A LONGITUDINAL STUDY OF TRUST AND PERCEIVED USEFULNESS IN CONSUMER ACCEPTANCE OF AN E-SERVICE: THE CASE OF ONLINE HEALTH SERVICES

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Abstract

Despite the proliferation of e-services, they are still characterized by uncertainties. As result, consumer trust beliefs are considered an important determinant of e-service adoption. Past work has not however considered the potentially dynamic nature of these trust beliefs, and how early-stage trust might influence later-stage adoption and use. To address this gap, this study draws on the theory of reasoned action and expectation-confirmation theory to carry out a longitudinal study of trust in e-services. Specifically, we examine how trust interacts with other consumer beliefs, such as perceived usefulness, and how together these beliefs influence consumer intentions and actual behaviours toward e-services at both initial and later stages of use. The empirical context is online health information services. Data collection was carried out at two time periods, approximately 7 weeks apart using a student population. The results show that perceived usefulness and trust are important at both initial and later stages in consumer acceptance of online health services. Consumers’ actual usage experiences modify perceptions of usefulness and influence the confirmation of their initial expectations. These results have implications for our understanding of the dynamic nature of trust and perceived usefulness, and their roles in long term success of e-services.

Keywords: Trust, Perceived Usefulness, Longitudinal Study, Electronic Services, E-services, Online Health Services.
1 INTRODUCTION

With the development of the Internet, the conduct of service transactions has changed from face-to-face service to e-services exchange. E-services offer consumers the promise of increased convenience, lower-cost of transacting, increased consumer choice, and greater accessibility to services by eliminating space and time constraints (de Ruyter et al. 2001; Rust & Kannan 2003). Initial adoption of e-service innovations by consumers is however only the first step toward realizing their success. Their long-term viability will depend on their continued usage by consumers (Bhattacherjee 2001). Examining the long-term viability of new e-service contexts therefore requires a dynamic and longitudinal focus on consumer beliefs, attitudes and usage behaviours rather than simply their initial intentions (Venkatesh et al. 2011). Previous studies have confirmed the need to consider dynamic beliefs in information technology usage and e-commerce adoption (e.g., Bhattacherjee & Premkumar 2004; Hsu et al. 2006; Venkatesh et al. 2011; Lin et al. 2014). Few studies have however given consideration to the dynamic nature of consumer beliefs in online health services adoption.

The purpose of this study is to address this need by determining the extent to which consumers’ beliefs toward e-service usage change over time, and examining how these beliefs come to influence their intentions and behaviours at both early and later stages of use. We focus here on two important consumer beliefs, namely trust and perceived usefulness. Trust is defined as a consumer’s confidence in the e-service provider’s reliability, integrity, dependability, and ability to deliver on expectations (Bhattacherjee 2002; Pavlou 2003). Our motivation to focus on these trust beliefs is due to the uncertainties that characterize the use of e-services. These uncertainties have resulted in consumers’ trust beliefs being considered amongst the most important psychological states influencing online behaviours (Pavlou & Gefen 2002; Pavlou 2003; Kim et al. 2008). Without trust, consumers lack the feelings of confidence and assurance needed to be vulnerable to the actions taken by e-service providers (Gefen 2000).

Perceived usefulness has been identified across a number of technology contexts as a cognitive belief salient to technology acceptance (Davis et al. 1989). It is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989). Perceived usefulness has been found important in e-service contexts such as e-commerce (Pavlou 2003; Gefen et al. 2003), mobile payment service (Chandra et al. 2010), online banking (Bhattacherjee 2001), and also as relevant to the dynamic study of system usage (Bhattacherjee & Premkumar 2004).

We develop our research model by first drawing on the theory of reasoned action (TRA) to examine the effects of trust and usefulness perceptions on consumers’ initial acceptance and usage behaviours. We subsequently draw on expectation confirmation theory (ECT) to examine how temporal changes in these consumer beliefs influence their later stage continuance intentions.

We empirically validate our model using data collected in a longitudinal study of consumer use of online health information services. The motivation to adopt this context is because previous studies of e-services have mostly focused on commercial contexts (e.g., e-commerce, e-shopping and e-banking) and e-government contexts. The Web has become an important health information dissemination channel (Yi et al. 2013), and people are increasingly searching for health information online (Xiao et al. 2014). Online health care services have thus become an important channel for consumers to engage in the self-management of their or their family’s health (Harbour & Chowdhury 2007). Unfortunately, the field has not yet sufficiently examined how our theories of e-service acceptance and use might extend to the context of online health information provision. While some studies have focused on trust research in online health information (e.g., Bansal et al. 2010; Yi et al. 2013), those studies use cross-sectional research designs rather than longitudinal designs. Understanding long term acceptance and use of such services is important to the realization of their potential and therefore deserves consideration.

