

Understanding trust and perceived usefulness in the consumer acceptance of an e-service: a longitudinal investigation

Jian Mou, Dong-Hee Shin & Jason Cohen

To cite this article: Jian Mou, Dong-Hee Shin & Jason Cohen (2017) Understanding trust and perceived usefulness in the consumer acceptance of an e-service: a longitudinal investigation, Behaviour & Information Technology, 36:2, 125-139, DOI: [10.1080/0144929X.2016.1203024](https://doi.org/10.1080/0144929X.2016.1203024)

To link to this article: <https://doi.org/10.1080/0144929X.2016.1203024>



Published online: 22 Jul 2016.



Submit your article to this journal [↗](#)



Article views: 2833



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 56 View citing articles [↗](#)



Understanding trust and perceived usefulness in the consumer acceptance of an e-service: a longitudinal investigation

Jian Mou^a, Dong-Hee Shin^c and Jason Cohen^b

^aDepartment of Interaction Science, Sungkyunkwan University, Seoul, South Korea; ^bFaculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, South Africa; ^cSchool of Media and Communication, Chung-Ang University

ABSTRACT

E-services remain characterised by uncertainty despite their proliferation. Consumer trust beliefs are therefore considered an important determinant of e-service adoption. However, the research has not yet considered the potentially dynamic nature of these trust beliefs or 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 in a longitudinal study of trust in e-services. We examine how trust interacts with other consumer beliefs such as perceived usefulness (PU) and how these beliefs together influence consumer intentions and behaviours concerning e-services at both the initial and latter stages of use. The empirical context is online health information services. Data collection on a student population occurred during two time periods approximately five weeks apart. The results show that PU and trust are important at both the initial and latter stages in the 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 PU as well as their roles in the long-term sustainability of e-services.

ARTICLE HISTORY

Received 6 May 2015
Accepted 12 June 2016

KEYWORDS

Trust; perceived usefulness; longitudinal study; electronic service; e-service; online health service

1. Introduction

The advent of the Internet has changed service transactions from face-to-face to e-service exchanges. E-services offer consumers increased convenience, lower transaction costs, increased consumer choice, and greater service accessibility by eliminating space and time constraints (de Ruyter, Wetzels, and Kleijnen 2001; Rust and Kannan 2003). The initial consumer adoption of e-service innovations is, however, only the first step towards realising their success. Their long-term viability will depend on continued consumer usage (Bhattacharjee 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 a simple study of their initial intentions (Venkatesh et al. 2011). Studies have confirmed the need to consider dynamic beliefs in information technology usage and e-commerce adoption (e.g. Bhattacharjee and Premkumar 2004; Venkatesh et al. 2011; Lin et al. 2014), but few studies have considered the dynamic nature of consumer beliefs in online health services adoption (Shin 2010).

To close this gap, this study determines the extent to which consumers' beliefs about e-service usage change

over time and examines how these beliefs influence their intentions and behaviour at both the early and latter stages of use. We focus on two important consumer beliefs – trust and perceived usefulness (PU). Trust is a consumer's confidence in the e-service provider's reliability, integrity, dependability, and ability to deliver on expectations (Bhattacharjee 2002; Pavlou 2003). We focus on these trust beliefs because of the uncertainties in e-service usage, which have caused consumers' trust beliefs to be considered among the most important psychological states influencing online behaviours (Pavlou and Gefen 2002; Pavlou 2003; Kim, Ferrin, and Rao 2008). Without trust, consumers lack the confidence and assurance they need to be willing to be vulnerable to the actions of e-service providers (Gefen 2000).

PU has been identified across diverse technology contexts as a cognitive belief salient to technology acceptance (Davis, Bagozzi, and Warshaw 1989). It has been found to be important in e-service contexts such as e-commerce (Gefen, Karahanna, and Straub 2003; Pavlou 2003), mobile payment services (Chandra, Srivastava, and Theng 2010), and online banking (Bhattacharjee 2001) and is also relevant to the dynamic study of system

usage (Bhattacharjee and 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 then 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 consumers' use of online health information services. We use this context because most studies on e-services have focused on commercial (e.g. e-commerce, e-shopping, 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 the self-management of consumers' health (Harbour and Chowdhury 2007). Unfortunately, the literature has not yet sufficiently examined how our theories of e-service acceptance and use might extend to online health information provision. Studies on trust research in online health information (e.g. Bansal, Zahedi, and Gefen 2010; Yi et al. 2013) have used cross-sectional research designs rather than longitudinal ones. Understanding the long-term acceptance and use of these services is critical to the realisation of their potential.

The rest of this paper proceeds as follows. In the next section, the theoretical background for our study is presented. Then, the research model and hypotheses are developed. Then, the research methodology and approach are outlined. The fifth section presents the 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, TRA, underpins the study of early e-service acceptance. This theory is well described elsewhere (Venkatesh and Morris 2000; Pavlou and Fygenson 2006) and has been used to explain the initial acceptance of information technology (IT) among individuals (Komiak and Benbasat 2006). The second theory, ECT, is used to explain post-purchase consumer satisfaction and behaviours (Oliver 1980) and investigate the later stages of IT use (Bhattacharjee and Premkumar 2004; Shin 2011; Bhattacharjee and Lin 2014).

2.1. Theory of reasoned action

Numerous theoretical models of e-service acceptance have been proposed. Among them, the TRA, the theory

of planned behaviour, and the technology acceptance model have frequently been applied to provide an understanding of e-services adoption (e.g. Featherman and Pavlou 2003; Leonard, Cronan, and Kreie 2004; Yousafzai, Foxall, and Pallister 2010). The TRA (Ajzen and Fishbein 1980) predicates a belief–attitude–intention–actual behaviour model in which actual behaviour is influenced by behavioural intention, while behavioural intention is determined by attitude and subjective norm (Fishbein and Ajzen 1975). Furthermore, behavioural beliefs are proposed to influence attitude and normative beliefs to influence subjective norm (see Figure 1). However, the TRA does not specify which behavioural beliefs influence attitudes. Consequently, research drawing on the TRA must identify the beliefs considered appropriate to employ in its context (Davis, Bagozzi, and Warshaw 1989; Yousafzai, Foxall, and Pallister 2010). In the context of e-services, trust and PU are considered important behavioural beliefs that can 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. Bhattacharjee and Lin 2014).

2.2. Expectation–confirmation theory

ECT is used to explain consumer satisfaction, post-purchase behaviours, and loyalty (Oliver 1980). Bhattacharjee (2001) adopted the ECT to develop an IS continuance model to explain users' post-adoption behaviour. The ECT suggests that consumers have expectations before making either a purchase or a decision. After their period of use, consumers will compare performance perceptions with their expectations, which will be either confirmed or rejected. A positive confirmation results in consumer satisfaction, leading to repurchase intentions. The model of Bhattacharjee and Premkumar (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 ongoing 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), web usage (Limayem, Hirt, and Cheung 2007), e-government (Venkatesh et al. 2011), and social networking services (Islam and Mäntymäki 2011). Research has also attempted to extend the model through the inclusion of various additional beliefs as predictors of continuance intentions (Venkatesh et al. 2011). Limayem, Hirt, and Cheung (2007) extended Bhattacharjee's (2001) model by incorporating habit as a predictor of continuance intention. One study suggests that 'when IT use is habitual, it ceases to be guided by conscious planning and is instead triggered by specific

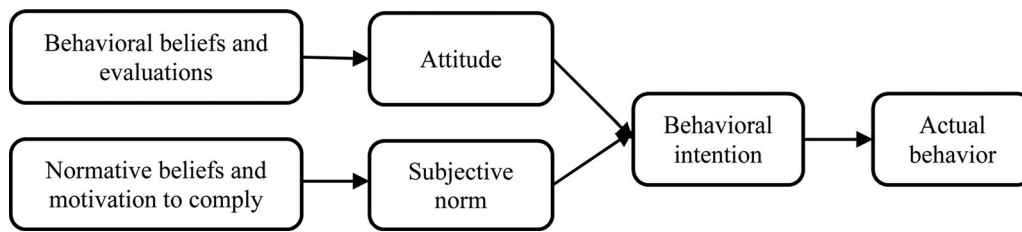


Figure 1. The TRA. Source: Fishbein and Ajzen (1975).

