

Adoption and non-adoption motivational risk beliefs in the use of mobile services for health promotion

Abstract

Purpose - This study validates empirically a theoretical model that integrates an innovative construct capturing consumers' non-adoption risk belief associated with not using a mobile service designed to support them in a non-leisure activity.

Design/methodology/approach - A theoretical model contrasting perceived non-adoption risk to perceived adoption risk of a mobile service supporting health promotion was developed and tested with a sample of potential consumers in North America.

Findings - Results show that non-adoption risk is a moderately strong antecedent of motivational factors in contrast to adoption risk that hinders the acceptance of a mobile service supporting health promotion.

Research limitations/implications - Healthcare is a highly sensitive social sector, so possible negative consequences of not using the support of a mobile service are an additional motivation for adopting this service. Future research should test the role of non-adoption risk in other contexts of technology use, including non-leisure settings.

Practical implications - Making potential users see the possible negative consequences of not using a mobile service designed to support them in a non-leisure activity increases their motivation and, subsequently, intention to use the service.

Social implications - Educational efforts to making consumers see the risks of not using a supporting technology application appear to be justified.

Originality/value - This study demonstrates the significant role of non-adoption risk belief that captures the negative consequences individuals may perceive if they fail to use as expected a mobile service application designed specifically to help them.

Keywords

Non-adoption risk, adoption risk, user adoption, mobile service, information and communication technology, healthcare, mobile health, m-health, mobile advertising, health promotion

1. Introduction

Previous research in information systems (IS) has pointed to key information and communication technology (ICT)-related perceptions that would make users more inclined to adopt a new ICT (Venkatesh, Morris, Davis, & Davis, 2003). Researchers demonstrated that users would accept a new ICT or ICT application mainly if they perceived this as being useful for them, easy to use, or enjoyable (Venkatesh, Speier, & Morris, 2002; Venkatesh, Thong, & Xu, 2012). Relatively recent research adds to this extrinsic and intrinsic benefit view of ICT adoption the negative angle. After all, the use of new ICT may also harbor many potential adoption risks for users, which too, are taken into account by individuals for forming acceptance decisions. These negative factors express apprehension in several directions (e.g., fear of wasting money or time, or concern on privacy) and

are known in the IS literature, usually, as perceived risk (Featherman & Pavlou, 2003; Glover & Benbasat, 2010). Therefore, a balanced investigation of the perceptions regarding the adoption and use of a new ICT or ICT application, especially in areas where the use of the ICT may present a broad set of issues (e.g., in the case of healthcare ICT), should take into account both the drivers and the perceived deterrents expressed as *adoption risk*.

Besides the relatively well-researched adoption risk described above there may exist, at least in some contexts, a largely overlooked risk perception, namely a *non-adoption risk*. This concept would express the perceived danger following doing nothing, e.g., not adopting a healthcare ICT offered to provide support to consumers. This factor would contrast the above-mentioned perceived risk of adopting the technology and act simultaneously to it as a determinant of user perceptions and behaviors. It may be especially relevant in contexts where not adopting an ICT may have significant consequences. For instance, in the case of a healthcare support ICT, not adopting the ICT may increase the risk that a person will not meet his or her health goals. Somewhat similarly, not adopting a work-related ICT might increase the risk that one's job performance declines; or not adopting a new game console might increase the risk that one's social status diminishes.

Without discounting the relevance and prevalence of non-adoption risk in other contexts, in this study we focus on healthcare support ICT, as non-adoption decisions in this context may have major implications (e.g., worsening of health condition or, even, getting a serious illness). We specifically test the concurrent effects of adoption and non-adoption risks on ICT adoption decisions in the particular context of a mobile service support application for smoking cessation. We do so for three reasons. First, this context is relevant for both adoption and non-adoption risk perceptions. Adoption perceived risks may include, for example, risk associated with privacy violation as related to personal health information and financial risk as related to subscribing to a, perhaps, useless service. Non-adoption risks are associated with feared health deterioration because of continuing to smoke. Second, knowledge regarding ICT (mobile services, in particular) adoption in this context can have important practical implications which may help improve peoples' health and lives. Third, smoking cessation context is growing in importance in modern societies. Yet, it received relatively scant attention in IS research.

The consequences of smoking for individual and public health have become a growing concern. As a result, there has been a wealth of smoking cessation initiatives worldwide (Shearer & Shanahan, 2006). One relatively recent approach in some parts of the world is to use newer ICT to assist people in their efforts to quit smoking (Chung, 2015; Song, Kim, Kwon, & Jung, 2013). Out of the solutions implemented through mobile ICT devices, applications using mobile services such as wireless text messaging on cell phones were having, reportedly, encouraging results (Free, Knight, Robertson, Whittaker, Edwards, Zhou, & Roberts, 2011; Møldrup, 2007; Obermayer, Riley, Asif, & Jean-Mary, 2004). In addition to the anytime-anywhere capabilities of cell phones, it seems that the features of wireless text messaging in terms of popularity, low cost, and low intrusiveness are a good explanation for the preference of this service as an individual support. Moreover, commercial offerings of text reminders, in general, have been gaining popularity various parts of the world (Downer, Meara, & Da Costa, 2005), including mobile services for health promotion and management activities (Cole-Lewis & Kershaw, 2010; Chen & Lin, 2018).

