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# Healthcare System-Use Behavior: A Systematic Review of ITs Determinants

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## ABSTRACT

*To understand patient and physician behavior, researchers have investigated the determinants of using healthcare information systems. Although this stream of research has produced important findings, it has yet to appreciably advance our understanding of system-use behavior in healthcare. To fill this gap, the current paper employs a systematic review to synthesize past research, reveal the key determinants of healthcare system usage, and illuminate a deeper understanding of the topic. This study thus helps healthcare researchers expand their baseline knowledge of these core determinants and conduct more fruitful future research on system-use behavior in healthcare.*

**Keywords:** *healthcare, healthcare information systems, system usage, system-use behavior, TAM, technology acceptance model*

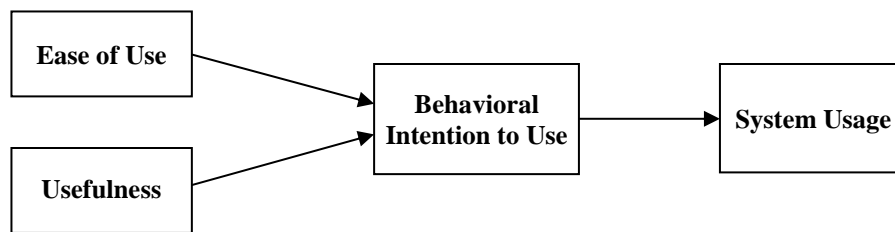
## INTRODUCTION

Healthcare information systems refer to any system that captures, stores, manages, or transfers information related to healthcare. In the past ten years, healthcare researchers have invested tremendous efforts to understand patient and clinician system-use behavior. Not surprisingly then, a number of research models have been developed to identify the determinants of user acceptance of information technologies in healthcare. Many of those models are mainly based on the Technology Acceptance Model (TAM) due to its practical utility and predictive power (Davis et al, 1989). However, based on our knowledge, very few studies have systematically examined the determinants of system acceptance in healthcare.

To fill this gap, the current study uses a systematic review approach to synthesize past research and to investigate the determinants of user-behavior in healthcare. A systematic review approach is very useful here because the empirical studies included in the analysis offer a variety of results of interest, which are unlikely to be obtained from a single study. By doing so, the current study not only identify key factors for using healthcare information systems but also helps to better understand clinician and patient behavior. This particular topic is of profound theoretical and practical importance, but so far it has not been directly and systematically investigated.

## METHODOLOGY

TAM, as shown in Figure 1, asserts that the intention to use or actual use of an information system is a function of perceived ease of use and perceived usefulness (Davis et al, 1989). To identify system-use predictors unique in the context of healthcare, the current study thus focuses on core determinants other than perceived ease of use and perceived usefulness.

**Figure 1: The Technology Acceptance Model.**

To find studies, we searched bibliographic databases and electronic bibliographies in various sources in February 2016. Examples of the bibliographic databases are Business Source Premier, ScienceDirect, ABI/INFORM, and PubMed. We manually searched some journals whose back issues were unavailable in bibliographic databases. For the electronic searches, we used such key words as information system, healthcare, health care, management information systems, technology acceptance model (TAM), system use, system usage.

To locate additional studies, we also scanned bibliographies of the papers identified, and checked their potential for inclusion. This comprehensive search strategy enables us to locate as many studies as possible. Finally, studies were chosen if they satisfied these two criteria: (1) they study information systems in healthcare and (2) they investigate determinants of using information systems. In total, we scanned over 130 articles and found that 16 studies met the inclusion criteria and thus were included in this research.

## DETERMINANTS IN PAST STUDIES

### *Perceived Compatibility*

Past research has identified compatibility as a key motivator for using healthcare information technology. Rooted in Rogers' Innovation Diffusion Theory (IDT), compatibility is defined as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995, p. 250). No doubt, healthcare delivery is a complex work process involving many medical tests, different treatment techniques, discussion with colleagues, synthesis of information from multiple sources, and application of multiple treatments simultaneously. Healthcare information systems, designed by technical specialists, may sometimes be unable to adequately capture this complex process or may even force physicians to change their approach to practice, resulting a reluctance to use healthcare systems (Bhattacharjee & Hikmet, 2007). Therefore, compatibility is of great importance to healthcare technology adoption.

Extant healthcare studies have confirmed the critical role of compatibility, as perceived by physicians, in system-use behavior. For example, Lee et al. (2015) find that an individual's prior compatible experiences have a significant impact on his/her attitude toward using new healthcare information technology. Similarly, investigating technology usage in a private hospital setting,

Ismail et al. (2012) also find a positive relationship between compatibility and attitude toward using new technology. Many other studies have also successfully integrated compatibility into their research models and have found that compatibility leads to preferable healthcare system adoption (Bhattacharjee & Hikmet, 2007; Rodriguez 2012). In an investigation of acceptance of e-prescriptions and automated medication-management systems in hospitals, Rodriguez et al. (2012) find that perceived compatibility has a significant effect on both perceived usefulness and perceived ease of use. The impact of compatibility on usefulness has also been confirmed by Bhattacharjee and Hikmet (2007) in their investigation of physicians' resistance toward healthcare information technology.

