Using the Decomposed Theory of Planned Behaviour to explain Healthcare Consumer Adoption of Electronic Health Records

Research in Progress

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Abstract

An Electronic Health Record (EHR) can be defined as the digital version of an individual's medical history. EHRs are intended to improve the quality and efficiency of healthcare, decrease costs and prevent medical errors. Previous studies have shown that achievement of the potential benefits from EHRs depends largely upon the adoption and continued use of EHR services by health care consumers (Esmaeilzadeh and Sambasivan 2017; Hanna et al. 2017). Further research, therefore, is necessary to better understand the factors that influence consumer EHR adoption. The proposed study aims to investigate the factors influencing consumer adoption of EHRs. A model based on the Decomposed Theory of Planned Behaviour (DTPB) (Taylor and Todd 1995) provides the theoretical framework for the research. The goal is to improve understanding of how health care consumers perceive this technology and the factors that influence their intentions to use it.

Keywords electronic health record, consumer perceptions, decomposed theory of planned behaviour

1 INTRODUCTION

An EHR is defined as an electronic version of an individual's health record. This longitudinal electronic record includes patient health information such as demographics, progress notes, medications, vital signs, past medical history, immunisations, laboratory data, and radiology reports (Blumenthal and Tavenner 2010; Menachemi and Collum 2011). The primary purpose of EHRs is to improve the delivery of healthcare by offering a wide variety of benefits such as better patient care, increased efficiency of the health system, and productivity (Bisbal 2013). EHRs, when optimally implemented, hold tremendous potential benefit for the healthcare system and can enhance how patient data is documented and organised (Bowman 2013).

EHRs have received great attention worldwide and been adopted across many countries. One of the important factors that has been shown to influence the successful and widespread adoption of EHRs is consumer support and endorsement (Esmaeilzadeh and Sambasivan 2017). EHRs have the potential to empower consumers by providing them with easier access to their health data, allowing them to exert more control over their health records, and transforming their ability to actively engage in their healthcare (Vahdat et al. 2014). According to Showell (2011), patients can be reframed as 'consumers' in the assumption that they have a consumer's right to select and choose in the health marketplace. Consumers have an important role to play as they hold valuable knowledge of what can limit or contribute to the acceptance and adoption of EHRs (McGinn et al. 2011). Nevertheless, the successful adoption of EHRs has been hindered by different factors such as technological, environmental, individual, health-related, psychological and risk factors (De Pietro and Francetic 2018). Understanding the technology adoption factors influencing healthcare consumers can, therefore, serve as a key to successful adoption and implementation.

There exists little research that provides an integrative and holistic view of the perspectives of healthcare consumers underpinned by sophisticated theoretical frameworks (Tavares et al. 2018). A comprehensive analysis of consumers' perceptions can serve as a key to successful implementation. It has been suggested in previous research that consumers will not adopt EHRs if the system does not align closely with their attitude and expectations (Greenhalgh et al. 2010). In addition, Koivumäki et al. (2017) and Tavares and Oliveira (2016) indicate the adoption of e-health technologies by health care consumers still requires more research given the importance of the topic. This paper describes a proposed study to explore how health care consumers perceive EHRs and how their perceptions contribute to their overall intention to adopt EHRs.

The organisation of the rest of the paper is as follows. The development of the theoretical framework and hypotheses is presented in Section 2. Section 3 describes the research methodology and finally conclusions are presented in Section 4.

2 RESEARCH MODEL AND HYPOTHESIS

The objective of the study described in the paper is to identify the key factors influencing healthcare consumer adoption of EHRs. To address the research objective, the following research question was proposed.

RQ: What are the key factors influencing healthcare consumer adoption of EHRs?