Given the theoretical gap regarding the need to simultaneously consider adoption and non-adoption risks in technology adoption decisions and the practical necessity to improve the acceptance of a mobile service supporting an individually and socially meaningful goal like

smoking cessation, the current investigation examines the roles of the two types of risk in motivating the use of a wireless text messaging support tool for health promotion. For that, a theoretical extension of the motivational model adapted from information systems research (Davis, Bagozzi, & Warshaw, 1992) with adoption and non-adoption risks as well as with social norm is proposed and validated in an empirical context. Thus, a study with 252 potential consumers (smokers) was conducted in North America. This paper reports on that study, as follows: the next two sections present the theoretical background and model development. Following them, study methodology and results are presented. Finally, a discussion section concludes the paper.

2. Theoretical background

Research on user reasons to adopt a new ICT has an established tradition in IS. Various models and theories that focus on the antecedents of ICT adoption have been validated (Muthitharoen, Palvia, & Grover, 2011; Venkatesh & Bala, 2008; Venkatesh et al., 2003). One of the prominent and parsimonious models used is the motivational model according to which user behavioral intention (BI) to adopt an ICT or ICT application is explained by two key factors: extrinsic motivation (EM) and intrinsic motivation (IM) (Davis et al., 1992; Igbaria, Parasuraman, & Baroudi, 1996; Venkatesh et al., 2002). While EM captures the external goals users would aim at by using a technology, similar to perceived usefulness of the technology (e.g., performing an activity, learning utilitarian information), IM expresses the intrinsic satisfaction associated with the use of that technology due to the interaction with the technology itself, similar to the enjoyment of using it (Lee, Lee, & Hwang, 2015; Ryan & Deci, 2000).

The two motivational sides in this adoption model encapsulate broad sets of user reasons for adopting the ICT; hence, the model is parsimonious and has good predictive ability, which made it appealing to and appropriate for our study. However, a more recent trend in information systems research simultaneously takes into account the opposite type of factors - ones which generally demotivate use. These factors were proposed due to the necessity to capture user concerns about newer technology that is being perceived by some individuals as being complicated, expensive, or bothersome. Such perceptions are captured by a resistance to adoption factor as developed by Lapointe & Rivard (2005; 2006), by inhibitors to adoption as investigated by Cenfetelli (2004) and Cenfetelli & Schwarz (2011) or, more frequently, by a perceived risk construct adapted from consumer behavior studies (Featherman & Pavlou, 2003; Im, Kim, & Han, 2008; Pavlou, 2003; Wells, Campbell, Valacich, & Featherman, 2010).

As the perceived risk concept appears to be popular in IS literature and focuses on adoption risks, and to clearly distinguish it from the non-adoption risk introduced by this study, negative risk-related perceptions associated with the use of an ICT or ICT application will be labeled from this point onwards as *Perceived Risk of Adopting (PRA) the technology*. This factor expresses perceived (hence subjective and not necessarily real) negative consequences that may undermine the chances of success of an ICT application, if adopted, from its users' viewpoint (Byrne, Dvorak, Peters, Ray, Howe, & Sanchez, 2016; Cheng, Tsai, Cheng, & Chen, 2012; Thakur & Srivastava, 2014). Previous research showed that these perceptions have usually several facets: e.g., doubt about making a right choice, fear about a wrong money investment, discomfort about wasting time, etc. (Lim, 2003). We, therefore too, assume a multifaceted conceptualization of PRA in this study.

In addition to PRA, theoretical reasoning suggests that non-adoption risk (e.g., risk of not buckling up in a car), which in our context is risk of *not using* the technology, is a separate simultaneous

risk perception that motivates action, rather than demotivating it like adoption risk. This reasoning sources from the fear appeals stream of research in IS. That research that relies on the fundament of protection motivation theory (Rogers, 1975) found that fear appeals (that are arguments induced by fear in response to a perceived external threat) positively influence user intentions to follow the recommended procedures to ensure information security (Johnston & Warkentin, 2010). Therefore, non-adoption risk would capture the potentially negative consequences individuals may perceive if they fail to use as expected an ICT application that was designed specifically to help them. For instance, the risk of not using a seat belt or a condom can motivate the use of these artifacts in rational individuals over and above the risks associated with using these products. In our context, the non-adoption risk reflects user fears of seeing their health condition deteriorate if not using the application which is meant to support them in maintaining and improving their health.

This non-adoption risk, labeled as *Perceived Risk of Not Adopting (PRNA) the technology* onwards, is expected to manifest in non-leisure ICT services predominantly where users may see a tangible loss if not using an application offered to help them. It is possible that non-adoption risks exist also in leisure settings. For instance, not using a popular app can have social implications for teenagers. In this study we focus on healthcare ICT given the high stakes of not adopting such tools. Specifically, one example of non-leisure services which merits further research is the mobile applications on cell phones (e.g., text messaging) helping smokers to quit smoking by providing educational advice and reminders. Accordingly, this study proposes to address the following question:

What are the influences of non-adoption perceived risk and of adoption perceived risk on consumer intent to adopt a wireless text messaging application for smoking cessation?