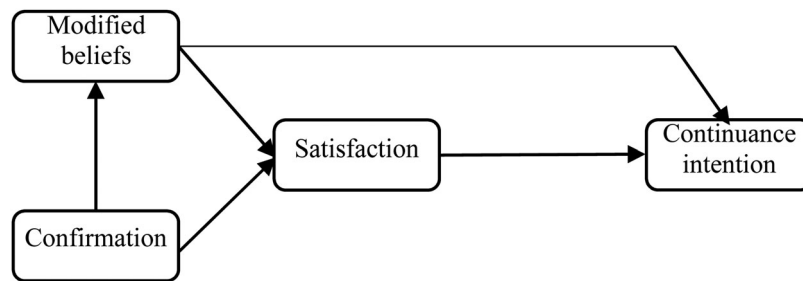


Figure 2. A post-acceptance model of IS continuance. Source: Adapted from Bhattacharjee (2001).

environmental cues in an unthinking or automatic manner' (Shin 2016, 505).

3. Model development and hypotheses

This study's research model is derived from both the TRA and ECT theories and is illustrated in Figure 3. The model incorporates both trust and PU 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. Consistent with ECT, the model depicts how modified beliefs of PU and trust at time 2 are determined by confirmation (Bhattacharjee 2001). In turn, these modified beliefs and confirmation influence user satisfaction. Moreover, because consumer beliefs may also influence each other (Xia and King 1996), we modelled the relationship

between trust and PU at both initial usage phase and late-usage phase. Importantly, the self-perception theory (Bem 1972) suggests that the formation of beliefs is based on routine behaviour. Thus, actual usage plays an important role to link the theoretical background of TRA and ECT. We therefore expect consumers' actual usage leads to their future beliefs. The TRA underpins the early, initial usage phase while the ECT underpins the later usage phase.

3.1. The link between beliefs and early-stage intentions and use

The TRA explains the relationships between beliefs, subjective norms, intentions, and actual usage. As reflected in Figure 3, we examine trust and PU as important

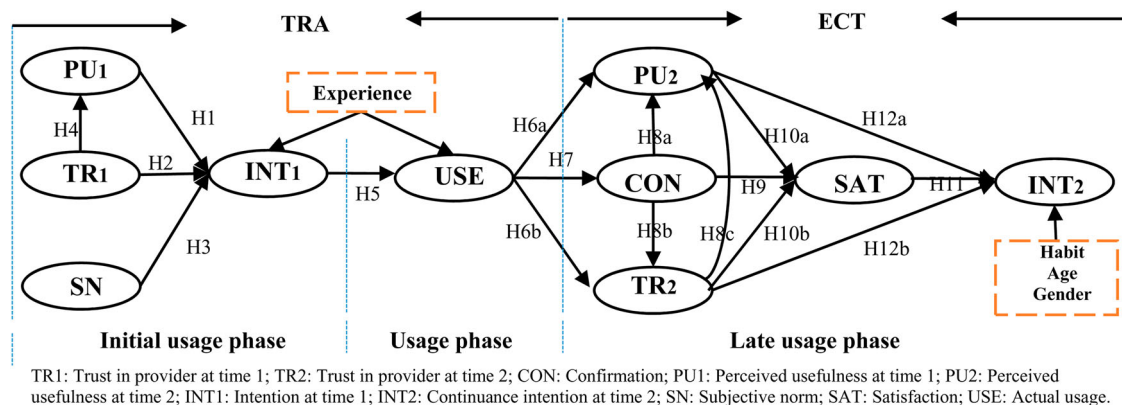


Figure 3. Research model.

behavioural beliefs. Past studies have empirically illustrated that PU influences online consumer behaviour (e.g. Gefen, Karahanna, and Straub 2003; Pavlou 2003). In the online health services context, PU is defined as a consumer's belief that an online health service will benefit them and will enhance the effectiveness of the self-management of their health (Lanseng and Andreassen 2007).

Trust in the e-service provider is defined as the consumer's confidence in the provider's integrity and dependability (Bhattacharjee 2002; Pavlou and Gefen 2002; Shin 2013a). Past research has examined the effects of initial trust on e-commerce acceptance (e.g. Gefen 2002; McKnight, Choudhury, and Kacmar 2002). A 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 the expectation of a satisfactory transaction experience (Pavlou 2003). Moreover, consumers are likely to perceive the potential for benefit only if the online health information provider is trusted as a reliable and competent health information provider.

Figure 3 also depicts the influence of subjective norm. According to the TRA, consumers are likely to form positive or negative intentions concerning a behaviour based on how they believe significant others will view the behaviour (Bhattacharjee and Lin 2014). This normative influence arises from peers or from other significant people, such as friends or family. Based on the foregoing, we hypothesise the following:

H1: PU at t1 has a positive effect on consumers' early-stage behavioural intentions concerning online health information services.

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

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

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

According to the TRA, actual behaviour is determined by behavioural intention. Studies have shown that IT usage intentions correlate with actual usage behaviours. Therefore, we further hypothesise the following:

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

Melone (1990) suggests that behaviour influences beliefs and attitudes in social psychology. Similarly, the self-perception theory suggests that the formation of beliefs is

based on routine behaviour (Bem 1972) and that 'the more usage there is, the more favourable the user evaluation' (Kim and Malhotra 2005, 745). Studies have consistently argued that the usage experience will modify beliefs and behavioural intentions (e.g. Kim and Malhotra 2005; Maier et al. 2012), suggesting that past behaviour serves to form evaluation. Hence, we expect that a consumer's actual usage experience with an e-service will influence (or update) their beliefs, specifically their PU and trust. According to the ECT, the usage experience will also provide the basis for the confirmation of initial expectations. This confirmation will in turn support belief modification (Venkatesh et al. 2011). In other words, users are theorised to revise their cognitions based on the degree to which their actual experience exceeded or fell short of their initial expectations. We thus expect that usage and confirmation will influence PU and trust beliefs after online health service usage. We therefore hypothesise the following:

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

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

In addition, empirical studies have found that, after e-service usage, PU is also determined by trust (Gefen, Karahanna, and Straub 2003). We thus propose the following:

H8c: Trust at t2 has a positive effect on PU at t2.

