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Effect of u-healthcare service quality on usage intention in a healthcare service☆

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ABSTRACT

The aging of society has become a major global concern influencing nearly every factor that affect life quality, including economic growth, labor markets, family composition, housing, pensions, and health. This social change requires a long-term care system that provides high-quality care for the elderly. The purpose of this study is to determine the quality characteristics of ubiquitous healthcare (u-healthcare) services for a healthcare service that influence service provider's usage intentions. A research model, based on the Unified Theory of Acceptance and Use of Technology is developed and applied to a long-term care system in order to identify factors that affect individuals' usage intentions for u-healthcare. Appropriate measures are developed and then tested on 142 staff of long-term care hospitals. The results identify the factors that significantly affect usage intention. The study provides healthcare decision makers and policy makers with information that will aid them in planning and implementing systems for long-term care.

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1. Introduction

Societal aging, due to rising life expectancies and declining birth rates, has caused major social change in many countries. Furthermore, it is expected to lead to many problems, such as reduction in the productive workforce, spiraling healthcare costs for the elderly, and deterioration of public finance (Chaudhry et al., 2006; Fried, 2012; Vita et al., 1998). Without disruptive change, many people may not be able to afford healthcare. To address these problems, healthcare decision makers and policy makers in many countries have begun to focus on the innovation of IT-based healthcare. Healthcare innovation is expected to result in ubiquitous healthcare (u-healthcare), care that is available anytime and anywhere, such as self-care, mobile care, and home care (Casalino et al., 2003; Holden and Karsh, 2010).

The phenomenon societal aging has led to rapid increase in the demand for health promotion and improved healthcare services such as long-term care. The problems with long-term care have been acknowledged as posing social risk. U-healthcare services are expected to provide individualized mobile healthcare services via wireless communication. They will integrate with conventional healthcare services at hospitals. Such hospital-based u-healthcare requires technology that enables the delivery of quality healthcare services regardless of time and place as well as service technology that enables

the management of each user's requirements. With such technology, users can receive uninterrupted quality of healthcare and information from their doctors or designated hospitals (Lee and Lee, 2010; Plaza et al., 2011).

Venkatesh et al. (2003) identified variables for eight models of user acceptance of technology. Several pertinent models have reviewed and synthesized those eight models to develop the Unified Theory of Acceptance and Use of Technology (UTAUT). The model becomes a baseline model for usage research regarding a variety of technologies in both organizational and nonorganizational settings (Venkatesh et al., 2012). It has been used in assessment of user adoption of mobile technology (Cheng et al., 2011; Zhou et al., 2010), electronic medical records (EMRs) (Hennington and Janz, 2007), internet banking (AbuShanab et al., 2010), online stocking (Wang and Yang, 2005), and location-based services (Xu and Gupta, 2009). Most previous studies focus on information and service industries (Elg et al., 2012; Osei-Frimpong et al., in press; Shin et al., 2013). Few studies have applied this model to healthcare quality issue, long-term care, and the effect of u-healthcare services quality on usage intention. Unlike previous studies, this study emphasizes an integrated approach in order to explore the relationship between healthcare quality characteristics and u-healthcare usage intention. Thus, this study provides a framework for effective u-healthcare technology adoption strategy in a long-term health care industry.

The purpose of this study is to explore factors that affect service providers' intentions to use u-healthcare for long-term care. Drawing on the u-healthcare service quality's five factors (connectivity, compatibility, complexity, perceived benefit, and perceived trust) that

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influence performance expectancy of the UTAUT, this study develops and empirically tests a research model for u-healthcare usage intention. The model is constructed based on the responses of people who intend to use u-healthcare services for long-term healthcare. Specifically, this study 1) identifies the various quality characteristics (connectivity, compatibility, complexity, perceived benefit, and perceived trust) of u-healthcare services for long-term care, 2) investigates the relationship among u-healthcare's quality characteristics, service provider's performance expectancy, and service provider's usage intentions, and 3) examines the relationships among the performance expectancy, effort expectancy, social influence, and usage intentions of service providers. This study is tested empirically by use of structural equation modeling (SEM). The result identifies the relationships among the characteristics of u-healthcare service quality, performance expectancy, effort expectancy, social influence, and usage intentions. This study will provide long-term healthcare providers and policy makers with significant strategic insights into improving the quality of long-term care.

2. Theoretical background

2.1. U-healthcare services

Societal aging, which is occurring on a global scale, has caused in major social changes. Hospitals are transforming from treatment centers to centers for health promotion and disease prevention. Recently, service providers have become increasingly interested in u-healthcare. U-healthcare services, healthcare services that are available anytime and anywhere, include remote management of patients' illnesses and maintenance and improvement of the quality of public healthcare. In addition, u-healthcare involves increasing the computerization and mobilization of hospitals; this includes personal digital assistants that enable physicians, nurses, and other healthcare providers to access of patient healthcare information anytime and anywhere.