3. Research model and hypotheses

The proposed theoretical model extends the motivational perspective of ICT adoption by including and accounting for adoption and non-adoption risks consumers arguably take into account in the examined context, as shown in Figure 1. This follows Davis et al. (1992) who posited that influences of external factors are exerted in the motivational model through the motivational constructs, rather than have direct effects on intentions. We next explain the logic behind the proposed effects.

*** Insert here “Figure 1. Research Model” ***

Previous studies showed that Perceived Risk (of Adopting) an ICT application could be an antecedent of both types of motivation. Specifically, consumer concerns about the risks associated with e-services reduce the perception of the utilitarian value of these services (Featherman & Pavlou, 2003; Pavlou, 2003; van Der Heijden, Ogertschmig, & van Der Gaast, 2005): if users perceive a risk when using a technology (e.g., it might risk their financial and wellbeing), this would negatively affect the usefulness they see in that technology and have lower extrinsic motivation to use it (note that in a utilitarian context such as smoking cessation, usefulness is a key extrinsic motivator). In addition to that, studies capturing consumer behavior in e-shopping found that perceiving a risk related to a purchase has negative consequences for the attitudinal orientation of consumers toward the seller and purchase (Grazioli & Jarvenpaa, 2000; Jarvenpaa,

Tractinsky, & Vitale, 2000). Due to the positive association between enjoyment, or intrinsic motivation in general, and attitude (Dabholkar & Bagozzi, 2002) it is expected that risk perceptions that influence negatively consumer attitude regarding an ICT mobile service would also diminish the intrinsic motivation associated with using that technology (note: this is true for utilitarian artifacts; it may not be true for artifacts the purpose of which is to produce thrill, such as rollercoasters). For instance, a consumer has always to fear that if his or her credit card or personal information is stolen from a website he or she will likely enjoy the use of the website to a lesser extent; concerns are unpleasant and reduce the enjoyment potential for most users.

Prior research has suggested that a multifaceted conceptualization of adoption risk is worthy because in reality people consider many risk facets before they make decisions (Laroche, McDougall, Bergeron, & Yang, 2004; Lim, 2003). Although some scholars captured its multidimensionality through a first-order construct having as antecedents the individual risk sides (Gewald & Dibbern, 2009; Stone & Mason, 1995; Yang, Pang, Liu, Yen, & Tarn, 2015), a popular approach in IS research operationalizes this risk as a second-order construct having as first-order components the risk facets (Featherman & Pavlou, 2003; Pavlou, 2003). This conceptualization implies that an overall risk assessment which manifests in risk facets influences peoples' decisions.

Previous research also indicated consistently that risk perception borrowed from consumer behavior into the IS literature has *six key facets* (Laroche et al., 2004; Lim, 2003): financial (fear of wasting money), performance (fear of the product/service not working properly), social (fear of social disapproval), physical (fear of bad consequences for health), psychological (fear of making a wrong choice), and time (fear of wasting time). Therefore, virtually any risk perception can be decomposed in terms of these facets. Furthermore, according to consumer behavior theory, risk perception depends on the context of the activity (Conchar et al., 2004), so the individual facets taken into account would differ from one case to another. However, despite possible differences in the relative contributions of the risk components, the combined influence of the most significant facets on the overall perceived risk should be relatively constant (Stone & Grønhaug, 1993). Thus, for instance, a generic computer tablet is cheaper (hence, less risky from a financial point of view) but, very likely, less reliable (hence, riskier from a performance point of view) compared to a leading brand tablet.

In our case, since the focus is on user adoption of wireless text messaging for smoking cessation, and in an attempt to build a parsimonious model, only three key types of risk perceptions of using of the six above are considered highly relevant. These facets are deemed to be significant, based on prior consumer behavior and IS research (Featherman & Pavlou, 2003; Lim, 2003; Stone & Grønhaug, 1993):

- *financial risk* (i.e., fear of uselessly spending too much money to subscribe to the mobile service);
- *psychological risk* (i.e., apprehension about making a bad choice when subscribing to an unknown mobile service), and
- *time risk* (i.e., fear of wasting time with a potentially useless mobile service).

Using wireless text messaging for a health promotion activity was not considered to involve performance, social or physical perceived risks for cell phone users. Thus, individuals already using text messaging on cell phones would not have concerns about handling such a service, about their peers' thoughts on them using text messaging, or about hypothetical health hazards of cell phones in general. However, *privacy risk* (i.e., fear of disclosing private data to a service provider),

also termed as *privacy concern* according to other research (Tan, Qin, Kim, & Hsu, 2012; Zhou, 2017), was added as a fourth meaningful risk facet in the theoretical model here since this type of risk, additional to the generic facets discussed above and specific to IS adoption research, was demonstrated constantly to play a key role in ICT use (Featherman & Pavlou, 2003).