The rest of the paper proceeds as follows. In the next section, the theoretical background for our study is presented. Next, the research model and hypotheses are developed. Then, the research methodology
and approach are outlined. The fifth section presents empirical results and the final section discusses the findings and the contributions of the study.

2 THEORETICAL BACKGROUND

Two theories underpin our longitudinal investigation. The first, the theory of reasoned action (TRA) underpins the study of early e-service acceptance. This theory is well described elsewhere (Venkatesh & Morris 2000; Pavlou & Fygenson 2006) and has been used to explain individual initial acceptance of IT (Komiak & Benbasat 2006). The second theory underpinning our model is expectation-confirmation theory (ECT). ECT is used to explain post-purchase consumer satisfaction and behaviours (Oliver 1980), and has been used in prior studies to investigate later stages of IT use (Bhattacherjee & Premkumar 2004; Limayem et al. 2007; Bhattacherjee & Lin 2014). Both of the theories are expanded upon next.

2.1 Theory of Reasoned Action (TRA)

In the past three decades, numerous theoretical models of e-service acceptance have been proposed. Among them, the theory of reasoned action (TRA), the theory of planned behaviour (TPB) and technology acceptance model (TAM) have frequently been applied to provide an understanding of e-services adoption (e.g., Featherman & Pavlou 2003; Leonard et al. 2004; Yousafzai et al. 2010). The TRA (Ajzen & Fishbein 1980) has been well established in social psychology discipline. It is one of the most widely used models for explaining individual behaviour (see Figure 1). It predicates a belief–attitude–intention–actual behaviour model. According to the TRA, actual behaviour is influenced by behavioural intention, while behavioural intention is determined by attitude and subjective norm. Subjective norm is defined as “the person's perception that most people who are important to him think he should or should not perform the behaviour in question”, attitude is defined as “an individual's positive or negative feelings (evaluative affect) about performing the target behaviour” (Fishbein & Ajzen 1975). Furthermore, behavioural beliefs are proposed to influence attitude and normative beliefs to influence subjective norm (refer Figure 1). However, TRA does not specify the specific behavioural beliefs that come to influence attitude. Consequently, researches drawing on TRA are required to identify the beliefs considered appropriate to employ in their research specific context (Davis et al. 1989; Yousafzai et al. 2010). In the context of e-services, trust and perceived usefulness are considered important behavioural beliefs with the potential to influence consumer adoption of e-services. Attitude has often been omitted in applications of the theory in order to derive more parsimonious research models (e.g., Kim et al. 2009; Bhattacherjee & Lin 2014).

![Behavioral beliefs and evaluations](image1)

![Normative beliefs and motivation to comply](image2)

![Attitude](image3)

![Subjective norm](image4)

![Behavioral intention](image5)

![Actual behavior](image6)

Figure 1: The Theory of Reasoned Action (Fishbein & Ajzen 1975)

2.2 Expectation-Confirmation Theory

Expectation confirmation theory (ECT) is used to explain consumer satisfaction, post-purchase behaviours and loyalty (Oliver 1980). Bhattacherjee (2001) adopted ECT to develop an IS continuance model to explain user post-adoption behaviour. ECT suggests that consumers have expectations before making a purchase / adoption decision. After their period of use, consumers will compare performance perceptions with their initial expectations. These expectations may be confirmed or disconfirmed. Confirmation of expectation is defined as a user’s perception of congruence between their initial expectations and observed performance (Bhattacherjee 2001). A positive confirmation results in consumer satisfaction, which leads to repurchase intentions.
Bhattacherjee and Premkumar’s model (2004) also posits that modified beliefs (e.g., PU) are themselves a function of the usage experience and that these modified beliefs can in turn influence continued and on-going usage. The model is illustrated in Figure 2.

The post-acceptance ECT model has been applied in contexts such as online shopping (Hsu et al. 2006; Kim et al. 2009), WWW usage (Limayem et al. 2007), e-government (Venkatesh et al. 2011), and social networking service (Islam & Mäntymäki 2011). Past research has also attempted to extend the model through inclusion of various additional beliefs as predictors of continuance intentions. For example, Venkatesh et al. (2011) extended the model by incorporating effort expectancy, social influence and facilitating conditions (adopted from UTAUT model). Trust may also serve as a relevant post-usage belief (Venkatesh et al. 2011).

Limayem et al. (2007) also extended Bhattacherjee’s model by incorporating habit as a predictor on continuance intention. Habit is defined as “the extent to which people tend to perform behaviors automatically because of learning” (Limayem et al. 2007). Past study suggests “when IT use is habitual, it ceases to be guided by conscious planning and is instead triggered by specific environmental cues in an unthinking or automatic manner” (Bhattacherjee & Lin 2014).