3.3. The link between later-stage beliefs, confirmation, satisfaction, and continuance intention

We hypothesise that modified beliefs and confirmation influence satisfaction. The ECT posits that satisfaction is determined by consumers' confirmation of expectations through initial usage (Bhattacharjee 2001) because consumers always compare early-usage expectations with their actual usage. If the initial expectations are confirmed, they will be more satisfied with the systems or service. Hsu et al. (2006) found that confirmation has a positive effect on consumers' satisfaction with online shopping usage. We thus propose the following:

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

Moreover, Bhattacharjee (2001) argues that beliefs also influence a user's post-acceptance affects such as

satisfaction. Research has found that PU positively impacts satisfaction in the mobile commerce context (Lin et al. 2014). Moreover, trust has been found to predict satisfaction in the online health context (Bliemel and Hassanein 2007). We thus propose the following:

H10a: The PU 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.

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

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

The research (Bhattacherjee and Premkumar 2004; Venkatesh et al. 2011) posits that intentions are also directly determined by consumers' post-usage evaluated beliefs. We therefore expect that consumers' continuance intentions are also determined by the evaluated (modified) beliefs of trust and PU. Moreover, meta-analyses on trust have found that the association of trust and intentions does not change over time but that trust remains important in influencing consumer intentions at later stages. We therefore hypothesise the following:

H12a: The PU 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

As Figure 3 shows, past online health service experience is a necessary control variable for early behavioural intention and actual use because the social psychology literature suggests that past behaviour may influence intentions and actual use (Kim and Malhotra 2005). For instance, Shim et al. (2001) found that prior experience with an 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 because people tend to perform behaviour automatically through learning (Limayem, Hirt, and Cheung 2007). Moreover, in the online health information context, gender and age differences have been considered to shape consumers' online health service adoption behaviour (Ybarra and Suman 2008).

4. Research methodology

We tested our hypotheses using a longitudinal research design in a laboratory setting. A longitudinal design allows the dynamic nature of the study's focal substantive constructs to be examined (Berrington, Smith, and SturGIS 2006); it also requires the researcher to collect repeated measures over time from the same units of observation. Doing so in this study allowed the changes in trust and usefulness to be described over time, enabling the estimation of our hypothesised model (see Figure 3).

We followed a longitudinal multiple-phase controlled laboratory design similar to that adopted in Zahedi and Song (2008).

4.1. Longitudinal study design

This study was carried out at a large national university in South Africa. We carried out a laboratory-based experimental-scenario research design. We invited first-year undergraduates registered in computer lab-related courses to participate. A total of around 1300 first-year students were registered for the courses. Using a university student sample for our study is appropriate because students represent an important portion of online consumers (Kim, Ferrin, and Rao 2008) and users of Internet health services (Bansal, Zahedi, and Gefen 2010; Shin 2015). Moreover, young people often have difficulties accessing traditional health services, and the Internet can offer them confidential and convenient access. The student body selected for this study represents a diverse cross-section of the consumer population, who are confronting various health-related issues. Many of these students are also learning to function independently at college without the typical family and support structures that had surrounded them. The engagement of such consumers with online health information services is thus particularly useful to examine.

We performed 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. In our pre-test, we found that the participants need around 30 minutes to complete online scenarios and questionnaire of phase 1, and 5 minutes to complete the phase 2 questionnaire.

The pre-test was then followed by the first phase and second phases of data collection, to which the larger undergraduate student sample was invited to participate. Data collection was part of a large study; see also Mou, Shin, and Cohen (2016).

4.1.1. Phase 1 (t1)

Phase 1 was conducted in a computer laboratory setting. An information sheet and consent form were provided and with the help of research assistants, participants were introduced to the purpose of this study. Participants who consented were then given the opportunity to choose from among three popular health informatics websites. The websites were all general medical, health, and wellness sites accessible to consumers with optional registration. These three health information websites have different features and information content. Allowing participants the opportunity to select their own website of interest increased the voluntary nature of the e-service usage process (Zahedi and 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 (such as diet and nutrition, exercise, and fitness) and to complete specific tasks related to the search for health information. The scenario tasks were adopted from van Deursen (2012) and Keselman, Browne, and Kaufman (2008) and then redesigned (see Appendix 2). The tasks within a controlled laboratory design are used to promote variability in use and attitudes and provide participants with a foundation for their initial perceptions. Participants were then asked to complete the first-round questionnaire, which comprises two parts. The first aims to capture the participants' trust beliefs, perceptions of site usefulness, subjective norms, and future usage intentions. The second part aims to capture the participants' demographic characteristics (e.g. age, gender, and whether they have experience seeking online health information). The total number of students invited to participate in phase 1 of our study was approximately 1300 students. Participation was voluntary and 761 respondents participated and completed our online scenarios and questionnaire over a number of sittings. Among them, 58 responses were subsequently eliminated as they had large amounts of missing data. As per the pre-test, the completion time for the scenario tasks and questionnaires was around 30 minutes for phase 1.

4.1.2. Phase 2 (t2)

After five weeks, the participants from phase 1 who had completed the online scenarios and questionnaire were asked to return to the laboratory. Most information systems studies using a longitudinal design employ an

interval ranging from one month to six months. We used a five-week time frame, which we assumed allowed for belief changes. Both the phase 1 and 2 surveys were administered to the participants through the university's e-learning questionnaire system. University's e-learning system facilitated both the dissemination and recording of questionnaire responses online. In order to guide participants to do this second-round online survey, the purpose of the study was explained and the questionnaire administered through the e-learning and with the help of research assistants. The second-round survey focused on participants' current perceptions, beliefs, and intentions. When the participants finished the second-round survey, all of them received a small token of appreciation for their time. As per the pre-test, the completion time for questionnaires was around 5 minutes for phase 2.

4.2. Measurement instrument

All constructs in the research model were operationalised based on previously validated instruments and modified to fit the context of online health information services. 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').

Behaviour intention (INT), PU, confirmation (CON), and satisfaction (SAT) were measured using scales developed by Bhattacharjee and Premkumar (2004). Three dimensions of trust (TRP) (benevolence, ability, and integrity) were measured using scales developed by Shin (2014) and Shin 2013b. Subjective norm (SN) was measured by adapting three scales from Venkatesh et al. (2011). Actual usage was measured by adapting two scales developed by Suh and Han (2002). Respondents were asked if they had used e-services before, and, if so, which ones.

The questionnaire was pre-tested using a convenience sample of senior students to determine if there were any ambiguous or confusing measurement items. The questionnaire items for measuring the constructs are presented in Appendix 3.

5. Empirical results

5.1. Participants

At time t1, we obtained 703 usable responses. At time 2, we invited these 703 participants to do the second-round survey. In total, 491 respondents completed the second-round survey, though 55 respondents were subsequently eliminated, as they were missing a large number of data values. Our final usable data comprised 436 respondents, for an attrition rate of approximately 37.9%. We

Table 1. Descriptive statistics of respondents' characteristics.

Demographics	Category	Frequency	%
Gender	Male	175	40.14
	Female	258	59.17
	Missing	3	0.69
Age	18–19	379	86.93
	20–22	40	9.17
	23–25	5	1.15
	>25	9	2.06
	Missing	3	0.69
Online health information experience	Yes	218	50.00
	No	212	48.62
	Missing	6	1.38
Choice of online health information service provider	Website 1	180	41.28
	Website 2	238	54.59
	Website 3	18	4.13

conducted our first-round survey at the beginning of March 2014; after five weeks, we conducted our second-round survey. We matched t1 and t2 by using an anonymous user ID. The demographic profile of the respondents is reported in Table 1. The respondents were aged between 18 and 22 (96%). Among them, 40% were male and 60% were female; 50% had previous online health information experience. Most participants chose website 1 (41%) or website 2 (54%) for the scenario tasks.