### ***Trust***

Trust is another important determinant of using healthcare information systems. According to Mayer et al. (1995), trust has been defined as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (p.712). Healthcare involves privacy issues, which concern patients, physicians, and primary care providers. The most important goal for primary care and technology providers is to secure healthcare information systems and prevent unauthorized people from accessing medical records and confidential information (AlHamad et al., 2014). Similarly, the main concern for patients is the trust of the healthcare information systems they are provided to use and the trust of the protection of their sensitive personal information. Therefore, in the context of healthcare, if patients and physicians trust an information system and its vendor, they are more likely to view the system as something they can safely gain from and thus use it more frequently (Lanseng & Andreassen 2007).

Focusing on Internet-based patient-physician communication applications, Klein (2007) find that patient trust in healthcare provider and in Internet-based application vendor has a significant effect on behavioral intention to use the healthcare information systems. In an investigation of patient privacy, AlHamad et al. (2014) argue that trust is one of the most important issues when dealing with patient privacy and suggest that the trust construct should be assessed in four dimensions: trust in protection of personal data, trust in healthcare information systems, trust in authorized access to records, and trust in system security. They further suggest that to alleviate patient privacy concerns, it is necessary to increase the trust between the patients and primary care provider and the trust between the patients and third parties who are involved in securing the networks and others. Investigating primary healthcare nurses' intention to use information technology, Hung et al. (2014) find that trust in primary health information system can significantly influence one's attitude toward using it.

### ***Performance Expectancy***

An information system may be of great importance to physicians because it can help them to better perform their daily job. Thus, performance expectancy is a vital variable to the understanding of attitude to and usage of healthcare information systems. Performance expectancy can be defined as the degree to which individuals believe that using an information system will benefit them in terms of improving job performance (2012). Researchers suggest that performance expectancy is

closely related to these three factors: perceived usefulness, extrinsic motivation, and job fit (Jeng & Tzeng, 2012). In the context of healthcare, performance expectancy may involve helping patients and physicians to be more effective in monitoring daily physical conditions, making personal healthcare plans, and safely maintaining medical records (Gao et al., 2015).

Past research offers evidence to the important role of performance expectancy in healthcare system-use behavior. Investigating social influence on the use of clinical decision support systems, Jeng and Tzeng (2012) find that performance expectancy has a significant impact on behavior intention. Focusing on the factors associated with consumer's intention to adopt wearable technology in healthcare, Gao et al. (2015) also find that performance expectancy can significantly influence behavioral intention. Similarly, Sun and Lu (2014) provide empirical evidence that performance expectancy has a significant effect on behavioral intention to use healthcare website. In an investigation of issues of accepting the German electronic health card (eHC), Wirtz et al. (2012) have grounded their research on technology acceptance model and the relevant literature, and find that performance expectancy can indirectly affect the attitude toward using the system through perceived usefulness.

### ***Perceived Risk***

Healthcare information systems deal with sensitive medical records and personal information and thus perceived risk of system failure may be a big concern for patients and physicians. Therefore, it is very necessary and important to consider the influences of perceived risk on healthcare information system usage. Perceived risk can be defined as the probability of a negative consequence happening from engaging in a behavior (Jung & Berthon, 2009). Generally, individuals will perform risk-benefit analysis that takes into account for drivers and inhibitors of system-use behavior when they are asked to use healthcare information systems (Gao et al. 2015). Because healthcare systems may raise users' concern about privacy and system failure, the decision to adopt healthcare technology involves a highly salient risk-benefit analysis in which users will face the tradeoff between perceived benefits and perceived risks (Gao et al. 2015).

Rodriguez et al. (2012) suggest that perceived risk can be negatively linked to perceived usefulness and to perceived ease of use, and their empirical study provides strong evidence to the second link. In an attempt to develop a model for delivering successful online healthcare, Jung and Berthon (2009) suggest that perceived risk will significantly and negatively influence one's attitude toward using healthcare information systems. Drawing from the unified theory of acceptance and use of technology (UTAUT), perceived risk theory, and credibility theory of online health information, Sun and Lu (2014) also suggest that perceived risk is the key influencing factor of users' acceptance and usage of healthcare website. Similarly, in an empirical study of wearable technology acceptance in healthcare, Gao et al. (2015) find that perceived risk has a significant, negative effect on individual's intention to adopt medical wearable devices.