![Figure 2. A post-acceptance model of IS Continuance (adapted from Bhattacherjee, 2001)](image)

### 3 MODEL DEVELOPMENT AND HYPOTHESES

Drawing on both the TRA and ECT theories, this study’s research model is derived and is illustrated in Figure 3.

![Figure 3. Research model](image)

The model incorporates both trust and perceived usefulness as behavioural beliefs that can influence consumers’ intentions at both the early initial usage stage and, once modified based on the usage experience, at later stages of use. TRA underpins the early, initial usage phase whilst ECT underpins the later usage phase. The underlying hypotheses of the model are discussed next.
3.1 The Link between Beliefs and Early-Stage Intentions and Use

TRA explains the relationships between beliefs, subjective norms, intentions and actual usage. As reflected in Figure 3, we examine trust and perceived usefulness as important behavioural beliefs. Perceived usefulness (PU) refers to the degree to which a consumer believes that using the e-service would enhance his/her performance or effectiveness. Past studies have empirically illustrated that PU influences online consumer behaviour (e.g., Pavlou 2003; Gefen et al. 2003). In the online health services context, PU is defined as a consumer’s belief that an online health service will be of benefit and will enhance their effectiveness in self-management of their health (Lanseng & Andreassen 2007).

Trust in the e-service provider is defined as the consumer’s confidence in the integrity and dependability of the provider (Rotter 1967; Bhattacherjee 2002; Pavlou & Gefen 2002). Past research has given attention to the effects of initial trust on e-commerce acceptance (e.g., McKnight et al. 2002; Gefen 2002). The more trusted e-service provider is more likely to be perceived as offering accurate and useful information that is in the best interests of the consumer. Trust can reduce uncertainty and provides expectation for a satisfactory transaction experience (Pavlou 2003).

Moreover, consumers are likely to perceive the potential for benefits only if the online health information provider is trusted as a reliable and competent provider of health information. Thus the beliefs of trust and perceived usefulness are inter-related.

Figure 3, also reflects the influence of subjective norm. According to TRA, consumers are likely to form positive or negative intentions towards behaviour based on how they believe significant others will view such behaviour (Bhattacherjee & Lin 2014). This normative influence arises from peers or other significant people e.g., friends and family.

Taken together it is hypothesized that:

H1: Perceived usefulness at t1 has a positive effect on consumers’ early-stage behavioural intentions toward online health information services.

H2: Trust at t1 has a positive effect on consumers’ early-stage behavioural intentions toward online health information services.

H3: Subjective norm at t1 has a positive effect on consumers’ early-stage behavioural intentions toward online health information services.

H4: Trust at t1 has a positive effect on the perceived usefulness of online health information services at the early usage stage.

According to TRA, actual behaviour is determined by behavioural intention. Past studies have shown IT usage intentions correlate with actual usage behaviours. Therefore, we further hypothesize that:

H5: Behavioural intention at t1 has a positive effect on the subsequent actual usage of online health information services.

3.2 The Link between Actual Usage and Later-Stage Beliefs and Confirmation

Past studies posit that the usage experience will modify beliefs and behavioural intentions (e.g., Bajaj & Nidumolu 1998; Kim & Malhotra 2005; Maier et al. 2012). Hence, we expect that a consumer’s actual usage experience with the e-service will influence (or update) their beliefs, namely perceived usefulness and trust. According to ECT, the usage experience will also provide the basis for the confirmation of initial expectations. Confirmation will in turn support belief modification (Venkatesh et al. 2011). In other words, users are theorized to revise their cognitions based on the degree to which their actual experience exceeded or fell short of their initial expectations. In this study we thus expect that usage and confirmation will influence perceived usefulness and trust beliefs at post online health service usage stage. We therefore, further hypothesize that:

H6a: Degree of actual use has a positive effect on perceived usefulness at t2.

H6b: Degree of actual use has a positive effect on consumer trust at t2.
H7: Degree of actual use has a positive effect on confirmation of expectation at t2.

H8a: Confirmation of expectation has a positive effect on perceived usefulness at t2.

H8b: Confirmation of expectation has a positive effect on trust at t2.

In addition, empirical studies have found that, at the post e-service usage stage, perceived usefulness is also determined by trust (Gefen et al. 2003). Hence:

H8c: Trust at t2 has a positive effect on perceived usefulness at t2.