All the subjects indicated that they had used other types of e-services, including online shopping, Internet banking, mobile banking, and social networking services. Because participants were allowed to choose among three online health information providers for the tasks and to become familiar with the online health service context, we conducted an ANOVA test to determine if trust, subjective norms, usefulness beliefs, and the acceptance scores were independent of the choice of provider. The results indicated that there were no significant differences among the items measuring trust, PU, subjective norm, and intention variables.

5.2. Data analysis

We performed the data analysis in three stages. First, we evaluated our data for common method bias. Second, we examined whether the intentions and beliefs changed over time by comparing the construct means at t1 and t2. We then tested the measurement model and structural model by using the Smart-PLS software package (Ringle, Wende, and Will 2005). We chose PLS as our structural equation modelling technique because PLS can easily estimate the loading of indicators on constructs and their causal relationships. Moreover, PLS provides a good approximation of covariance-based structural equation modelling in terms of final estimates (Gefen, Rigdon, and Straub 2011; Hair, Ringle, and Sarstedt 2011; Sun et al. 2013).

5.2.1. Common method bias

In addition to using a longitudinal design, which can reduce common method bias associated with cross-sectional designs (Premkumar and Bhattacharjee 2008), we also checked for common method bias by performing Harman's one-factor test (Podaskoff and 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 69.4% of the variance, the first factor explaining 21.3%, which is less than 50%. For time 2, EFA revealed factors explaining 68.4% of the variance, and the first factor explained 23.5%. These results suggest that no single factor explained a majority of the variance, thus indicating that common method bias was not a threat in this study at either t1 or t2.

We randomly collected additional 41 responses from students not registered in our surveyed classes who were present at different times of the day in other computer laboratories across campus. We compared their responses to those from our time 1 sample ($N = 703$). No significant differences in responses were found, except for two items – an event which, given the number of items included in the instrument, is likely due to chance. Thus, we do not expect that the timing of our surveys, or the laboratory conditions or locations, influenced our results.

5.2.2. Comparison of construct means

Studies on IT usage have considered whether user beliefs change over time (e.g. Bhattacharjee and Premkumar 2004; Hsu et al. 2006; Venkatesh et al. 2011). This research has argued that earlier beliefs serve as an anchor for later-stage evaluations because they are not made from scratch but are formed from earlier judgements (Kim and Malhotra 2005). Others have argued, however, that early-stage beliefs wear off over time and are less likely than are actual user experiences to influence later-stage beliefs (Szajna and 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, which allowed us to compare the repeated measures over time from the same units of observation. The mean PU score dropped from 5.74 to 5.61, a statistically significant change ($t = 2.36$, $p = .019$). INT dropped from 4.86 to 4.65, which was also statistically significant ($t = 2.87$, $p = .004$). This result confirmed that PU and behavioural intention do change over time (i.e. over five weeks). Though TR dropped from 5.50 at time 1 to 5.43 at time 2 ($t = 1.68$, $p = .093$), the change was not

Table 2. Comparison of means in usefulness, trust, and intention.

	N	First time point		Second time point		Paired differences (1–2)		t-Statistic	p-Value
		Mean	SD	Mean	SD	Mean	SD		
PU1 ≠ PU2	436	5.74	1.08	5.61	0.95	0.13	1.14	2.36	.019
TR1 = TR2	436	5.50	0.92	5.43	0.85	0.07	0.88	1.68	.093
INT1 ≠ INT2	436	4.86	1.54	4.65	1.60	0.21	1.54	2.87	.004

statistically significant (see Table 2). Hence, users' trust beliefs seem to decrease slightly with the use of online health service over time; PU decreased slightly over time, which was not unexpected given that respondents have been known to correct their performance expectations during application use as the subject matters become more realistic (Sokura, Öörni, and Bragge 2012).

5.2.3. Measurement model evaluation

We next tested the study's research model. An initial principal components analysis (PCA) was carried out to confirm the unidimensionality of the measures and eliminate any inappropriate items. We removed TRP3 at this stage. Thereafter, the measurement model was analysed using Smart PLS. The items loaded onto their expected theoretical constructs. The mean, standardised loadings of the measurement items, average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha value are reported in Appendix 1. The values of the loadings are above the recommended value of 0.70. Besides actual usage (UES), for which one item is slightly lower than 0.7, all other measures exceed the prescribed 0.7 threshold for Cronbach's α . The values of composite reliability are above the acceptable value of 0.70, and the AVE is above the recommended threshold of 0.50. Thus, the convergent validity is confirmed. For discriminant validity, we compared inter-construct correlations with the square root of the AVE, which measures the percentage of overall variance in the indicators captured by the latent construct (Hair et al. 1998). Our results showed that the square root of

AVE of each construct is larger than the inter-construct correlations (see Table 3). Thus, discriminant validity is confirmed.

5.2.4. Results of hypothesis testing

Bootstrap resampling (1000 resamples) was used to produce *t*-values to determine path significance. The model explains roughly 38% of the variance in early-stage intentions to use the online health information service. However, in the later stage, the R^2 value for continuance intention is 0.37, indicating that the model explains 37% of the variance for consumer continuance usage intention. The analysis controlled for the effects of online health information experience (at the initial usage phase) and habit, age, and gender for behavioural intention at the post-usage stage. The effect of age on later-stage intention was significant.

PU is significantly influenced by trust. Trust, PU, and subjective norm have significant effects on behavioural intention. In turn, behavioural intention has a positive effect on the actual usage of online health services. Hence, H1, H2, H3, H4, and H5 are all supported. This finding supports the view that trust and PU are important to the consumer acceptance of online health service; it also confirms the TRA suggestion that behavioural intention is influenced by beliefs and subjective norm. Intentions were important to subsequent usage behaviours.

In the late-usage phase, PU and confirmation were determined by usage behaviour, supporting H6a and H7. However, H6b is rejected, as usage did not influence trust. Confirmation has a significant influence on PU and

Table 3. Construct correlations.

	Mean (SD)	CON	HAB	INT1	INT2	PU1	PU2	SAT	SN	TR1	TR2	USE
CON	5.19 (0.88)	0.865										
HAB	4.99 (1.57)	0.110	0.815									
INT1	4.86 (1.54)	0.334	0.073	0.973								
INT2	4.65 (1.60)	0.417	0.086	0.539	0.970							
PU1	5.74 (1.08)	0.314	0.034	0.329	0.249	0.893						
PU2	5.61 (0.95)	0.421	0.081	0.413	0.450	0.376	0.879					
SAT	5.30 (1.00)	0.493	0.190	0.398	0.504	0.310	0.499	0.866				
SN	3.22 (1.63)	0.254	0.075	0.365	0.304	0.124	0.157	0.210	0.942			
TR1	5.50 (0.92)	0.334	0.079	0.535	0.382	0.321	0.371	0.374	0.196	0.834		
TR2	5.43 (0.85)	0.440	0.126	0.416	0.460	0.249	0.398	0.432	0.204	0.504	0.794	
USE	1.54 (0.73)	0.263	0.056	0.298	0.445	0.165	0.242	0.274	0.229	0.154	0.165	0.832

Note: Diagonal bold values are square root of AVE.

Table 4. Summary of results.

