the system in these aspects: it reduces paper work, provides healthcare instruction, and is equipped with learning functions; in contrast, they feel negatively in terms of insufficient computers and evaluation contents, disconnecting with other information system, complicated operation procedure, etc. [14]. In recent years, the application of healthcare information systems and relevant research results are fruitful, which can be separated into four major categories: the factors which can impact the input of the system, the structure of the system, the components of the system, and the efficiency of the system.

2.2. Behavior theory and Technology Acceptance Model

In 1975, Ajzen and Fishbein [18] proposed the Theory of Reasoned Action, TRA, which mainly illustrates a person's behavioral tendency, for the purpose of predicting, changing and interpreting an individual's particular behavior. TRA posits that individual behavior is driven by behavioral intentions where behavioral intentions are a function of an individual's attitude toward the behavior and subjective norms surrounding the performance of the behavior. In this theory, attitude and subjective norms are independent of each other and they could each exert indirect influence on an individual's behavior through behavioral intention. Attitude toward the behavior is defined as the individual's positive or negative feelings about performing a behavior. Subjective norm reflects social pressures when an individual is performing a behavior and his perception of whether people important to the individual think the behavior should be performed.

In 1985, Ajzen [19] proposed the Theory of planned behavior, TPB. It is an extension of the Theory of Reasoned Action that strived for a more appropriate prediction and interpretation of behavioral theory. The difference between TPB and TRA is that the former predicts behavior under comparatively less controllable circumstances, while the latter predicts behavior based on the assumption that all behaviors and behavioral motivations are under control. TPB also adds the concept of perceived behavioral control as a third variable. It refers to an individual's perceived ease or difficulty of performing a particular behavior [20]. It is assumed that perceived behavioral control is determined by the total set of accessible control beliefs. In other words, if an individual feels that he obtains more resources and opportunities while the difficulty of performing a behavior is comparatively less, his perceived behavioral control would be stronger.

In order to explore the relationship between the perceived emotions factor and the use of science technology, Davis [21] developed the Technology Acceptance Model, TAM that shows how users come to accept and use a technology and is based on the