The selected four risk facets above express perceived negative consequences, in different domains, of subscribing to a mobile service offered to help quitting smoking. Since people normally act upon a total risk assessment and based on one risk dimension, and this overall adoption risk is created through mental weighting of risk components, we propose that it is this overall risk that affects extrinsic and intrinsic benefit assessments rather than the risk facets themselves. Integrating the points in the above discussion, we propose the following hypotheses:

H1a: Perceived Psychological Risk is positively associated with Perceived Risk of Adopting wireless text messaging for smoking cessation.

H1b: Perceived Time Risk is positively associated with Perceived Risk of Adopting wireless text messaging for smoking cessation.

H1c: Perceived Privacy Risk is positively associated with Perceived Risk of Adopting wireless text messaging for smoking cessation.

H1d: Perceived Financial Risk is positively associated with Perceived Risk of Adopting wireless text messaging for smoking cessation.

H2: Perceived Risk of Adopting is negatively associated with Extrinsic Motivation of using wireless text messaging for smoking cessation.

H3: Perceived Risk of Adopting is negatively associated with Intrinsic Motivation of using wireless text messaging for smoking cessation.

It appears obvious that Perceived Risk of Not Adopting is context dependent. For instance, in a sensitive field like healthcare, if people do not use an ICT application designed to help them preserve or improve their health, they may perceive a risk of seeing their condition deteriorate. Therefore, such an ICT application can be broadly seen in this context as having a similar scope to medication. The Beliefs about Medicines Questionnaire (BMQ), which is a widely used method for assessing consumer beliefs about specific and general medication, identified three broad categories of relevant perceptions: *General-Harm* (i.e., individuals perceive medication as harmful), *General-Overuse* (i.e., individuals believe that doctors over-prescribe medication), and *General-Benefit* (i.e., individuals perceive potential benefits of medicines) (Horne, Graupner, Frosta, Weinman, Wright, & Hankins, 2004; Horne, Weinman, & Hankins, 1999). Theoretical reasoning indicates that Perceived Risk of Not Adopting an ICT application (e.g., mobile service) for health promotion could be similar to the General-Benefit side of the beliefs about medicines – i.e., consumers would not achieve a potential benefit if not using the technology designed to help them.

We argue that Perceived Risk of Not Adopting a non-leisure mobile service (or non-adoption risk) is a driver of extrinsic motivation to use the ICT because the considerations associated with this risk are primarily utilitarian (e.g., what will it do to my health?). Thus, PRNA captures, through a *double negation*, the perceived benefit of using the ICT as an effect of avoiding possibly negative consequences. At the same time, extrinsic motivation is a broader concept as it also encapsulates aspects such as perceptions of performance improvement, effectiveness, and usefulness (Venkatesh et al., 2003; Venkatesh et al., 2012). Moreover, extrinsic motivation can be viewed as

the avoidance of an unwanted outcome (Bock, Zmud, Kim, & Lee, 2005; Lowry, Gaskin, & Moody, 2015). Therefore, the non-adoption risk, that is exactly addressing an undesired consequence, is expected to have a positive implication and reinforce the perceived benefit component of the extrinsic motivation to use the ICT and, hence, the entire construct. For instance, if a person perceives the risk of not using seat belts as high, they will have stronger than otherwise extrinsic motivation to wear a seatbelt while driving. Accordingly, we hypothesize that:

H4: Perceived Risk of Not Adopting is positively associated with Extrinsic Motivation of using wireless text messaging for smoking cessation.

Risks are normally assessed in a social context; what may be perceived as risky in one social setting (e.g., drinking and driving) may be perceived as less risky in another. In this study we account for the social setting by including social influence as an antecedent of risk assessments. Social influence reflects the influence of family, friends, colleagues or others reinforcing the intent to adopt an ICT application. These aspects are usually captured in IS studies through a Subjective Norm construct (Davis, Bagozzi, & Warshaw, 1989). Subjective Norm captures an individual's perceptions of the opinions of people important to him or her regarding whether he or she should, or should not, use the ICT application in question. This social influence factor was considered as an antecedent of Behavioral Intention to use a technology in common technology adoption models (Venkatesh et al., 2003; Venkatesh et al., 2012) mostly due to a compliance mechanism. That is, the notion that significant other people are seen as able to reward desired behavior or to punish lack of such behavior motivates action (Venkatesh & Davis, 2000; Warshaw, 1980). Moreover, Subjective Norm can be an antecedent of Perceived Usefulness (Venkatesh & Davis, 2000; Shibchurn & Yan, 2015) due to an internalization mechanism – i.e., whenever other peoples' beliefs are assumed into the individual's own belief composition (Venkatesh et al., 2003; Warshaw, 1980).