Hypothesis (path)	Path coefficient	t-Value	Supported
H1	0.161	4.081***	Yes
H2	0.431	10.228***	Yes
H3	0.257	6.625***	Yes
H4	0.321	6.153***	Yes
H5	0.293	7.293***	Yes
H6a	0.127	3.200**	Yes
H6b	0.053	1.211	No
H7	0.263	6.325***	Yes
H8a	0.275	5.126***	Yes
H8b	0.426	8.957***	Yes
H8c	0.256	5.359***	Yes
H9	0.282	5.865***	Yes
H10a	0.307	6.967***	Yes
H10b	0.186	3.937***	Yes
H11	0.290	5.459***	Yes
H12a	0.205	3.683***	Yes
H12b	0.261	5.486***	Yes

* $p < .05$; ** $p < .01$; *** $p < .001$.

trust at t2, supporting H8a and H8b. Confirmation, PU, and trust are important to satisfaction, while trust has an indirect effect through usefulness. Hence, H8c, H9, H10a, and H10b are supported. Continuance intention at t2 is significantly determined by satisfaction, PU, and trust at t2. Hence, H11, H12a, and H12b are supported. This finding confirmed the suggestions of the IS continuance model (Bhattacharjee 2001) that intention is determined by evaluated (modified) beliefs and satisfaction, while satisfaction is determined by modified beliefs and confirmation. Table 4 summarises the results of this study.

6. Discussion

The objective of this study was to develop and test a longitudinal model of the consumer acceptance of online health information services. To do so, we integrated the TRA and ECT and empirically tested our research model by carrying out data collection at two points in time approximately five weeks apart. Data were collected in a laboratory setting from a sample of university students. The study offers several important findings.

First, the TRA theorises that actual usage is driven by behavioural intention. In turn, beliefs and subjective norms are the key determinants of consumer intention to accept information systems or e-services. Our results showed that initial beliefs and subjective norm were important in influencing intentions and that intentions in turn drove actual use. Our findings are consistent with the suggestion of the TRA, indicating that it is a robust theory that can be employed to study health-related behaviour.

Second, the results indicated that trust had a significant impact on the PU of online health information services at both the initial and later stages. In the online

health information service context, trust has stronger effects on behavioural intention than PU does in both stages ($\beta = 0.431$ in the early stage; $\beta = 0.261$ in the later stage). This confirmed the importance of trust in consumer online behaviour.

Third, our findings support the ECT's suggestion that confirmation is important to satisfaction and the updating of beliefs, while evaluated (modified) beliefs and satisfaction were in turn important to continued usage. We found that both trust and PU had significant effects on satisfaction and that satisfaction in turn had a direct impact on consumer continuance intention. Confirmation had both direct and indirect impacts on satisfaction and continuance intention. These results suggest that trust may be a relevant component within an ECT-based model of post-usage intention, especially in the e-service context.

Fourth, we found that actual usage is important in leading to further PU and confirmation. This result is consistent with Lin et al. (2014). However, trust was not directly influenced by actual use but rather increased in relation to a positive confirmation of expectations, suggesting that consumers consider the benefits gained as part of their trust building.

Fifth, in comparing the construct means, we found that both beliefs (PU and trust beliefs) and intention wear off over time. However, the changes in consumer trust over the five weeks are not significant. This finding is consistent with Szajna and Scamell (1993).

7. Implications and conclusion

7.1. Theoretical implications

Our study makes several important theoretical contributions. First, it has integrated the TRA and ECT, two theoretical perspectives important for predicting initial and continuance acceptance in the non-commercial e-service context. Specifically, we empirically validated the integrated theoretical framework in the online health information service field. This appears to be the first study to adopt an integrated TRA and ECT to examine online health behaviours.

Second, we have confirmed the TRA and ECT as useful theoretical underpinnings for the examination of early and later stages of IS use and have shown that actual usage is important to the integration of these two models. Actual usage precedes the confirmation of expectations and belief modification in both a process and causal sense. This insight can help researchers better understand the association between usage and beliefs.

Third, our results highlight that trust and PU are important to the prediction of consumer acceptance of online health services in both the early and later usage phases. This finding suggests that, in online

environments, trust can integrate various theories (such as the TRA and ECT), which should help researchers integrate trust in other theories.

Fourth, our study confirmed that PU and behavioural intention do change over time, providing a key contribution to the development of a theory on the dynamic nature of e-service acceptance.

Fifth, by adopting online health information services as a context for the longitudinal study, we shed light on consumers' general perceptions and behavioural intentions concerning this high-potential e-service area.

7.2. Implications for practice

This study also has several important practical implications. First, the importance of trust and PU in the consumer acceptance of online health information services at both the early and later usage stages suggests that e-service providers should increase consumers' usefulness perceptions in order to promote acceptance and should focus on trust building, perhaps through the implementation of privacy protection or establishing their reputation as a reliable and competent provider of health information services.

Second, the revelation of the importance of three trust dimensions – online health services providers' ability, benevolence, and integrity – can help practitioners better understand the formation of trust. Practitioners need to ensure that they increase provider-based trust by building their reputation as a reliable, competent provider of health information and that they are seen to do so in a manner that is in the best interests of consumers rather than in the best interests of, for example, pharmaceutical companies or the commercial advertisers on their sites.

Third, later-stage trust was not found to be a simple function of actual usage. Thus, health service providers should consider the importance of other trust-building mechanisms, such as third-party seals or structural assurance.

Fourth, the dynamic nature of PU and intention should motivate practitioners to focus on improving acceptance through the implementation of trust-building mechanisms. The investigation of the function of PU and trust can help practitioners become better positioned to establish their online service offerings. Website designers will also benefit from understanding the importance of PU and consumer trust.

7.3. Limitations and future research

Our study also has several limitations. First, due to the difficulty in carrying out longitudinal studies in the field, the sample is drawn from a university population. This is a

threat to the external validity of the findings and may limit the generalisability 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, one in which the salience of trust and usefulness perceptions is likely to be highly significant. However, the results of the dynamic model test may not generalise 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 and Andreassen 2007). We focused 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.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

- Ajzen, I., and M. Fishbein. 1980. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Bansal, G., F. M. Zahedi, and D. Gefen. 2010. "The Impact of Personal Dispositions on Information Sensitivity, Privacy Concern and Trust in Disclosing Health Information Online." *Decision Support Systems* 49: 138–150.
- Bem, D. 1972. "Self-perception Theory." In *Advances in Experimental Social Psychology*, Vol. 6, edited by L. Berkowitz, 1–62. New York: Academic Press.
- Berrington, A., P. W. F. Smith, and P. Sturgis. 2006. *An Overview of Methods for the Analysis of Panel Data*. ESRC National Centre for Research Methods Briefing Paper.
- Bhattacharjee, A. 2001. "Understanding Information Systems Continuance: An Expectation-Confirmation Model." *MIS Quarterly* 25 (3): 351–370.
- Bhattacharjee, A. 2002. "Individual Trust in Online Firms: Scale Development and Initial Test." *Journal of Management Information Systems* 19 (1): 211–241.
- Bhattacharjee, A., and C. P. Lin. 2014. "A Unified Model of IT Continuance: Three Complementary Perspectives and Crossover Effects." *European Journal of Information Systems* 24 (4): 364–373.
- Bhattacharjee, A., and G. Premkumar. 2004. "Understanding Changes in Belief and Attitude Toward Information Technology Usage: A Theoretical Model and Longitudinal Test." *MIS Quarterly* 28 (2): 229–254.
- Bliemel, M., and K. Hassanein. 2007. "Consumer Satisfaction with Online Health Information Retrieval: A Model and Empirical Study." *e-Service Journal* 5 (2): 53–84.
- Chandra, S., S. C. Srivastava, and Y. L. Theng. 2010. "Evaluating the Role of Trust in Consumer Adoption of Mobile Payment Systems: An Empirical Analysis."