### 3.3 The Link between Later-Stage Beliefs, Confirmation, Satisfaction and Continuance Intention

We further hypothesize that modified beliefs and confirmation influence satisfaction. ECT posits that satisfaction is determined by consumers’ confirmation of expectations from initial usage (Bhattacherjee 2001). This is because consumers always compare early-usage expectations with their actual usage. If the initial expectations are confirmed then they will be more satisfied with the systems or service. Hsu et al. (2006) found that confirmation has a positive effect on consumer’s satisfaction of online shopping usage. Hence:

H9: Confirmation of expectation has a positive effect on consumers’ satisfaction with online health information use.

Moreover, Bhattacherjee (2001) argues that beliefs also influence a user’s post-acceptance affects such as their satisfaction. It is therefore hypothesized that:

H10a: Perceived usefulness of online health usage at t2 has a positive effect on consumer satisfaction with online health information service use.

H10b: Consumer trust beliefs at t2 have a positive effect on consumer satisfaction with online health information service use.

Bhattacherjee’s (2001) IS continuance model proposes satisfaction as one of the primary antecedents of consumer continuance intentions. This is because, in the post-usage phase, users may rely not only on their cognitive beliefs but also on their affective experience when forming subsequent behavioural responses (Bhattacherjee & Lin 2014). This affective experience is captured in the satisfaction construct. Past empirical studies support the effects of satisfaction on consumers’ continuance intentions in the e-service context (e.g., Hsu et al. 2006; Lee & Kwon 2011; Zhao & Lu 2012). Hence we can hypothesize,

H11: Satisfaction with online health information service use has a positive effect on continuance intentions.

Prior work (Bhattacherjee & Premkumar 2004; Venkatesh et al. 2011) posits that intentions are also directly determined by consumer’s post-usage evaluated beliefs. We therefore expect that consumers’ continuance intentions are also determined by evaluated (modified) beliefs of trust and perceived usefulness. We therefore, further hypothesize that:

H12a: Perceived usefulness of online health usage at t2 has a positive effect on continuance intentions.

H12b: Consumer trust beliefs at t2 have a positive effect on continuance intentions.

### 3.4 Control Variables

Figure 3 identifies past online health service experience as a necessary control variable for early behavioural intention and for actual use. This is because social psychology literature suggests that past behaviour may influence intentions and actual use (Bajaj & Nidumolu 1998; Kim & Malhotra 2005). For instance, Shim et al. (2001) found that prior experience with the e-service predicts consumer behaviour. Consumers who have not used online health information before may have a lower likelihood of future acceptance and use.
Habit (HAB), age and gender are considered as controls in the later usage phase of the model. HAB was considered as a control because people tend to perform behaviour automatically due to learning (Limayem et al. 2007). In addition, in the online health information context, gender and age differences have been considered to shape consumer’s online health service adoption behaviour (Ybarra & Suman 2008).

4 RESEARCH METHODOLOGY

To test our hypotheses, we carried out a longitudinal research design, which was conducted in a laboratory setting. Through a longitudinal design the dynamic nature of the study's focal substantive constructs can be examined (Berrington et al. 2006). A longitudinal design requires the researcher to collect repeated measures over time from the same units of observation. Doing so in this study allowed for the change in trust and usefulness to be described over time, as well as to estimate our hypothesized model (Figure 3).

We followed a longitudinal multiple-phase controlled laboratory design similar to that adopted in Zahedi and Song (2008). The phases of the longitudinal study are described below and illustrated in Figure 4.

<table>
<thead>
<tr>
<th>Pretest</th>
<th>Phase 1 (t1)</th>
<th>Phase 2 (t2)</th>
<th>After 7 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Determine if there exist ambiguous or confusing measurement</td>
<td>• Introduce study to participants</td>
<td>• Complete second-round questionnaire (t2)</td>
<td>• Distribute a small token of appreciation.</td>
</tr>
<tr>
<td>• Introduce online tasks.</td>
<td>• Complete all the tasks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Complete first-round questionnaire (t1).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. Longitudinal data collection schedule

4.1 Longitudinal Study Design

This study was carried out a large national university in South Africa using a sample of university students who represent an important portion of online consumers (Kim et al. 2008).

We commenced with a pre-test to determine if there were any ambiguous or confusing measurement items in the questionnaire. The pre-test was carried out using a convenience sample of students. The pre-test was followed by the first phase of the study where participation from the larger student population was invited.