The present research adopts the latter view as this is suitable for a voluntary setting in contrast to the former approach that is characteristic to mandatory contexts (Venkatesh et al., 2003). Further, looking at an even more granular level, theoretical thinking indicates that significant other peoples' opinions incorporated in the own belief structure are enhancing precisely the perceived benefits component of the perceived usefulness (or extrinsic motivation), hence PRNA (consistent with the discussion preceding hypothesis *H4* above). This refinement is possible in this research only precisely due to the innovative introduction of the PRNA factor. Through the same belief mechanism, favorable opinions on the mobile service should be also alleviating the perceived risks of using an ICT application for health promotion – if users think this is more beneficial for them they are more prone to accept the possible risks. This implies that what other important individuals (family, friends, coworkers, etc.) consider as risky and less desirable may influence users' risk perceptions. For instance, if a user's friends consider a website to be problematic, the person is more likely to perceive the risks of this website to be higher than otherwise. Similarly, when a user's family members consider a website to be important for his or her health, the user will likely perceive the non-adoption risk (i.e., risk of not using the website) as higher than otherwise. Consequently, we hypothesize that:

H5: Subjective Norm is negatively associated with Perceived Risk of Adopting wireless text messaging for smoking cessation.

H6: Subjective Norm is positively associated with Perceived Risk of Not Adopting wireless text messaging for smoking cessation.

As demonstrated by Davis et al. (1992) from the perspective of the motivational model, behavioral intention to use a technology (i.e., adoption intention) has two main antecedents: extrinsic motivation (EM) that can be associated with perceived usefulness and intrinsic motivation (IM) that can be associated with enjoyment. EM and IM are strong determinants of the intention to use an ICT and also channel the effect of all other possible factors of influence. Further, these two main antecedents are also linked. Behavioral studies demonstrated a positive relationship between the utilitarian value (or extrinsic motivation) and hedonic value (or intrinsic motivation) associated with the use of a technology (Chang, Liu, & Chen, 2014; Davis et al., 1992; Deci & Ryan, 1985; van der Heijden et al., 2005; Tang, Zhao, & Liu, 2016). Venkatesh and collaborators made a step further and suggested that there is, in fact, a positive influence of intrinsic motivation over perceived usefulness associated with a technology use (Venkatesh, 1999; Venkatesh et al., 2002) because intrinsic motivation increases enjoyment regarding the fulfillment of a task resulting in a higher quality and productivity in a broader sense. Higher intrinsic motivation levels improve cognitive processing and, subsequently, increase the perception of utility (hence, extrinsic motivation) (Venkatesh et al., 2002). Consequently, we propose the following hypotheses:

H7: Intrinsic Motivation is positively associated with Extrinsic Motivation of using wireless text messaging for smoking cessation.

H8: Extrinsic Motivation is positively associated with Intention of adopting wireless text messaging for smoking cessation.

H9: Intrinsic Motivation is positively associated with Intention of adopting text messaging for smoking cessation.

4. Methodology

The theoretical model was tested through a cross-sectional study in a North American setting that was part of a larger project. A specialized Web-based surveying company was used to recruit participants from their panels of pre-registered respondents in Canada. Inclusion criteria for participants were that they had to be at least 18 years old, smoke at least occasionally, own cell phones, and use wireless text messaging.

Participants meeting these criteria and consenting to participate in the study were presented a Web scenario on how a mobile service on their cell phones may be used to help them quit smoking, if they chose to do so. It was assumed that reducing or quitting smoking is a widely known desired effect from individual and public health points of view due to the abundance of medical reports and media campaigns directed towards this goal. According to the scenario, health providers (physicians and nurses) in a call center supporting people willing to quit smoking would send participants at random times humorous daily text messages with fresh content that remind and encourage users to abstain from or quit smoking. If having questions or needing help, users would be able to send text messages to the call centre and would be answered the same way as early as possible. The service would be offered for 6 months and users would cover their text messaging expenses if they decided to subscribe to the service. For increased authenticity, participants were presented samples of cell phone screen shots with actual messages. These messages were drawn from field studies on health promotion through text messaging, as reported in the literature, specifically for smoking cessation (Naughton, Prevost, Gilbert, & Sutton, 2012; Rodgers, Corbett, Bramley, Riddell, Wills, Lin, & Jones, 2005; Whittaker, Borland, Bullen, Lin, McRobbie, &

Rodgers, 2009) as well as for other interventions targeting behavior change towards a healthier lifestyle (Chow, Redfern, Hillis, Thakkar, Santo, Hackett, Jan, Graves, de Keizer, Barry, & Bompont, 2015; Cole-Lewis & Kershaw, 2010; Fjeldsoe, Marshall, & Miller, 2009; Neville, Greene, McLeod, Tracy, & Surie, 2002; Patrick, Raab, Adams, Dillon, Zabinski, Rock, Griswold, & Norman, 2009).

The Web scenario was followed by an online survey eliciting participant perceptions on the mobile service as described. The survey captured the items corresponding to the constructs in the theoretical model as well as relevant demographic characteristics. All items were captured with 7-point Likert-type scales adapted from previous research in IS (Featherman & Pavlou, 2003; van der Heijden, 2004; Venkatesh & Davis, 2000) and consumer behavior (Laroche et al., 2004; Stone & Grønhaug, 1993; Stone & Mason, 1995).