- Communications of the Association for Information Systems* 27: 561–588.
- Davis, F. D., R. P. Bagozzi, and P. R. Warshaw. 1989. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models." *Management Science* 35 (8): 982–1003.
- de Ruyter, K., M. Wetzels, and M. Kleijnen. 2001. "Customer Adoption of E-service: An Experimental Study." *International Journal of Service Industry Management* 12 (2): 184–207.
- Featherman, M. S., and P. A. Pavlou. 2003. "Predicting E-services Adoption: A Perceived Risk Facets Perspective." *International Journal of Human-Computer Studies* 59: 451–474.
- Fishbein, M., and I. Ajzen. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.
- Gefen, D. 2000. "E-commerce: The Role of Familiarity and Trust." *OMEGA* 28: 725–737.
- Gefen, D. 2002. "Customer Loyalty in E-commerce." *Journal of Association for Information Systems* 3: 27–51.
- Gefen, D., E. Karahanna, and D. W. Straub. 2003. "Trust and TAM in Online Shopping: An Integrated Model." *MIS Quarterly* 27 (1): 51–90.
- Gefen, D., E. E. Rigdon, and D. Straub. 2011. "An Update and Extension to SEM Guidelines for Administrative and Social Science Research." *MIS Quarterly* 35 (2): 3–14.
- Hair, J. F., R. E. Anderson, R. L. Tatham, and W. C. Black. 1998. *Multivariate Data Analysis* (5th ed.). Upper Saddle River, NJ: Prentice Hall.
- Hair, J. F., C. M. Ringle, and M. Sarstedt. 2011. "PLS-SEM: Indeed a Silver Bullet." *The Journal of Marketing Theory and Practice* 19 (2): 139–152.
- Harbour, J., and G. G. Chowdhury. 2007. "Use and Outcome of Online Health Information Services: A Study among Scottish Population." *Journal of Documentation* 63 (2): 229–242.
- Hsu, M. H., C. H. Yen, C. M. Chiu, and C. M. Chang. 2006. "A Longitudinal Investigation of Continued Online Shopping Behavior: An Extension of the Theory of Planned Behavior." *International Journal of Human-Computer Studies* 64 (9): 889–904.
- Islam, A. L. K. M. N., and M. Mäntymäki. 2011. "Continuance of Professional Social Networking Sites: A Decomposed Expectation-Confirmation Approach." Proceedings of the Thirty Second International Conference on Information Systems, Shanghai, China.
- Keselman, A., A. C. Browne, and D. Kaufman. 2008. "Consumer Health Information Seeking as Hypothesis Testing." *Journal of the American Medical Informatics Association* 15 (4): 484–495.
- Kim, D. J., D. L. Ferrin, and H. R. Rao. 2008. "A Trust-Based Consumer Decision-Making Model in Electronic Commerce." *Decision Support Systems* 44 (2): 544–564.
- Kim, S. S., and N. K. Malhotra. 2005. "A Longitudinal Model of Continued IS Use: An Integrative View of Four Mechanisms Underlying Post Adoption Phenomena." *Management Science* 51 (5): 741–755.
- Komiak, S. Y. X., and I. Benbasat. 2006. "The Effects of Personalization and Familiarity on Trust and Adoption of Recommendation Agents." *MIS Quarterly* 30 (4): 941–960.
- Lanseng, E. J., and T. W. Andreassen. 2007. "Electronic Healthcare: A Study of People's Readiness and Attitude Toward Performing Self-diagnosis." *International Journal of Service Industry Management* 18 (4): 394–417.
- Lee, Y., and O. Kwon. 2011. "Intimacy, Familiarity and Continuance Intention: An Extended Expectation-Confirmation Model in Web-Based Services." *Electronic Commerce Research and Applications* 10: 342–357.
- Leonard, L. N. K., T. P. Cronan, and J. Kreie. 2004. "What Influences IT Ethical Behaviour Intentions – Planned Behaviour, Reasoned Action, Perceived Importance, or Individual Characteristics?" *Information and Management* 42: 143–158.
- Limayem, M., S. G. Hirt, and C. M. K. Cheung. 2007. "How Habit Limits the Predictive Power of Intention: The Case of Information Systems Continuance." *MIS Quarterly* 34 (4): 705–737.
- Lin, J., B. Wang, N. Wang, and Y. Lu. 2014. "Understanding the Evolution of Consumer Trust in Mobile Commerce: A Longitudinal Study." *Information Technology and Management* 15 (1): 37–49.
- Maier, C., S. Laumer, A. Eckhardt, and T. Weitzel. 2012. "Using User Personality to Explain the Intention-Behavior Gap and Changes in Beliefs: A Longitudinal Analysis." Proceedings of the Thirty Third International Conference on Information Systems, Orlando, FL.
- Melone, N. P. 1990. "A Theoretical Assessment of the User-Satisfaction Construct in Information Systems Research." *Management Science* 36 (1): 76–91.
- McKnight, D. H., V. Choudhury, and C. Kacmar. 2002. "The Impact of Initial Consumer Trust on Intentions to Transact with a Web Site." *Journal of Strategic Information Systems* 11 (3): 297–323.
- Mou, J., D. H. Shin, and J. Cohen. 2016. "The Role of Trust and Health Belief in the Acceptance of Online Health Services." *IT & People*.
- Oliver, R. L. 1980. "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions." *Journal of Marketing Research* 17: 460–469.
- Pavlou, P. A. 2003. "Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model." *International Journal of Electronic Commerce* 7 (3): 101–134.
- Pavlou, P. A., and M. Fygenson. 2006. "Understanding and Predicting Electronic Commerce Adoption: An Extension of the Theory of Planned Behavior." *MIS Quarterly* 30 (1): 115–143.
- Pavlou, P. A., and D. Gefen. 2002. "Building Effective Online Marketplaces with Institution-Based Trust." Proceedings of the Twenty-Third International Conference on Information Systems, Barcelona, Spain, 667–675.
- Podaskoff, P. M., and D. W. Organ. 1986. "Self-reports in Organizational Research: Problems and Prospects." *Journal of Management* 12: 531–544.
- Premkumar, G., and A. Bhattacharjee. 2008. "Explaining Information Technology Usage: A Test of Competing Models." *OMEGA* 36 (1): 64–75.
- Ringle, C. M., S. Wende, and A. Will. 2005. *SmartPLS* (Release 2.0 (beta)). Hamburg, Germany: University of Hamburg. <http://www.smartpls.de>.
- Rust, R. T., and P. K. Kannan. 2003. "E-service: A New Paradigm for Business in the Electronic Environment." *Communications of the ACM* 36 (6): 37–42.