4.1.1 Phase 1(t1)

Phase 1 was conducted in a computer laboratory setting. Participants were introduced to the purpose of this study and then given the opportunity to choose between four popular health informatics websites. The websites were all general medical, health and wellness sites accessible to consumers with optional registration. These four health information websites have different features and information content. Allowing participants the opportunity to select their own website of interest increases the voluntary nature of the e-service usage process (Zahedi & Song 2008). Participants were asked to browse their chosen health website for information on a variety of issues in a number of general health categories that included diet and nutrition, exercise and fitness, and were asked to complete specific tasks related to the search for health information. The tasks (available from the authors on request) were adopted and redesigned from van Deursen’s (2012) study. The use of tasks within a controlled laboratory design is used to promote variability in use and attitudes and to provide participants a foundation for their initial perceptions. Participants were then asked to complete the first-round questionnaire. The questionnaire captured the participants’ trust beliefs, their perceptions of site usefulness, subjective norms and their future usage intentions.
4.1.2  Phase 2 (t2)

After seven weeks, participants were asked to return to the laboratory. Bhattacherjee and Premkumar (2004) considered seven weeks to be an acceptable time period for longitudinal usage studies. Participants were asked to then complete the second-round survey which focused on their current perceptions, beliefs and intentions. Both phase 1 and phase 2 surveys were administered to the student participants through the university’s e-learning system.

4.2  Measurement Instrument

All constructs in the research model were operationalized based on previously validated instruments. Besides the actual usage (USE) variable, all constructs were measured using multi-item Likert-scales with anchors ranging from 1=“strongly disagree” to 7=“strongly agree”.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Operationalization</th>
<th>Example Items</th>
<th>Phase 1</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness (PU)</td>
<td>4-item scale modified based on Bhattacherjee and Premkumar (2004).</td>
<td>Using this website can be of benefit to me in managing my health.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Trust in Provider (TR)</td>
<td>4-item scale modified based on Pavlou and Gefen (2004).</td>
<td>This website information provider is in general trustworthy.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Continuance Intention (INT)</td>
<td>8-item scale modified based on Bhattacherjee and Premkumar (2004); Kim et al. (2009)</td>
<td>I intend to continue using/use this website to obtain health information.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Subjective Norms (SN)</td>
<td>3-item scale modified based on Venkatesh et al. (2011).</td>
<td>People who influence my behaviour think that I should use health infomatics website.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Actual Usage (USE)</td>
<td>2-item scale modified based on Suh and Han (2002).</td>
<td>Over the past 7 week’s period, how often did you use the health website? (Not at all - Several times a week).</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Confirmation (CON)</td>
<td>4-items item scale modified based on Bhattacherjee and Premkumar (2004).</td>
<td>My experience with using this website was better than what I had expected.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Satisfaction (SAT)</td>
<td>4-items item scale adapted from Bhattacherjee and Premkumar (2004).</td>
<td>How do you feel about your overall experience of the surfing through this website? 1)very satisfied, (2) pleased, (3) contented, (4) delighted</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>Dichotomous yes/no scale</td>
<td>Before participating in this study did you have any previous experience with online health website?</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Habit (HAB)</td>
<td>3-item scale modified based on Limayem et al. (2007).</td>
<td>Using the Web has become automatic to me.</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.  Phase 1 and phase 2 questionnaire items.

Example questionnaire items for measuring the constructs are presented in Table 1. For time 2, the measurement items for trust, usefulness and intentions were the same as in phase 1 to facilitate analysis of the dynamic nature of the beliefs. The measures for satisfaction and confirmation in the phase 2 instrument are also highlighted in Table 1 together with the measures for actual use.

5  EMPIRICAL RESULTS

5.1  Participants

At time t1 we obtained 161 responses. At time 2 we invited these 161 participants to do the second round survey. In total, 74 respondents completed the second round survey. This suggests an attrition
rate of approximately 54%. Four respondents were subsequently eliminated as they were missing a large number of data values. Our final usable data was 70 respondents. We matched t1 and t2 by using an anonymous user ID. The demographic profile of the respondents is reported in table 3. The respondents aged between 18 and 22 (81.3%). Among them 58.6% were male, 41.4% were female. Among the respondents, 60% had previous online health information experience. Most of the participants chose website 1 (44%) and website 2 (34%) to do the scenario tasks (see Table 3).

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>41</td>
<td>58.57</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>29</td>
<td>41.43</td>
</tr>
<tr>
<td>Age</td>
<td>18-19</td>
<td>13</td>
<td>18.57</td>
</tr>
<tr>
<td></td>
<td>20-22</td>
<td>44</td>
<td>62.86</td>
</tr>
<tr>
<td></td>
<td>23-25</td>
<td>10</td>
<td>14.29</td>
</tr>
<tr>
<td></td>
<td>&gt;25</td>
<td>3</td>
<td>4.29</td>
</tr>
<tr>
<td>Online health information</td>
<td>Yes</td>
<td>42</td>
<td>60.00</td>
</tr>
<tr>
<td>experience</td>
<td>No</td>
<td>28</td>
<td>40.00</td>
</tr>
<tr>
<td>Choice of online health</td>
<td>Website 1</td>
<td>31</td>
<td>44.29</td>
</tr>
<tr>
<td>information service provider</td>
<td>Website 2</td>
<td>24</td>
<td>34.29</td>
</tr>
<tr>
<td></td>
<td>Website 3</td>
<td>3</td>
<td>4.29</td>
</tr>
<tr>
<td></td>
<td>Website 4</td>
<td>12</td>
<td>17.14</td>
</tr>
</tbody>
</table>

Table 3. Descriptive statistics of respondents’ characteristics.