A measurement scale for Perceived Risk of Not Adopting (PRNA) was not found in the available literature. As the context of this study is health promotion, the mobile support service was considered to look like a health product from the perspective of the users – i.e., its purpose is to improve health by helping users to quit smoking. Therefore, not using the service as expected may involve some risks for health, over time, hence, possibly, trigger perceptions of risk associated with not using the service. Following this rationale, for the context of this research, PRNA was considered as capturing a perceived beneficial effect similar to that of following medical advice and was measured as a four-item construct starting from the BMQ health benefit scale validated in previous health research on medicines (Horne et al., 2004; Horne et al., 1999). Measurement scales for the theoretical model are presented in Appendix A.

In order to not influence respondent perceptions and feelings, neither the Web scenario nor the online survey told participants that smoking would be harmful. Participants were not urged to quit smoking at any point in time. All questions about their acceptance of the mobile service contained a hypothetical condition expressed as “if I decided to quit smoking”.

5. Results

In order to capture a broad segment of potential users, data were collected through a commercial firm using an Internet panel of over 420,000 pre-recruited Canadian consumers. Invitations to participate in the study were sent by the firm to all panelists meeting the including conditions (i.e., being at least 18 years old, owning a cell phone, using text messaging, and smoking at least occasionally) across Canada. The experiment stopped when 300 responses were recorded. This quota was met in about one week. All 300 respondents were offered a small financial compensation by the surveying firm. After eliminating the incomplete and invalid answers (e.g., with more than 5% data missing or with the same rating for all statements), a total of 252 valid responses were recorded. The average age of the participants was 41.2 years and 55.1% of them were female. Participants reported an average of 23.6 years of smoking and an average of 99.8 cigarettes smoked per week. Average experience with cell phone use was 8.8 years and with text messaging use 4.0 years. In terms of text messaging activity, participants reported an average of 47.2 messages received per week and of 57.7 messages sent per week.

Preliminary data analyses commenced with the assessment of non-response bias. This was done by comparing the respondent demographics with relevant statistics of the target population (Dimoka et al., 2012). The analysis revealed that the smoking numbers roughly match those

reported by Health Canada (Health Canada, 2015). The text messaging usage averages seemed to be slightly below those reported by the Canadian Wireless Telecommunications Association in the latest available study (Canadian Wireless Telecommunications Association, 2015) – however, usage figures are rapidly changing in wireless communications.

A second test for non-response bias was to compare the key demographics of early and late responders (Dimoka et al., 2012; Sun, Bhattacharjee, & Ma, 2009). Comparison of means for the age, gender, smoking figures and text messaging usage figures indicated no significant differences between the two respondent groups. Therefore, it was concluded that it was likely that non-response bias was not an issue for the study sample.

The next step in the preliminary assessment of the data collected was to test the potential influence of common method variance (CMV). This risk may appear since all variables (both independent and dependent) are collected from self-reported data in the same survey (Sharma, Yetton, & Crawford, 2009). First, a Harman's one-factor test was conducted according to guidelines from Podsakoff, MacKenzie, Lee, & Podsakoff (2003). The test method consisted of entering all items of the theoretical model into an exploratory factor analysis. The unrotated solution produced by SPSS 24.0 resulted in seven factors with eigenvalues greater than one, the smallest of these being 1.045. The first factor isolated through this method accounted for only 31.2% of the variance while all seven factors explained 76.1% of the variance. This indicates that the variables unlikely stem from a single factor. Second, the test indicated by Pavlou et al. (2007) to detect possible CMV was applied. A visual inspection of the factor correlation matrix (Table 3) showed low-medium values. Since all correlations were below the threshold of 0.90, it can be concluded there is no evidence of CMV. Third, we ran a modified Lindell & Whitney (2001) test by including in the analysis a theoretically unrelated (called 'marker') variable. This variable was a four-item construct measuring attitude toward smoking cessation we captured in the same survey but was not used in the present study's model. All the correlations of this construct with the model factors were small (absolute values below 0.08) and none of them were significant at the 0.05 level or better. This is another indication that there is no systematic bias in the data and, overall, that CMV should not be a major concern for this study (Pavlou et al., 2007; Turel & Serenko, 2012).

Partial Least Squares (PLS) modeling technique was used to analyze the theoretical model due to its suitability for complex models having exploratory purposes (Bontis, Crossan, & Hulland, 2002; Chin, 1998). Perceived overall risk of using was evaluated as a second-order construct through a repeated indicators approach (i.e., based on the four primary perceived risk constructs) following examples in literature (Lohmoller, 1989; Turel, Serenko, & Bontis, 2010). PLS is suitable for this approach as it can handle well formative indicators, besides the reflective ones (Thomas, Lu, & Cedzynski, 2005).

5.1. Measurement model evaluation

The first step in the PLS analysis was the evaluation of the measurement model (Gefen & Straub, 2005; Hair, Ringle, & Sarstedt, 2011). After running SmartPLS (Ringle, Wende, & Will, 2005), preliminary loadings and cross-loadings tests indicated that the second item of Extrinsic Motivation had poor performance. Consequently, this item was dropped from the model and SmartPLS was re-run.