- Shim, S., M. A. Eastlick, S. L. Lotz, and P. Warrington. 2001. "An Online Prepurchase Intentions Model: The Role of Intention to Search." *Journal of Retailing* 77: 397–416.
- Shin, D. 2010. "The Effects of Trust, Security and Privacy in Social Networking: A Security-Based Approach to Understand the Pattern of Adoption." *Interacting with Computers* 22 (5): 428–438.
- Shin, D. 2011. "Understanding E-book Users: Uses and Gratification Expectancy Model." *New Media and Society* 13 (2): 260–278.
- Shin, D. 2013a. "User Experience in Social Commerce: In Friends We Trust." *Behavior and Information Technology* 32 (1): 52–67.
- Shin, D. 2013b. "N-Screen: How Multi-Screen Will Impact Diffusion and Policy." *Information, Communication and Society* 16 (6): 918–944.
- Shin, D. 2014. "Measuring the Quality of Smartphones: Development of a Customer Satisfaction Index for Smart Devices." *International Journal of Mobile Communications* 12 (4): 311–327.
- Shin, D. 2015. "User Value Design for Cloud Courseware System." *Behaviour & Information Technology* 34 (5): 506–519.
- Shin, D. 2016. "Cross-Platform User Experience Towards Designing an Inter-Usable System." *International Journal of Human-Computer Interaction* 32 (7): 503–514.
- Sokura, B., A. Öörni, and J. Bragge. 2012. "Changes in User Beliefs and Attitudes During the Learning Process of Office Applications." Proceedings of ECIS 2012. Paper 213.
- Suh, B., and I. Han. 2002. "Effect of Trust on Customer Acceptance of Internet Banking." *Electronic Commerce Research and Applications* 1: 247–263.
- Sun, Y., N. Wang, X. Guo, and Z. Peng. 2013. "Understanding the Acceptance of Mobile Health Service: A Comparison and Integration of Iterative Models." *Journal of Electronic Commerce Research* 14 (2): 183–200.
- Szajna, B., and R. W. Scamell. 1993. "The Effects of Information System User Expectations on Their Performance and Perceptions." *MIS Quarterly* 17 (4): 493–516.
- van Deursen, A. J. A. M. 2012. "Internet Skill-Related Problems in Accessing Online Health Information." *International Journal of Medical Informatics* 81: 61–72.
- Venkatesh, V., and M. G. Morris. 2000. "Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behaviour." *MIS Quarterly* 24 (1): 115–139.
- Venkatesh, V., J. Y. L. Thong, F. K. Y. Chan, P. J. H. H. Hu, and S. A. Brown. 2011. "Extending the Two-Stage Information Systems Continuance Model: Incorporating UTAUT Predictors and the Role of Context." *Information Systems Journal* 21: 527–555.
- Xia, W., and W. King. 1996. "Interdependency of the Determinants of User Interaction and Usage: An Empirical Test." ICIS 1996 Proceedings, Cleveland, OH. Paper 1.
- Xiao, N., R. Sharman, H. R. Rao, and S. Upadhyaya. 2014. "Factors Influencing Online Health Information Search: An Empirical Analysis of a National Cancer-Related Survey." *Decision Support Systems* 57: 417–427.
- Ybarra, M., and M. Suman. 2008. "Reasons, Assessments and Actions Taken: Sex and Age Differences in Uses of Internet Health Information." *Health Education Research* 23 (3): 512–521.
- Yi, M. Y., J. J. Yoon, J. M. Davis, and T. Lee. 2013. "Untangling the Antecedents of Initial Trust in Web-Based Health Information." *Decision Support Systems* 55: 284–295.
- Yousafzai, S. Y., G. R. Foxall, and J. G. Pallister. 2010. "Explaining Internet Banking Behaviour: Theory of Reasoned Action, Theory of Planned Behaviour, or Technology Acceptance Model?" *Journal of Applied Social Psychology* 40 (5): 1172–1202.
- Zahedi, F. M., and J. Song. 2008. "Dynamic of Trust Revision: Using Health Infomediaries." *Journal of Management Information Systems* 24 (4): 225–248.
- Zhao, L., and Y. Lu. 2012. "Enhancing Perceived Interactivity Through Network Externalities." *Decision Support Systems* 53: 825–834.

Appendix 1. Cross-loading, reliability and validity.

	CON	HAB	INT1	INT2	PU1	PU2	SAT	SN	TR1	TR2	USE
ACU1	0.284	0.059	0.319	0.466	0.177	0.260	0.284	0.216	0.166	0.182	0.982
ACU2	0.065	0.022	0.090	0.168	0.051	0.068	0.116	0.183	0.040	0.029	0.649
INT11	0.296	0.088	0.972	0.500	0.311	0.390	0.373	0.337	0.521	0.393	0.272
INT12	0.329	0.069	0.977	0.518	0.328	0.414	0.392	0.346	0.533	0.413	0.294
INT13	0.350	0.056	0.970	0.553	0.321	0.402	0.398	0.381	0.506	0.409	0.304
HAB21	0.041	0.758	0.031	0.032	-0.013	0.056	0.128	0.020	0.018	0.087	0.073
HAB22	0.030	0.678	0.013	-0.016	0.040	0.063	0.111	0.027	0.013	0.077	0.014
HAB23	0.115	0.978	0.073	0.082	0.053	0.083	0.189	0.083	0.086	0.125	0.038
INT21	0.389	0.073	0.512	0.965	0.240	0.431	0.474	0.278	0.367	0.434	0.430
INT22	0.401	0.085	0.537	0.977	0.235	0.446	0.500	0.294	0.380	0.461	0.436
INT23	0.423	0.092	0.518	0.968	0.249	0.434	0.493	0.313	0.364	0.443	0.428
PEB21	0.859	0.071	0.284	0.392	0.298	0.392	0.429	0.185	0.319	0.451	0.233
PEB22	0.866	0.067	0.251	0.302	0.241	0.322	0.371	0.238	0.235	0.348	0.226
PEB23	0.854	0.131	0.312	0.343	0.251	0.367	0.451	0.225	0.310	0.342	0.181
PEB24	0.880	0.110	0.307	0.394	0.291	0.369	0.447	0.235	0.284	0.370	0.267
PU11	0.260	0.071	0.312	0.248	0.899	0.339	0.305	0.096	0.303	0.239	0.132
PU12	0.263	0.014	0.289	0.221	0.904	0.351	0.261	0.133	0.266	0.204	0.169
PU13	0.309	0.036	0.228	0.192	0.879	0.337	0.271	0.092	0.266	0.215	0.145
PU14	0.294	0.002	0.332	0.222	0.890	0.319	0.267	0.120	0.306	0.228	0.147
PU21	0.337	0.111	0.352	0.418	0.339	0.849	0.429	0.107	0.328	0.374	0.165
PU22	0.394	0.053	0.379	0.386	0.339	0.916	0.447	0.160	0.327	0.350	0.214
PU23	0.361	0.061	0.386	0.400	0.354	0.868	0.459	0.180	0.339	0.340	0.242
PU24	0.387	0.061	0.335	0.380	0.287	0.884	0.418	0.103	0.308	0.334	0.230
SAT21	0.480	0.181	0.349	0.437	0.266	0.466	0.870	0.188	0.370	0.438	0.238
SAT22	0.398	0.129	0.333	0.445	0.277	0.443	0.908	0.151	0.312	0.394	0.237
SAT23	0.350	0.200	0.321	0.402	0.231	0.389	0.844	0.179	0.285	0.332	0.184
SAT24	0.467	0.154	0.374	0.458	0.295	0.425	0.841	0.209	0.324	0.323	0.282
SN11	0.232	0.073	0.291	0.247	0.139	0.116	0.188	0.923	0.147	0.168	0.169
SN12	0.228	0.085	0.360	0.298	0.092	0.169	0.209	0.958	0.178	0.192	0.252
SN13	0.256	0.056	0.369	0.307	0.123	0.152	0.196	0.944	0.222	0.211	0.218
TRP11	0.229	0.050	0.381	0.260	0.239	0.295	0.246	0.112	0.784	0.414	0.053
TRP110	0.272	0.092	0.485	0.354	0.332	0.293	0.347	0.221	0.867	0.443	0.125
TRP111	0.297	0.116	0.508	0.334	0.325	0.310	0.347	0.220	0.849	0.458	0.154
TRP12	0.257	0.059	0.431	0.279	0.220	0.302	0.268	0.126	0.810	0.435	0.092
TRP14	0.283	0.042	0.421	0.299	0.226	0.262	0.301	0.126	0.829	0.395	0.113
TRP15	0.261	0.084	0.407	0.312	0.232	0.306	0.286	0.134	0.843	0.406	0.109
TRP16	0.261	0.059	0.409	0.301	0.224	0.321	0.270	0.171	0.820	0.404	0.113
TRP17	0.294	0.026	0.398	0.275	0.229	0.317	0.297	0.184	0.837	0.407	0.148
TRP18	0.288	0.033	0.481	0.373	0.295	0.315	0.361	0.136	0.837	0.406	0.172
TRP19	0.328	0.082	0.497	0.367	0.312	0.365	0.363	0.179	0.855	0.424	0.179
TRP21	0.257	0.111	0.244	0.255	0.107	0.275	0.240	0.094	0.372	0.685	0.073
TRP210	0.377	0.130	0.356	0.425	0.237	0.340	0.405	0.167	0.374	0.850	0.181
TRP211	0.394	0.134	0.335	0.405	0.274	0.330	0.372	0.146	0.354	0.812	0.185
TRP22	0.314	0.105	0.224	0.294	0.127	0.298	0.256	0.124	0.383	0.732	0.095
TRP24	0.301	0.082	0.287	0.297	0.143	0.262	0.271	0.183	0.404	0.766	0.073
TRP25	0.304	0.079	0.290	0.326	0.110	0.245	0.268	0.189	0.417	0.782	0.109
TRP26	0.351	0.079	0.375	0.388	0.197	0.335	0.310	0.156	0.458	0.825	0.144
TRP27	0.336	0.035	0.285	0.323	0.166	0.287	0.314	0.151	0.401	0.767	0.093
TRP28	0.371	0.116	0.387	0.414	0.243	0.351	0.402	0.157	0.420	0.841	0.140
TRP29	0.432	0.118	0.447	0.446	0.285	0.391	0.489	0.228	0.435	0.858	0.169
AVE	0.748	0.664	0.947	0.941	0.797	0.773	0.750	0.887	0.695	0.630	0.693
CR	0.922	0.852	0.982	0.980	0.940	0.932	0.923	0.959	0.958	0.944	0.812
Alpha	0.888	0.871	0.972	0.969	0.916	0.916	0.889	0.936	0.951	0.935	0.661