The study achieves this by proposing and testing a EHR consumer adoption model that extends the DTPB (Taylor and Todd 1995). The Theory of Planned Behaviour (TPB) by Ajzen (1991) postulates that an individual's behavioural intention is a function of attitude, subjective norm, and perceived behavioural control. Using the TPB as a basis, Taylor and Todd (1995) developed the DTPB, which explains user behaviour by further decomposing the three determinants (attitude, subjective norm, and perceived behavioural control) of intention. In addition to the DTPB constructs, the model proposed in this study provides a platform for investigating more comprehensive system characteristics by adding two important variables supported by the empirical literature on EHRs, security and privacy concerns and perceived health literacy. The study specifically explains the impact of these factors on the Intention to Use EHRs from the healthcare consumer perspective.

Previous research in Health Information Technology (HIT) that has adopted the DTPB to predict individuals' intention to adopt HIT has demonstrated that the DTPB performs better than the TPB (Hung et al. 2012; Ma et al. 2015). This can be explained in terms of the increased explanatory power and better, more precise, understanding of behavioural antecedents as a result of the decomposition which added more value to the model (Jaruwachirathanakul and Fink 2005; Shih and Fang 2004; Taylor and Todd 1995).

For the proposed study, the DTPB was considered to be a suitable starting point to predict the behavioural intention of health care consumers to adopt EHRs. DTPB has a firm base in the literature and many research studies have applied DTPB in different domains, including business, finance education, and healthcare (e.g Alruwais et al. 2016; Hung et al. 2012; Ma et al. 2015). Figure 1 shows the proposed research model tested in this study.

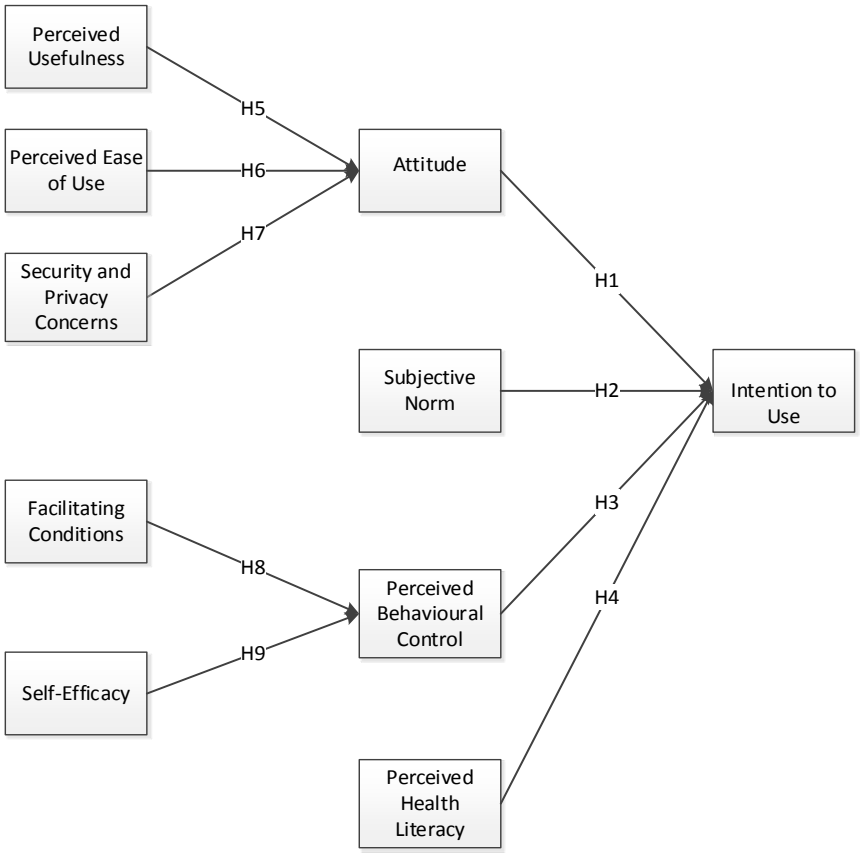

Figure 1: Proposed research model

The model proposes that Intention to Use is influenced by four constructs, namely Attitude, Subjective Norm, Perceived Behavioural Control, and Perceived Health Literacy, where the first three are DTPB constructs (Taylor and Todd 1995). The literature also provides empirical support indicating the significance of Perceived Health Literacy as a direct influencing factor on the intentions of people to adopt EHRs (Noblin et al. 2012; Vezyridis and Timmons 2015). Therefore, this relationship was also included in the model.