For the new results a first assessment of Cronbach's alpha for all first-order constructs of the model was performed (Bontis, 1998; Jarvenpaa, Shaw, & Staples, 2004). All items displayed alpha values

greater than 0.7. Next, Average Variance Extracted (AVE) values were assessed for all first-order constructs and appropriate values, greater than 0.5, as recommended (Bontis, 2004), were recorded. Furthermore, high factor loadings and composite reliability values (above 0.7) and low errors were noticed for all constructs. These results (see Table 1) indicated appropriate reliability and convergent validity levels.

***** Insert here “Table 1. Test Statistics of the Measurement Model” *****

The next analysis was an evaluation of the table of loadings and cross-loadings for first-order constructs produced by SmartPLS. Visual inspection of this table showed that all item loadings were larger on the constructs they were supposed to load on than on other constructs, as indicated by Table 2. Further, a matrix of correlations between first order constructs and having on the diagonal the square root of the AVE measure for each construct showed the diagonal elements were larger than all corresponding off-diagonal elements (Table 3). Both these test results prove an appropriate discriminant validity of the model (Bontis, 2004; Gefen & Straub, 2005). Overall, the measurement model was considered suitable thus allowing the execution of the next step, the structural analysis.

***** Insert here “Table 2. Loadings and Cross-Loadings of First Order Constructs” *****

***** Insert here “Table 3. First-Order Construct Correlations and Square Root of Average Variance Extracted” *****

A first check for possible multicollinearity was conducted as a test of validity of the formative second-order Perceived Risk of Adopting. As Table 2 shows, indicators of the first-level risk constructs that form the second-order risk factor have relatively low correlation coefficients, well below the threshold of 0.90 considered as dangerous by literature (Cenfetelli & Bassellier, 2009; Ou, Pavlou, & Davison, 2014). Further, a Variance Inflation Factor (VIF) was calculated for every first-order risk construct with respect to the other risk constructs in the second-order Perceived Risk of Adopting. As VIF values for all risk facets resulted between 1.88 and 2.94, hence below the recommended threshold of 5 (Hair, Black, Babin, & Anderson, 2009), multicollinearity was not considered an issue. Accordingly, following the two tests, we could conclude that the formative second-order Perceived Risk of Adopting did not show multicollinearity and, hence, could be considered valid.

5.2. Structural model evaluation

The second step in the PLS analysis was the evaluation of the structural model (Gefen, Rigdon, & Straub, 2011). Figure 2 captures path coefficients, their significance levels and the coefficients of determination (R^2) obtained by running SmartPLS. Table 4 summarizes the results of hypotheses testing for the research model.

***** Insert here “Figure 2: Results of Structural Evaluation. Significance levels: * = 0.05; ** = 0.01; *** = 0.001” *****

***** Insert here “Table 4. Results of Hypotheses Testing” *****

Figure 2 and Table 4 show that of the 12 hypotheses proposed, 10 were supported. As hypothesized, behavioral Intention to adopt text messaging for smoking cessation was driven by Extrinsic Motivation (EM) and Intrinsic Motivation (IM). These two constructs have as antecedents the two opposite types of perceived risk but in a different manner: while Perceived Risk of Not Adopting (PRNA) is a driver of EM, Perceived Risk of Adopting is a driver of IM only. Subjective Norm was found to be a significant antecedent of Perceived Risk of Not Adopting only. As hypothesized, all first-order adoption risk constructs had a strong and significant influence on the second-order Perceived Risk of Adopting construct.

Total effects on the Adoption Intention of the ICT service were also extracted from SmartPLS output. As Table 5 shows, and as expected, EM and IM had the strongest total effect (larger for the latter construct due to both its direct effect and the indirect effect through EM). While Perceived Risk of Adopting had a negative but slightly not significant effect, Perceived Risk of Not Adopting and Subjective Norm had a positive effect, significant at the 0.05 statistical level.

***** Insert here “Table 5. Total Effects on Behavioral Intention to Adopt the Mobile Service” *****

The theoretical model demonstrated relatively high explanatory power. The variance explained for Adoption Intention was 62.9% and that for Extrinsic Motivation 62%. Values for IM and PRNA explained variances were comparatively smaller ($R^2=18.4\%$ and $R^2=18.5\%$, respectively) but acceptable (Moon & Kim, 2001). The value for the risk of adopting was very small but this is understandable as its only antecedent hypothesized in the research model did not have a significant influence on it.

Path coefficient values in Figure 2 and Table 4 suggest a possible mediation of PRNA between Subjective Norm and Extrinsic Motivation. To investigate this, we conducted a mediation test by applying the Baron and Kenny procedure (Baron & Kenny, 1986) together with the Sobel test (Sobel, 1982). We obtained a test statistic of 1.772 and a p -Value of 0.076 that indicates that the mediation effect was approaching significance.