There has been much research into u-healthcare. Specifically, research has examined trends in healthcare research (Holden and Karsh, 2010; Touati and Tabish, 2013), mobile computing acceptance factors in the healthcare industry (Wu et al., 2007), u-healthcare technology development (Favela et al., 2010; Lin et al., 2008; Rigby, 2007). Studies on the acceptance of u-healthcare have typically used the technology acceptance model (TAM) proposed by Davis and his colleagues (Davis, 1989; Davis et al., 1989; Jang and Lee, 2011; Pai and Huang, 2011). In testing mobile computing acceptance factors in the healthcare industry, Wu et al. (2007) found that users' self-efficacy and compatibility for mobile healthcare services positively influenced their perceptions of mobile healthcare's usefulness and ease of use. Jung and Berthon (2009) studied successful healthcare technology usage by devising a research model, based on the TAM, for examining the relationships among compatibility, trust, and perceived usefulness. Maass and Varshney (2012) investigated, based on the TAM, individuals' intentions to use ubiquitous information systems for healthcare; they found that perceived ease of use positively influences perceived usefulness and intention to use. Perceived usefulness and enjoyment positively influence usage intention.

2.2. The UTAUT

Originally derived from expectancy theory, the UTAUT is composed of four core variables (performance expectancy, effort expectancy, social influence and facilitating conditions) and four moderating variables (age, experience, gender, and voluntariness of use). The UTAUT consolidates the constructs of eight major theories regarding information technology acceptance. Specifically, the UTAUT integrates eight theoretic models in order to predict behavioral intention and usage behavior related to information technology acceptance. The theoretical models include the following: the theory of reasoned action,

the TAM, the theory of planned behavior (TPB), the innovation diffusion theory, social cognitive theory, the motivational model, the model of PC utilization, and a model combining the TAM and the TPB. The UTAUT conceptualizes the determinants of user acceptance and usage behavior; all of these determinants contribute to usage behavior either directly or indirectly through behavioral intentions. The relationships among the four core variables are moderated by the four moderating variables.

According to the UTAUT, performance expectancy (derived from the construct of perceived usefulness) is defined as the degree to which an individual believes that using the system will help him or her to attain job performance goals. Effort expectancy (derived from the construct of perceived ease of use) is defined as the degree of ease of use of the system (Venkatesh et al., 2003). Venkatesh et al. (2012) proposed the UTAUT2, which extended the UTAUT by incorporating three additional variables: hedonic motivation, price value, and habit. In the UTAUT2, individual differences (age, gender, and experience) are hypothesized to moderate the effects of these three additional variables on behavioral intention and technology use. Compared to the UTAUT, the UTAUT2 led to a substantial improvement in the explained variance of behavioral intention and technology use. Recently, the UTAUT has been used in a number of field studies such as the adoption of mobile payment services (Thakur, 2013), use of collaboration technology (Brown et al., 2010), user acceptance and use of mobile Internet technology (Venkatesh et al., 2012), satisfaction with adoption of e-government technology (Chan et al., 2010), and continuance intention for web-based learning (Chiu and Wang, 2008).

3. Research model and hypothesis

3.1. Research model

Fig. 1 shows the research model used in this study as the strategic rationale for including various characteristics in the analysis of service provider's usage intentions for u-healthcare services. In this model, which is based on the UTAUT, the expected quality of u-healthcare services (performance expectancy) is characterized by effort expectancy as well as five additional variables: connectivity, compatibility, complexity, perceived benefit, and perceived trust. Effort expectancy and social influence, two of the main UTAUT variables, are included in the model in order to verify their relationships with u-healthcare usage intention.

Venkatesh et al. (2003) uses facilitating condition variables to explore usage behavior effect. However, this study cannot measure this variable since the hospitals in the study do not yet offer u-healthcare services so as not to examine usage behavior. Therefore, facilitating condition variable is excluded for this study perspective. This study also excludes control variables measuring the effects of performance expectancy, effort expectancy and social influence on usage intention and usage behavior by group difference since this study does not focus on exploring group difference.

3.2. Hypothesis development

Based on previous studies, we specify connectivity, compatibility, complexity, perceived benefit, and perceived trust as u-healthcare service quality characteristics. Since u-healthcare services differ from other healthcare services in terms of their delivery mode, selected variables are identified as better characterizing for service providers to use such u-healthcare service.

The connectivity variable refers to how service providers can utilize u-healthcare whenever and wherever they wish via quick and easy connections to healthcare services. The importance of such connectivity has been studied in the context of mobile and wireless Internet services. Lee et al. (2012) studied the factors affecting individuals' usage intentions toward mobile financial services and found that connectivity has a positive relationship with perceived ease of use. Given its ubiquity, mobility, and accessibility, which are all enabled by connectivity, u-healthcare

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