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Predictive factors of telemedicine service acceptance and behavioral intention of physicians

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ABSTRACT

Purpose: Despite the proliferation of telemedicine technology, telemedicine service acceptance has been slow in actual healthcare settings. The purpose of this research is to develop a theoretical model for explaining the predictive factors influencing physicians' willingness to use telemedicine technology to provide healthcare services.

Methods: We developed the Telemedicine Service Acceptance model based on the technology acceptance model (TAM) with the inclusion of three predictive constructs from the previously published telemedicine literature: (1) accessibility of medical records and of patients as clinical factors, (2) self-efficacy as an individual factor and (3) perceived incentives as regulatory factors. A survey was conducted, and structural equation modeling was applied to evaluate the empirical validity of the model and causal relationships within the model using the data collected from 183 physicians.

Results: Our results confirmed the validity of the original TAM constructs: the perceived usefulness of telemedicine directly impacted the behavioral intention to use it, and the perceived ease of use directly impacted both the perceived usefulness and the behavioral intention to use it. In addition, new predictive constructs were found to have ramifications on TAM variables: the accessibility of medical records and of patients directly impacted the perceived usefulness of telemedicine, self-efficacy had a significant positive effect on both the perceived ease of use and the perceived usefulness of telemedicine, and perceived incentives were found to be important with respect to the intention to use telemedicine technology.

Conclusions: This study demonstrated that the Telemedicine Service Acceptance model was feasible and could explain the acceptance of telemedicine services by physicians. These results identified important factors for increasing the involvement of physicians in telemedicine practice.

1. Introduction

As the population ages, medical costs due to chronic diseases are rapidly increasing. This explosive cost increase is a serious social issue that must be resolved in the near future. As a result, telemedicine service has been proposed as a promising solution to this problem with the potential to improve patient care, especially for those with chronic medical conditions, such as diabetes, hypertension, and even cancer [1].

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Telemedicine service in South Korea initially began as a pilot project by the Seoul National University Hospital and Yeoncheon-gun Healthcare Center in 1988. Since 1988, telemedicine technology has developed rapidly, and many university hospitals have conducted telemedicine projects with government support. Nevertheless, although telemedicine service has been accepted by the United States and elsewhere, telemedicine service is making slow progress due to physician resistance about Korean telemedicine act and premature termination of funding [2]. Because a hospital owner is physician commonly, both hospital and physician have opposed the use of telemedicine.

Physicians are the principal users and stakeholders of telemedicine service, and their acceptance of it in healthcare settings has a profound influence on its success. However, physician resistance is common when new information systems are implemented within a healthcare organization. Some physicians may perceive telemedicine technology as a threat to their expertise and may be reluctant to adopt it. In case of South Korea, telemedicine is still illegal. In addition, the Korea Medical Association (KMA) had opposed telemedicine service to protect private hospital. Because both metropolitan and rural physicians perceived patients will concentrate in major hospital, when patients can see a physician in major hospitals using telemedicine services [3].

Telemedicine service is a valuable healthcare service only when physicians use it proactively; therefore, physician attitudes toward telemedicine technology play a key role in its successful use. Furthermore, physicians act as the gatekeepers of telemedicine service by deciding whether it is offered. Therefore, physicians must actively participate in the acceptance of telemedicine service. To convince physicians to adopt telemedicine service, it is important to understand the determinant variables underlying how physicians might change their perceptions of telemedicine service. Although research regarding the managerial issues surrounding telemedicine service is essential for its successful implementation, many telemedicine studies have focused on the development of telemedicine technology and its clinical applications, and empirical evidence is limited.

The aim of this study is to develop a theoretical model to better understand the acceptance of telemedicine by physicians and to explore key variables for facilitating and inhibiting such acceptance through a comprehensive research framework. To examine these factors, we developed the Telemedicine Service Acceptance (TSA) model as an extension of the technology acceptance model (TAM). The TSA model contains several factors drawn from the original TAM variables and from previous qualitative studies on telemedicine service. Finally, we validated the TSA model and evaluated its causal relationships with several variables.

2. Theoretical background

2.1. *Technology acceptance model*

During the last few decades, the TAM developed by Davis has become the dominant model for explaining technology acceptance by assessing the beliefs, attitudes, and intentions toward technology and its actual adoption [4]. Technology acceptance has been defined as "an individual's psychological state with regard to his or her voluntary or intended use of a particular technology." The original model regarded intention as the direct determinant of behavior, whereas user attitudes and social norms were predictors of intention. The main goal of the TAM was to predict the acceptance of information technology and to shed light on design problems inherent in new information systems before they are adopted [5]. The TAM included a set of two variables (perceived ease of use and perceived usefulness) that are commonly used in many computer technology acceptance contexts. Most researchers found this model to be very simple and easy to use. Similarly, the TAM was found to be a very powerful model for identifying variables influencing user acceptance of computer technology. The TAM has proven to be successful in predicting and explaining use across a variety of new technologies.

Since the TAM was originally introduced, the initial model has been enhanced by the addition of certain constructs meant to explain user acceptance of new information technologies [6–10]. Among these studies, several were conducted to retest the original model in healthcare contexts [11–13]. Chau and Hu claimed that the TAM was a good predictive model of physician behavioral intent to accept telemedicine technology [14]. Others added additional constructs to the original model to enhance its explanatory power in healthcare applications. Yu et al. found that positive social norms and computer skills, as well as perceived ease of use (PEOU) and perceived usefulness (PU), are crucial factors for technology acceptance [15]. Yi et al. proposed a complicated model that combined the TAM, theory of planned behavior and innovation diffusion theory and applied it to explain attitudes of healthcare professionals toward PDA applications [10]. These modified or integrated models could provide a more detailed explanation of information technology acceptance by physicians.

2.2. *Predictors of telemedicine service acceptance*

Physician resistance is a well-known inhibiting factor for telemedicine service acceptance. However, some studies have reported that physicians have positive attitudes toward telemedicine service when specific criteria are satisfied. To review previous studies related to telemedicine service, we searched for articles that were published from 1997 to 2010 using scientific literature databases such as PubMed. The main search keywords were telemedicine, physicians, provider, satisfaction, assessment, effect, attitude and evaluation. After reviewing the 196 articles returned by our search, we derived a total of 93 study variables. These variables were classified as major factors after 6 meetings of 8 experts. These could be categorized into three factors: clinical factors, individual factors and regulatory factors.

First, among the various clinical factors found to be important in telemedicine service acceptance, accessibility of patients' records and accessibility of patients predominantly increases the satisfaction of physicians. Seamless access to patient records has led to increased documentation of patients' health conditions such that accurate and up-to-date patient information can be supplied [16]. In addition,