Attitude is considered to be influenced by three constructs, namely Perceived Usefulness, Perceived Ease of Use and Security and Privacy Concerns, where Perceived Usefulness, and Perceived Ease of Use are DTPB constructs (Taylor and Todd 1995). Several studies on HIT including EHRs indicate security and privacy concerns as an important factor directly or indirectly influencing EHRs adoption (Cocosila and Archer 2014; Tieu et al. 2015). The literature also confirms that there is a relationship between privacy and security concerns and attitude (Fortes and Rita 2016; Gurung and Raja 2016). Therefore, the relationship was included in the model.

Perceived Behavioural Control is considered to be influenced by two constructs, Self-Efficacy and Facilitating Conditions, both of which are DTPB constructs (Taylor and Todd 1995).

The proposed model has nine associated hypotheses which are listed in Table 1.

#	Hypothesis
H1	Attitude will positively influence consumers' Intention to Use EHRs.
H2	Subjective Norm will positively influence consumers' Intention to Use EHRs.
H3	Perceived Behavioural Control will positively influence consumers' Intention to Use EHRs.
H4	Perceived Health Literacy will positively influence consumers' Intention to Use EHRs.
H5	Perceived Usefulness will positively influence consumers' Attitude toward EHRs.

#	Hypothesis
H6	Perceived Ease of Use will positively influence consumers' Attitude toward EHRs.
H7	Security and Privacy Concerns will negatively influence consumers' Attitude toward EHRs.
H8	Facilitating Conditions will positively influence consumers' Perceived Behavioural Control toward EHRs.
H9	Self-Efficacy will positively influence consumers' Perceived Behavioural Control toward EHRs.

Table 1. Summary table of hypotheses

3 METHODOLOGY

The research involves a mainly quantitative approach, however, there are two optional open-ended questions included at the end of the questionnaire. As a significant proportion of the target population currently use electronic technologies (Australian Bureau of Statistics 2017), an online survey provides a relatively cost-effective alternative allowing for the collection of large amounts of data in a short time frame. Therefore, the study uses a cross-sectional online questionnaire to collect data.

The target population for this research study will be Australian residents aged 18 years and above (i.e. adult consumers) who may be required to make decisions about adoption of EHRs. A balanced mix of gender, age range and geographic spread will be sought. Recruitment will be undertaken through a third party recruitment company, 'The Digital Edge' (https://www.thedigitaledge.com.au/), which has an ISO accredited research panel of 100,000 active Australians.

3.1 Questionnaire design

A questionnaire has been developed to collect data to test the proposed model of consumer adoption of EHRs. The questionnaire is comprised of three sections with 48 items. The first section consists of general information describing the research. The following section includes items that measure the constructs Perceived Usefulness, Perceived Ease of Use, Perceived Health Literacy, Subjective Norm, Perceived Behavioural Control, Self-efficacy, Facilitating Conditions, Security and Privacy Concerns, Attitude and Intention to Use utilising five-point Likert scales with responses ranging from "strongly disagree" to "strongly agree". The final section gathers background information about the respondents through standard categorical-type questions. Further, the final section includes an open-ended question and extra space for people to leave comments about the research. The items to measure the majority of the constructs were adapted from previous research in information systems, consumer behaviour and health care. Item measures were also slightly modified to adapt to the particular research context where appropriate. Table 2 shows the research constructs with questionnaire item sources.