### ***Perceived Threat***

Past research suggests that physicians appear to be relatively independent in making decisions on technology acceptance. One reason for such independence may well be that they have specialized training and autonomy. Therefore, perceived threat to professional autonomy is likely to be a salient construct affecting physicians' acceptance of healthcare information systems. Perceived threat to professional autonomy can be defined as "the degree to which a person believes that using a particular system would decrease his or her control over the conditions, processes, procedures, or content of his or her work" (Walter & Lopez, 2008, p. 209]. Past research also suggests that professionals tend to resist using an information system if they perceive the system as threatening to their professional autonomy (Bhattacharjee & Hikmet, 2007).

Focusing on the usage of Electronic Medical Records (EMR) systems and Clinical Decision Support (CDS) systems, Walter and Lopez (2008) find that perceived threat to professional autonomy has a significant, negative direct impact on perceived usefulness of an information system and on behavioral intention to use that system. Presenting a theoretical model of physicians' resistance of using healthcare information technology, Bhattacharjee and Hikmet (2007) find that perceived threat can indirectly influence behavioral intention to use healthcare information systems through resistance to change, which is defined as "any conduct that serves to maintain the status quo in the face of pressure to alter the status quo" (Zaltman & Duncan, 1977, p. 63).

### ***Credibility***

Healthcare information systems provide a lot of useful information to patients and physicians. Consequently, users may visit the healthcare websites for different reasons. For example, users can visit a healthcare website to easily get some drug information or to find answers to some questions related to unspeakable health problems. Therefore, trust in this information is tightly related to the credibility of the information and/or healthcare provider. In an investigation of the credibility of online information, Fogg and Tseng (1999) simply define credibility as the degree of being trustworthy. This definition thus indicates that a credible person is the one who is trustable and credible information is the information that is trustable (Sun & Lu, 2014). Past research suggests that if a user perceives something or some person as credible, the user will have more positive attitude toward the thing and the person.

Studies in healthcare have also found a significant effect of credibility on system-use behavior. For example, Sun and Lu (2014) have found that credibility of online health information has a significant influence on both behavioral intention to use and actual usage of healthcare websites. In a review of the potential benefits and pitfalls of e-health, Jung and Berthon (2009) have developed a theory-based model of e-health acceptance, and suggested that credibility can impact both perceived usefulness and perceived risk and thus can indirectly influence attitude toward using healthcare information systems.

**Table 1: Summary of the determinants found in past studies.**

Determinant	Research Paper	Findings
Perceived Compatibility	Bhattacharjee and Hikmet 2007 Lee, Tsao, and Chang 2015 Jung and Berthon 2009 Wirtz, Mory, and Ullrich 2012 Ismail, Kit, Buhari, and Muzaini 2012 Rodriguez, Lozano, and Alonso 2012	Perceived compatibility has a significant impact on perceived ease of use, perceived usefulness, and attitude.
Trust	AlHamad, Omari, and AlHamad 2014 Klein 2007 Hung, Tsai, and Chuang 2014 Lanseng and Andreassen 2007 Klein 2007	Trust has a significant impact on perceived ease of use, perceived usefulness, attitude, and behavioral intention.
Performance expectancy	Jeng and Tzeng 2012 Gao, Li, and Luo 2015 Sun and Lu 2014 Wirtz, Mory, and Ullrich 2012 Kohnke, Cole, and Bush 2014	Performance expectancy has a significant impact on perceived usefulness and behavioral intention.
Perceived Risk	Jung and Berthon 2009 Gao, Li, and Luo 2015 Sun and Lu 2014 Rodriguez, Lozano, and Alonso 2012	Perceived risk has a significant impact on perceived ease of use and behavioral intention.
Perceived Threat	Walter and Lopez 2008 Bhattacharjee and Hikmet 2007	Perceived threat has a significant impact on perceived usefulness and behavioral intention.
Credibility	Sun and Lu 2014 Jung and Berthon 2009	Credibility has a significant impact on behavioral intention.

## CONCLUSION

Employing a systematic review approach, the current study combines findings from many individual studies to investigate the determinants of using healthcare information systems. Thus, this study contributes to an integrated analysis of system-use behaviors in the field of healthcare. The current study finds that in the context of healthcare, the key determinants of system-use behavior are perceived compatibility, trust, performance expectancy, perceived risk, perceived threat, and credibility. All these findings, therefore, constitute an important step toward a better understanding of healthcare system-use behavior and facilitate future research to further investigate these key determinants in the context of healthcare.

Specifically, future research can apply these six determinants to various healthcare system use contexts to compare their predictive power and to find out which one is the most salient predictor. Future research can also compare their predictive power with that of perceived usefulness and perceived ease of use. Such a comparison will enable researchers to discover whether the predictive power will shift from perceived usefulness and perceived ease of use to these six determinants in the context of using healthcare information systems. Moreover, this research is based on 16 individual studies found from the literature and thus may have the limitation of small sample size. For this reason, future research is also needed to collect more healthcare system use behavior studies and investigate whether there are other critical determinants of using healthcare information systems.

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