5.2 Data Analysis

We carried out the analysis in three stages. First, we evaluated our data for common method bias. Second, we examined whether the intentions and beliefs (trust and usefulness) change over time by comparing the construct means at t1 and t2. After that, we tested the measurement model and structural model by using Smart-PLS software package (version 2.0 M3) (Ringle et al. 2005).

5.2.1 Common method bias

In addition to the use of a longitudinal design, which itself can reduce common method bias associated with cross-sectional designs (Premkumar & Bhattacherjee 2008), we also checked for common method bias by performing Harman’s one factor test (Podaskoff & Organ 1986). According to this approach, common method variance is present if one factor accounts for the majority of the covariance in the dependent and independent variables. An exploratory factor analysis (EFA) of all of our time 1 scale items revealed factors explaining 78.1% of the variance, the first factor explaining less than 50%. For time 2, EFA revealed factors explaining 76.4% of the variance, the first factor did not explain more than 50%. These results suggest that no single factor explained a majority of the variance, thus supporting that common method bias was not a threat for this study at either t1 or t2.

5.2.2 Comparison of construct means

Past work into IT usage has considered whether user beliefs change over time (e.g., Bhattacherjee & Premkumar 2004; Venkatesh et al. 2011; Hsu et al. 2006). Those researchers have argued that earlier beliefs serve as an anchor for later stage evaluations. This is because later-stage judgments are not made from scratch but are formed from earlier judgments (Kim & Malhotra 2005). Others however have argued that early-stage beliefs wear off over time, and are less likely than actual user experiences to influence later-stage beliefs (Szajna & Scamell 1993). To determine if user beliefs change over time, we compared the means at the two time periods by using a paired-sample t-test. The mean PU score dropped from 5.62 to 5.40, but the change was not statistically significant (t=1.18, p=0.243). INT kept the same mean. However, TR increased from 5.15 at time 1 to 5.33 at time 2 (t=-1.12, p=0.268). Hence, users’ trust beliefs seem to increase slightly with the using of online health service over time (see Table 4). Perceived usefulness decreased slightly over time, this is not unexpected
given that as the subject matters get more realistic, respondents have been known to correct the performance expectations from application use (Sokura et al. 2012).

<table>
<thead>
<tr>
<th></th>
<th>First time point</th>
<th>Second time point</th>
<th>Paired differences(1-2)</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
<td></td>
</tr>
<tr>
<td>PU1=PU2</td>
<td>70</td>
<td>5.62 (0.99)</td>
<td>5.40 (1.09)</td>
<td>0.22</td>
<td>1.57</td>
</tr>
<tr>
<td>TR1=TR2</td>
<td>70</td>
<td>5.15 (1.08)</td>
<td>5.33 (1.05)</td>
<td>-0.19</td>
<td>1.37</td>
</tr>
<tr>
<td>INT1=INT2</td>
<td>70</td>
<td>4.45 (1.53)</td>
<td>4.45 (1.57)</td>
<td>-0.04</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Table 4. Comparison of means in usefulness, trust and intention.

5.2.3 Measurement model evaluation

We next proceeded to test the study’s research model. An initial principal components (PCA) analysis was carried out to confirm the unidimensionality of the measures and to eliminate any inappropriate items. We removed SAT1 and CON1 items at this stage. Thereafter, the measurement model was analysed by using Smart PLS. The items loaded onto their expected theoretical constructs. The mean, standardized loadings of the measurement items, average variance extracted (AVE), composite reliability (CR) and Cronbach’s alpha value are reported in Table 6. The values of the loadings are above the recommended value of 0.70. The values of composite reliability are above the acceptable value of 0.70, and the AVE is above the recommend threshold of 0.50, thus, the convergent validity is confirmed. For the discriminant validity, the square root of AVE of each construct is larger than the inter-construct correlations (see Table 5), and thus discriminant validity is confirmed.