Construct	Item Source	Construct	Item Source
Perceived Usefulness	Davis (1989) ; Noblin (2010)	Facilitating Conditions	Thompson et al. (1991) ; Taylor and Todd (1995)
Perceived Ease of Use	Davis (1989) ; Taylor and Todd (1995)	Security and Privacy Concerns	Assadi and Hassanein (2017) ; Deng et al. (2018)
Subjective Norms	Taylor and Todd (1995)	Self-efficacy	Compeau and Higgins (1995)
Perceived Health Literacy	Noblin et al. (2012)	Attitude	Taylor and Todd (1995)
Perceived Behavioural Control	Taylor and Todd (1995)	Behavioural Intention	Cheng et al. (2006) ; Taylor and Todd (1995)

Table 2: Sources of the items in the questionnaire

3.2 Data Collection and Data Analysis

The online survey will be created and administered using the Qualtrics survey software suite. Potential participants will receive an email invitation from the third party recruitment company. The invitation will contain general information about the study and the amount/type of reward the participant will receive. For those who do not wish to take part in the survey, there will be a 'decline' option embedded in the email. The invitation will also include an email address for any queries relating to the survey. All interested panel members will be passed automatically to the Qualtrics online questionnaire. The survey is intended to take no longer than 15 minutes for a participant to complete.

The quantitative data collected will be analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). PLS-SEM is a multivariate data analysis method widely used in information systems research (Hair, Hollingsworth, Randolph, & Chong, 2017). PLS-SEM using SmartPLS 3.0 will

be used to test the research model due to the suitability of this structural equation modelling methodology for complex exploratory models (6+ constructs) and models that include formative measured constructs as well as reflective ones (Hair et al., 2017).

According to Hair et al. (2016), the sample size for PLS should be equal to ten times the largest number of structural paths directed at a particular construct in the structural model or ten times the largest number of formative indicators used to measure one construct. As this research involves a complex formative construct (i.e. Security and Privacy Concerns), the sample size need to be ten times the number of this construct's indicators, that is, 13 indicators. Therefore, testing of the model requires a minimum of 130 participants. To account for possible invalid cases and non-responses, a sample of at least 200 is sought. A sample of this size helps in establishing the statistical validity of the results.

PLS testing of the model will be carried out in two stages. The first stage is the evaluation of the measurement model (also called outer model) and the second stage is the evaluation of the structural model (also called inner model). The measurement model specifies the relationships between each latent variable and its measures, whereas the structural model specifies the relationships between the latent variables themselves (Henseler, Hubona, & Ray, 2016). The qualitative data collected will be analysed using thematic analysis and is intended to complement the quantitative findings and give additional insights into them.

4 CONCLUSION

4.1 Expected outcome

The study is expected to identify the key factors that potentially influence health care consumer adoption of EHRs. The results of this study should be valuable in improving understanding of health care consumer perspectives about EHR adoption and support widespread adoption of EHRs. A better understanding of consumer characteristics, attitudes, and beliefs will be beneficial to EHRs research and provide valuable insights into the factors that influence the adoption of EHRs. There have been few studies to date that have applied the DTPB (Taylor and Todd 1995) in the healthcare domain and this study adds new knowledge by using it in the EHR consumer context.

4.2 Implications for practice

The outcomes of the study will have several implications for practice. Understanding the consumer adoption factors in the context of EHR systems will provide a more nuanced understanding that will be valuable to health care educators, health care professionals and government policymakers as they develop strategies designed to inform potential consumers and educate people as to how to use EHR systems. Policymakers taking into account the relevance of these factors can promote the effective use of EHRs which may potentially lead to an increased level of adoption. The findings of the study should also inform evidence-based interventions and/or training to promote more effective use of EHRs. The knowledge of factors such as ease of use and usefulness can also help developers to design, develop and offer better consumer oriented EHR systems.

4.3 Study limitations

The research study has several limitations. Firstly, the data collection involves a cross-sectional survey. Therefore, it is difficult to guarantee that the relationships will remain the same over time and additional research using longitudinal studies would add value. Secondly, the findings may also be affected by the recruitment strategy. Data collection will be conducted online with participants recruited by a third party survey company. Therefore, the sample of the study represents a cohort of online users and all users will have some level of comfort with technology. As a result, the participants may not fully represent the population of interest and the future research should use data collection methods that include a wide spectrum of people in terms of technology proficiency and access to technology.

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