

An Insight into the Adoption of Accountable-eHealth Systems – An Empirical Research Model Based on the Australian Context

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Abstract

This paper provides a first look at the acceptance of Accountable-eHealth (AeH) systems—a new genre of eHealth systems designed to manage information privacy concerns that hinder the proliferation of eHealth. The underlying concept of AeH systems is *appropriate use* of information through *after-the-fact* accountability for intentional misuse of information by healthcare professionals. An online questionnaire survey was utilised for data collection from three educational institutions in Queensland, Australia. A total of 23 hypotheses relating to 9 constructs were tested using a structural equation modelling technique. The moderation effects on the hypotheses were also tested based on six moderation factors to understand their role on the designed research model. A total of 334 valid responses were received. The cohort consisted of medical, nursing and other health related students studying at various levels in both undergraduate and postgraduate courses. Hypothesis testing provided sufficient data to accept 7 hypotheses. The empirical research model developed was capable of predicting 47.3% of healthcare professionals' perceived intention to use AeH systems. All six moderation factors showed significant influence on the research model. A validation of this model with a wider survey cohort is recommended as a future study.

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1. Introduction

Preservation of information privacy is an imperative requirement of eHealth systems [1]. In the healthcare setting, information privacy refers to the obligation by healthcare providers not to misuse personal information disclosed by the patients or resulting from examination of the patient to any other person or organisation without consent [2]. eHealth systems utilise electronic health records (EHR) as the main source of information, which may contain sensitive personal information about a patient that may cause negative ramifications if inappropriately used. Concerns regarding these ramifications have contributed

to a heightened attention on information privacy management in eHealth systems.

Whilst consumers, i.e. patients, demand better privacy preservation, healthcare professionals (HCPs) call for better access to information. Timely access to information in healthcare is of utmost importance as it enables HCPs to make fully-informed medical decisions. Access to information falls under Pfleeger's [2] third pillar of security—availability—which is concerned with ensuring that information is available to authorised users when required. Electronic information systems are often considered a double edged sword in this regard—whilst it is technologically capable of providing access to information in a time-efficient manner, they can also be the source of unnecessary delays when the underlying security policies do not accurately reflect the goals and requirements of the users.

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A number of privacy management methods have been proposed in medical informatics literature [3–5] that are predominantly preventive measures based on rigid access controls. However, systems that enforce rigid restrictions on information access may not be appropriate for eHealth systems that can be used at the point-of-care. Recently however, there has been an increasing interest in information privacy management through information accountability (IA), and Accountable-eHealth (AeH) systems [6] have been proposed that rely on *appropriate use* of information through *after-the-fact* accountability. They make all uses of a consumer's health information transparent and hold HCPs accountable for inappropriate uses by tracking and checking all transactions against context-aware privacy policies. Demarcation lines, instead of rigid restrictions, are used to warn HCPs when they are about to access restricted information but allow them to proceed if they professionally judge that their actions are justifiable.

When potential breaches occur, notifications will be sent to consumers that direct them to the transaction in question and allow them to view further details and resolve the incident using a justification query/response mechanism. The after-the-fact approach will alleviate the concerns of both patients and HCPs, by providing an adequate level of information privacy without restricting HCPs in delivering high-quality, time-critical healthcare. Both stakeholders are likely to seek comfort from the parallels that can be drawn between AeH systems and law enforcement in the offline world [7].

Although AeH systems exhibit capabilities for the appropriate management of healthcare information, it is important to know how this new genre of eHealth systems would be accepted by eHealth stakeholders. As a first step in this direction, this paper presents a conceptual research model on the acceptance of AeH systems by future HCPs.

In what follows, the most significant related works will be discussed which laid the foundation for the design of the research model presented in this paper. Next, the method utilised in this study will be discussed. The results and analysis will be discussed which includes the assessment of the measurement model, validation of the structural research model and the investigation of the significance of moderating factors on the research model. Following a detailed discussion of the results, the paper will close with a conclusion section.

2. Related work and research model design

Underpinning the theoretical model developed in this study is the Unified Theory of Acceptance and Use of Technology (UTAUT) [8], a well-established and frequently used model of technology acceptance and is also motivated by the model developed by Schaper and Pervan [9]. Their research model, also based on UTAUT and motivated by Chau et al. [10], uses three dimensions of technology acceptance: individual context, technology context and implementation context to capture the factors affecting the intention to use ICT.

The UTAUT model [8] was developed based on eight prominent technology acceptance models: the Technology Acceptance Model (TAM) [11], the Theory of Reasoned Ac-

tion (TRA) [12], the Innovation Diffusion theory (IDT) [13], the Theory of Planned Behaviour (TPB) [14], the Motivation Model (MM) [15], the Model of PC Utilisation (MPCU) [16], the combined TAM and TPB [17] and Social Cognitive Theory [18]. UTAUT has four main constructs: performance expectancy, effort expectancy, social influence and facilitating conditions. The primary moderators of the model are gender, age, experience and voluntariness of use.

Although the model is applicable to a wide range of industries and disciplines including healthcare [9], its application in this study faced several limitations. Firstly, the survey participants were university students studying medicine, nursing or other health related courses. Although postgraduate students were within the cohort, the majority was undergraduate students. Therefore, constructs such as facilitating conditions were not included in the research model. Secondly, the type of eHealth system in question has not been implemented and the participants did not have a working experience of such a system. Determinants such as social influence therefore could not be included in to the research model.

Technology acceptance in healthcare has been studied in the research domain for many years. Schaper et al. [9] proposed a research model designed towards examining the ICT acceptance and utilisation by Australian occupational therapists. This model was based on the UTAUT model itself and a generic technology acceptance framework proposed by Chau et al. [10]. They used three dimensions of technology acceptance: individual context, technology context and implementation context to capture the factors affecting the intention to use ICT. Together with the UTAUT model, we also focus on this work as a foundation for the designed research model presented in this paper.

In our study, the hypotheses were formulated to capture both previously validated technology acceptance relationships and characteristics of AeH systems. We adopt the constructs from the individual context and the technology context from Schaper et al. [9] and introduce an information context, which deals with aspects relating to healthcare information manipulation within AeH systems. The implementation context used by Chau et al. [10] and Schaper et al. [9] were not utilised due to the specific focus and intention of the study being the perceived intention to use the proposed EHR system. The actual use of the system can only be measured once the proposed system can be implemented in a controlled healthcare setting, which at this stage of the study is not feasible given its complexity, limited resources and time constraints. The constructs used as measurements in each of the contexts are discussed as follows.

The individual context deals with a person's personal beliefs and behaviours. Personal characteristics influence one's technology acceptance decisions [10]. As regards to personal characteristics, many aspects have been previously studied under different circumstances. But, computer self-efficacy, computer anxiety and computer attitude are the most common and prominent constructs used in many technology acceptance studies [8]. To be specific to the nature and domain of this study, we introduce "EHR" as an augmentation to the general meaning of "Computer" in this context, which is reflected in our hypotheses.

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