<table>
<thead>
<tr>
<th></th>
<th>Mean (S.D.)</th>
<th>CON</th>
<th>INT1</th>
<th>INT2</th>
<th>PU1</th>
<th>PU2</th>
<th>SAT</th>
<th>TR1</th>
<th>SN</th>
<th>TR2</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CON</td>
<td>5.09 (0.98)</td>
<td></td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>INT1</td>
<td>4.45 (1.53)</td>
<td>0.05</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT2</td>
<td>4.49 (1.57)</td>
<td>0.64</td>
<td>0.09</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU1</td>
<td>5.62 (0.99)</td>
<td>-0.23</td>
<td>0.39</td>
<td>-0.11</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU2</td>
<td>5.40 (1.09)</td>
<td>0.55</td>
<td>-0.10</td>
<td>0.64</td>
<td>-0.14</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT</td>
<td>4.72 (1.30)</td>
<td>0.68</td>
<td>-0.09</td>
<td>0.67</td>
<td>-0.16</td>
<td>0.66</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR1</td>
<td>5.15 (1.08)</td>
<td>0.17</td>
<td>0.40</td>
<td>0.06</td>
<td>0.51</td>
<td>-0.08</td>
<td>0.06</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>3.65 (1.38)</td>
<td>0.00</td>
<td>0.27</td>
<td>0.02</td>
<td>0.36</td>
<td>-0.04</td>
<td>-0.11</td>
<td>0.33</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR2</td>
<td>5.33 (1.05)</td>
<td>0.56</td>
<td>-0.08</td>
<td>0.63</td>
<td>-0.11</td>
<td>0.58</td>
<td>0.62</td>
<td>0.14</td>
<td>-0.23</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>USE</td>
<td>0.43 (0.69)</td>
<td>0.25</td>
<td>0.23</td>
<td>0.45</td>
<td>-0.10</td>
<td>0.31</td>
<td>0.25</td>
<td>-0.05</td>
<td>-0.06</td>
<td>0.15</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Table 5. Construct correlations (Diagonal bold values are square root of AVE).
Table 6. Results of reliability, validity and means of the construct items.

5.2.4 Results of hypothesis testing

For the structural model, the PLS results are reported at Figure 5. Bootstrap resampling (300 resamples) was used to produce t-values for determining significance of paths. The model explains roughly 30% of the variance in early stage intentions to use the online health information service. However, in the later stage, the R² value for continuance intention is 0.65, which means the model explains 65% of variance for consumer continuance usage intention. The analysis controlled for the effects of online health information experience (at initial usage phase) and habit, age and gender for
behavioural intention at post usage stage. The effect of online health information experience on early stage intention and the effects of habit on continuance intention were significant.

Figure 5. PLS test of research model (non-significant controls omitted to improve readability).

As seen from Figure 5, at initial usage phase, perceived usefulness is significantly influenced by trust. Both trust and perceived usefulness has significant effects on behavioural intention. In turn, behavioural intention has a positive effect on actual usage of online health services. Hence, H1, H2, H4, H5 are supported. However, subjective norm has no significant effect on behavioural intention. H3 is thus rejected. This finding supports the view that trust and perceived usefulness are important to consumer acceptance of online health service. However, intention is not influenced by subjective norm at early usage phase. The use of an online health service is thus affected more by individual beliefs than social influences. Intentions were important to subsequent usage behaviours.

<table>
<thead>
<tr>
<th>Hypothesis (path)</th>
<th>Path coefficient</th>
<th>t-Value</th>
<th>Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>0.290</td>
<td>2.595**</td>
<td>Yes</td>
</tr>
<tr>
<td>H2</td>
<td>0.202</td>
<td>2.191*</td>
<td>Yes</td>
</tr>
<tr>
<td>H3</td>
<td>0.082</td>
<td>0.819</td>
<td>No</td>
</tr>
<tr>
<td>H4</td>
<td>0.5130</td>
<td>4.785***</td>
<td>Yes</td>
</tr>
<tr>
<td>H5</td>
<td>0.194</td>
<td>2.331*</td>
<td>Yes</td>
</tr>
<tr>
<td>H6a</td>
<td>0.165</td>
<td>3.063**</td>
<td>Yes</td>
</tr>
<tr>
<td>H6b</td>
<td>-0.006</td>
<td>0.086</td>
<td>No</td>
</tr>
<tr>
<td>H7</td>
<td>0.284</td>
<td>4.891***</td>
<td>Yes</td>
</tr>
<tr>
<td>H8a</td>
<td>0.281</td>
<td>2.746**</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesis (path)</th>
<th>Path coefficient</th>
<th>t-Value</th>
<th>Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H8b</td>
<td>0.563</td>
<td>8.760***</td>
<td>Yes</td>
</tr>
<tr>
<td>H8c</td>
<td>0.393</td>
<td>2.330*</td>
<td>Yes</td>
</tr>
<tr>
<td>H9</td>
<td>0.372</td>
<td>4.708***</td>
<td>Yes</td>
</tr>
<tr>
<td>H10a</td>
<td>0.326</td>
<td>2.750**</td>
<td>Yes</td>
</tr>
<tr>
<td>H10b</td>
<td>0.226</td>
<td>1.851</td>
<td>No</td>
</tr>
<tr>
<td>H11</td>
<td>0.326</td>
<td>4.741***</td>
<td>Yes</td>
</tr>
<tr>
<td>H12a</td>
<td>0.195</td>
<td>2.144*</td>
<td>Yes</td>
</tr>
<tr>
<td>H12b</td>
<td>0.258</td>
<td>3.99**</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 7. Summary of results (* p<.05; ** p<.01; *** p<.001)

