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# Mobile computing acceptance factors in the healthcare industry: A structural equation model

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## ABSTRACT

**Objective:** This paper presents a revised technology acceptance model to examine what determines mobile healthcare systems (MHS) acceptance by healthcare professionals.

**Method:** Conformation factor analysis was performed to test the reliability and validity of the measurement model. The structural equation modeling technique was used to evaluate the causal model.

**Results:** The results indicated that compatibility, perceived usefulness and perceived ease of use significantly affected healthcare professional behavioral intent. MHS self-efficacy had strong indirect impact on healthcare professional behavioral intent through the mediators of perceived usefulness and perceived ease of use. Yet, the hypotheses for technical support and training effects on the perceived usefulness and perceived ease of use were not supported.

**Conclusion:** This paper provides initial insights into factors that are likely to be significant antecedents of planning and implementing mobile healthcare to enhance professionals' MHS acceptance. The proposed model variables explained 70% of the variance in behavioral intention to use MHS; further study is needed to explore extra significant antecedents of new IT/IS acceptance for mobile healthcare. Such as privacy and security issue, system and information quality, limitations of mobile devices; the above may be other interesting factors for implementing mobile healthcare and could be conducted by qualitative research.

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## 1. Introduction

The healthcare industry, conventionally, is recognized as having lagged behind other industries in the use and adoption of new information technologies (IT) and information systems (IS) [1–4]. However, this situation is shifting at a fast pace. Modern IT/IS is an essential tool that fosters and promotes progress in health care and drastically reforms current health

care practices. Mobile IT/IS applications in health care can be recognized as both emerging and enabling technologies [5–7] that have been applied in several countries for emergency care or general health care. For example, a variety of wireless technologies such as mobile computing, wireless networks and global positioning systems (GPS) have been applied to ambulance care in Sweden [8] and emergency trauma care in the Netherlands [9]. Relevant information about the patient

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(vital information) and the ambulance (exact time and location) can be transmitted to the hospital in real-time. Therefore, the hospital can be well-prepared for ambulance arrival. In Finland, a system with secure mobile healthcare services was tested in 2003 and was available nationwide in 2004. This system includes health consulting, electronic prescription, etc. Authorized individuals can easily access the system via mobile devices such as mobile phones [10].

Furthermore, health care professionals also need to access and input medical or patient information from anywhere, at any time in their daily ward rounds [7,11,12]. Hence, mobile healthcare systems can facilitate efficient and effective patient care information input and access at the point of patient care. The systems can improve patient care and quality of services, decrease clinical errors, integrate resources, and enable ubiquitous real-time access to patient information and up-to-date medical knowledge [5,12–15]. However, most applications, in fact, have failed [16] or have not been implemented as predicted [17]. Among these, 30% of the failure rate results from non-technical factors [18,19]. Insufficient user acceptance has long been an obstacle to the successful adoption of IT/IS. Therefore, it is extremely significant to probe the determinants crucial to advance IT/IS acceptance by healthcare professionals.

With accelerated hospital competition and the popularity of the Internet and mobile devices, there is a need to understand the factors that would entice healthcare professionals to use mobile healthcare systems (MHS). Comprehending the essentials of what determines healthcare professional MHS acceptance can provide great management insight into developing effective strategies that will allow hospitals to create new opportunities and values for its customers, to increase the efficiency and effectiveness of health care personnel, and thereby, remain competitive. Generally, the essential characteristics of users and technologies in professional healthcare differ greatly from the customary commercial context [20]. Thus, any model developed for the general public may not apply to a healthcare environment. MHS acceptance may need to consider MHS-specific factors, such as healthcare professional values and their mobile computing capabilities. Hence, the purpose of this study is to present a conceptual framework for assessing the medical professional behavioral intention to adopt MHS. Technology acceptance model (TAM) and the innovation diffusion theory (IDT) serve as the theoretical basis for this study that are integrated with MHS self-efficacy, and technical support and training. We also validate the factors that determine healthcare professional MHS acceptance and examine the relationships among those latent variables.

## 2. Conceptual model and research hypotheses

In this study, MHS refers to the healthcare information processing system, including all relevant medical professional participants and the use of new IT/IS to deliver healthcare services and exchange healthcare information via mobile devices anytime and anywhere [1,20–22]. Healthcare professional MHS adoption refers to the healthcare professionals'

psychological state regarding the individuals' intention to use MHS in their practice. The integrated mobile IT/IS can provide easy access to the networks and resources whether the healthcare professionals or patients are stationary or moving. MHS allows professionals to access real-time patient records and state-of-the-art medical information [5,14]. The variety of mobile devices includes personal digital assistants (PDAs), laptops, pocket and tablet computers, GPS, smart-phones, etc. [10,22–24]. While system use is recognized as a good indicator of IT/IS success, user adoption and system acceptance can be predicted adequately from the individual's behavioral intent. A number of empirical studies have proven this point [20,21,25,26].

Based on our observation and intensive literature review, there are several important factors for determining the success of modern IT/IS in health care; for example, the reluctance of healthcare professionals to use systems as a consequence of limitations in their IT skills [17,27]. Other potential determinants may found in the answers to the following questions: how IT/IS is compatible with healthcare practitioners' current working conditions; what kinds of training programs, resources and support were provided; what incentives were used to get healthcare professionals to use the system [5]. In addition, some studies indicated that mobile device size, access procedures, ease of use, mobile interface, and training and support are the most significant factors for new application usage [23,28]. These issues are described as follows.

### 2.1. Technology acceptance model and innovation diffusion theory

The users' acceptance of new IT/IS is the primary factor in IT/IS success [21]. Technology acceptance model is a well-established model that has been used broadly to predict and explain human behavior [29,30]. The initial TAM is composed of five constructs: perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (BI), and actual system use (AU). Among these, PU and PEOU are the most dominant determinants for system use and PEOU has a direct effect on PU. Attitude toward using directly influences a user's behavioral intention to use determining actual system use. Venkatesh and Davis [31] proposed an extended TAM, labeled TAM2 which omits attitude toward using because of weak predictors of either behavioral intention to use or actual system use. In other words, behavioral intention to use is jointly determined by PU and PEOU. This means that healthcare professional perceptions of the degree to which MHS is easy to use influences both perception of usefulness and the professional intentions to use MHS. The professionals' intentions to use MHS can be explained or predicted by the perception of MHS ease of use and usefulness [30,32]. Therefore, the following hypotheses are proposed.

**H1.** Perceived usefulness has a direct effect on behavioral intention to use MHS.

**H2a.** Perceived ease of use has a direct effect on behavioral intention to use MHS.

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