Note: Bold values indicate $p < .01$.

Appendix 2. Task sheet (adapted from van Deursen 2012 and Keselman, Browne, and Kaufman 2008).

Please visit one of the following websites:

Website 1: [xxx]; Website 2: [xxx]; Website 3: [xxx]

1. Which website did you visit?

Please complete the following tasks using your chosen website.

2. Identify a health-related topic of interest to you. Then using your chosen website's search feature search for information on this topic: How relevant did you find the articles?

A. Not at all relevant. B. Somewhat relevant. C. Relevant. D. Very relevant.

3. Read one of the articles, and answer the following questions:

What is its title?

When was it written?

4. What information is required to register or sign up to your chosen website?

5. Does this website contain information on second-hand smoke?

(1). Yes (2). No

6. Imagine ... You are visiting your elderly relative, who lives alone in another part of the country. On the second day of your visit, she carries several bags of groceries up two flights of stairs and stops with a pained expression on her face. When you press her to tell you what is wrong, she admits that she is having chest pains. She says that the pain feels as if something were squeezing her chest. She is also nauseous and out of breath. She lies down to rest. The discomfort lasts 2–3 minutes, after which the pain stops. When you talk to her about this incident, she admits that, for the past year, she has been troubled by periodic squeezing pain in her chest. Sometimes she can also feel the pain in her neck and shoulders. The pain usually happens after she does something physically active: climbs several flights of stairs, does some heavy housework, unloads groceries, etc. When this happens, she also often feels nauseous and out of breath. She also feels very tired. The pain typically lasts a few minutes and goes away after she rests a while.

Using your chosen website, try to identify the name of the condition your elderly relative suffers from.

7. Imagine ... During a hike you are bitten by a tick. A red spot appears that grows. This is a sign you have been infected with Lyme borreliosis. A friend recommends starting with an antiviral (remedy against viral infections) immediately, since Lyme's disease can have very unpleasant consequences, especially when treatment starts too late! Answer the following question using your chosen website:

Does this website provide any information to help you make a decision as to whether or not it is a good idea to start an antiviral remedy?

A. Yes. B. No. C. No information.

Appendix 3. Measurement items.

Perceived usefulness (PU) (t1/t2)

(PU1) Using this website can be of benefit to me in managing my health.

(PU2) Using this website can improve my performance in managing my health.

(PU3) Using this website will be useful for my health.

(PU4) Using this website can enhance my effectiveness in managing my health.

Trust in provider (TRP) (t1/t2)

(TRP1) I expect this website information provider has good intentions toward me.

(TRP2) I expect this website information provider is acting in my best interest.

(TRP3) I expect this website information provider is well meaning. *

(TRP4) This website information provider is truthful in its dealings with me.

(TRP5) I would characterize this website information provider as honest.

(TRP6) This website information provider would keep its commitments to deliver quality information.

(TRP7) This website information provider is sincere and genuine.

(TRP8) I believe this website information provider is effective in assisting me to search for health information.

(TRP9) This website performs its role of health information provider very well.

(TRP10) Overall, this website is a capable and proficient provider of health information.

(TRP11) In general, this website is a very knowledgeable provider of health information.

* dropped following initial PCA

Subjective norms (SN) (t1)

(SN1) People who influence my behavior think that I should use a health information website.

(SN2) People who are important to me think that I should use a health information website.

(SN3) People who are in my social circle think that I should use a health information website.

Continuance intention (INT) (t1/t2)

(INT1) I intend to continue using this website to obtain health information.

(INT2) I plan to continue using this website to obtain health information.

(INT3) I will continue using this website to obtain health information.

Satisfaction (SAT) (t2)

How do you feel about your overall experience of surfing through this website?

(SAT1) Very satisfied.

(SAT2) Very pleased.

(SAT3) Very contented.

(SAT4) Absolutely delighted.

Confirmation (CON) (t2)

Compared to my initial expectations, the ability of the online health website ...

(CON1) To benefit me in managing my health.

(CON2) To improve my performance in managing my health.

(CON3) To be useful for my health.

(CON4) To enhance my effectiveness in managing my health.

Actual use (ACU) (t2)

Over the past 5-week-period, how often did you use the health website?

(ACU1) Not at all ... Several times a week.

In the last 5 weeks, approximately how many hours did you spend using the health website?

(ACU2) 1–5hours ... > 15hours