At t2, perceived usefulness and confirmation were determined by usage behaviour. Supporting H6a and H7, H6b is rejected as usage did not influence trust. Confirmation has a significant influence on perceived usefulness and trust at t2, thus supporting H8a and H8b. Confirmation and Perceived usefulness are subsequently important to satisfaction, whilst trust has an indirect effect through usefulness. Hence, H8c, H9 and H10a are supported. H10b is rejected. Continuance intention at t2 is significantly determined by satisfaction, and perceived usefulness and trust at t2. Hence, H11, H12a and H12b are supported. This finding confirmed the suggestions of the IS continuance model (Bhattacherjee 2001) that intention is determined by evaluated (modified) beliefs and satisfaction, while satisfaction is determined by modified beliefs and confirmation. Table 7 summarises the results of this study.
DISCUSSION AND CONCLUSION

The objective of this study was to develop and test a longitudinal model of consumer acceptance of online health information services. We empirically tested our research model by carrying out data collection at two points in time approximately seven weeks apart.

TRA theorized that beliefs and subjective norms are the key determinants of consumer intention to accept information systems or e-services. Our results showed that initial beliefs were important to intentions, in turn, intentions drove actual use. Surprisingly, we could not confirm the effects of subjective norm on acceptance, TRA suggest that subjective norm is a salient variable that influences behavioural intention. However, we found at early usage stage consumers’ acceptance intention is not influenced by subjective norms. This may be due to the context under study within which normative pressures of the social environment may not be as important in influencing individual behaviours (Martín & Herrero 2012). Moreover, in this study, 60% of users had online health information seeking experience. Venkatesh and Davis (2000) suggested that subjective norm becomes less important when users have already gained some usage experiences and when usage is voluntary. Our findings support ECT’s suggestions that confirmation was important to satisfaction and the updating of beliefs, in turn, evaluated (modified) beliefs and satisfaction were important to continued usage. However, later trust had an insignificant effect on satisfaction. Such findings have occurred in other online contexts (e.g., Harris & Goode 2004). This suggests that trust may not be a relevant component within an ECT-based model of post-usage intention, where satisfaction is primarily driven by experience of outcomes i.e., usefulness and confirmation (Bhattacherjee 2001). Moreover, trust was not directly influenced by actual use but rather increased in relation to a positive confirmation of expectations suggesting that consumers consider benefit gained as a part of their trust building.

Our study makes important contributions in several ways. First, our study has integrated TRA and ECT as two theoretical perspectives important for predicting initial and continuance acceptance in the e-service context. We have confirmed TRA and ECT as useful theoretical underpinnings for the examination of early and later stages of IS use and shown that actual usage is important to the integration of these two models. Actual usage would precede confirmation of expectation and belief modification in both a process and causal sense. Second, our results show that trust and perceived usefulness are important to the prediction of consumer acceptance of online health services at both the early and later usage phase. This suggests that e-service providers should increase consumers’ usefulness perceptions to promote acceptance and should focus on trust building e.g. through the implementation of privacy protection and through building their reputation as a reliable and competent provider of health information services. Later stage trust was not however found to be a simple function of actual usage. Future research will need to consider the importance of other trust building mechanisms.

It is important to note some limitations of our study. First, due to the difficulty in carrying out longitudinal studies in the field, the sample is drawn from a university population. This is a recognized threat to external validity of the findings and may limit the generalizability of the conclusions to other populations. The use of online health information services as a context for study is important due to its recent growth as a high-potential area for e-services and one in which the salience of trust and usefulness perceptions is likely to be highly significant. It is recognized that results of the dynamic model test may not generalize beyond this particular e-service context. Second, some of the scenario tasks used in the initial phase of data collection may not be applicable to all consumers and this lack of immediate applicability may have created bias in initial perceptions of usefulness (Lanseng & Andreassen 2007). We focused specifically on the impacts of trust and usefulness, future research may wish to consider alternative beliefs such as risk and security perceptions as well as other individual factors such as self-efficacy and personal innovativeness within a longitudinal study of e-service usage.
References