Demographic and descriptive measures, including age, gender, years of smoking and number of cigarettes smoked as well as all data on cell phone and text messaging experience and use were tested as possible control variables. No changes in the measurement model were detected and only small increases in R^2 values for the endogenous constructs were recorded with these controls. None of the control variables tested had a significant influence on the model as none of their paths to the endogenous constructs were statistically significant.

6. Discussion and conclusions

This study sought to integrate an original non-adoption risk construct expressing Perceived Risk of Not Adopting an ICT (non-leisure in our case) mobile application into a motivational theory of ICT use which also accounts for adoption risks. For that, a theoretical model combining factors favorable to adoption with factors against adoption and contrasting Perceived Risk of Adopting an ICT application to Perceived Risk of Not Adopting it was developed and tested empirically in the context of using a mobile service on cell phones as a support tool in smoking cessation programs.

The research question of this study was: *What are the influences of non-adoption perceived risk and of adoption perceived risk on consumer intent to adopt a wireless text messaging application for smoking cessation?* As shown in Figure 2 and Table 4, Perceived Risk of Adopting was found to be a significant obstacle to adoption by exerting its negative influence through Intrinsic Motivation, similar to findings in other IS studies (Cocosila, Archer, & Yuan, 2009). This is consistent with consumer behavior research where risk perception is an obstacle to completing a purchase (Laroche et al., 2004). We also found that all four risk facets taken into account in this research had a strong and significant influence on the overall risk perception of using the technology. Therefore, to mitigate risk, developers of a text messaging-based mobile service for smoking cessation should take into account user concerns about possibly wasting time and money, losing control over private data, and, generally, about making the right decision if subscribing for such a service.

The negative influence of Perceived Risk of Adopting on Extrinsic Motivation (i.e., perceived usefulness) found by previous studies (Featherman & Pavlou, 2003) could not be supported here since the path between these constructs was not significant, as shown in Figure 2 and Table 4. This may have led to the negative but slightly not significant total effect of PRA on the Adoption Intention. A possible explanation is that smoking cessation is by its very nature a health promotion intervention, hence without immediate and apparent usefulness, and previous research in healthcare showed that it may be difficult to ensure people compliance in such cases (Anna, Jose-Maria, Maria-Teresa, Caterina, Consolacion, Dulcis, Amparo, & Javier, 2004). This is similar to preventive flu vaccination, for instance, that may have a positive effect but this does not manifest immediately like when taking a prescribed medicine to lower flu fever.

As hypothesized, Perceived Risk of Not Adopting had a moderately strong positive influence on Extrinsic Motivation (path coefficient of 0.211, significant at $p < 0.01$). Thus, if people perceive their health state as likely to deteriorate if not using the ICT application designed to help them, they tend to see the utilitarian value of that application as higher. This is consistent with previous research showing that system self-preservation (e.g., by avoiding threat or injury) is an aspect of negative extrinsic motivation (Lowry, Gaskin, & Mood, 2015). Social influence exerted by other individuals (e.g., family and friends) proved to have a major impact on Perceived Risk of Not Adopting, as Subjective Norm was a strong significant antecedent of this non-adoption risk (Figure 2 and Table 4). Hence, people tend to perceive the negative consequences of not using the application if the opinions of significant others, assumed into the own belief structure (Venkatesh et al., 2003; Warshaw, 1980), are favorable to the use. In contrast, Subjective Norm did not have a significant influence on the Perceived Risk of Adopting. This means that social influence exerted by other individuals is not strong enough to either mitigate or reinforce the concerns on using this technology for smoking cessation.

As expected, Intrinsic Motivation and, especially, Extrinsic Motivation are significant and strong antecedents of the Intention to adopt text messaging for smoking cessation. This confirms previous findings of IS studies showing the key role of extrinsic motivators (Davis et al., 1992; Venkatesh

et al., 2003) but, also, the important role of intrinsic ones, such as enjoyment with using the ICT (Childers, Carr, Peck, & Carson, 2001; Igarria, Iivari, & Maragahh, 1995; Lee, Lee, & Hwang, 2015) in ICT use decisions. Therefore, to be successful, such an ICT application must be seen by users as being both useful and enjoyable and provide them with both utilitarian and hedonic gains. Results also show that Perceived Risk of Not Adopting is a motivator, unlike other risk perceptions, which are de-motivators. The total effect of the Perceived Risk of Not Adopting on the intention to adopt the ICT appears to be larger than that of the Perceived Risk of Adopting (Table 5). Therefore, in the use of a mobile service for non-leisure purposes, even if the targeted activity has no immediate outcome, the perceived risk of suffering negative consequences if not using the service designed to help that specific activity is an important factor that is reinforcing the motivation to use the ICT.

A derived question would regard the appropriateness of the proposed theoretical model to explaining consumer intent to adopt a wireless text messaging application for smoking cessation. This question is justified by the newness of the model built here that includes an innovative Perceived Risk of Not Adopting factor. All four items of the PRNA construct proposed here were significant and with high effects (between 0.76 and 0.91) on the latent variable. This construct manifested appropriate reliability values in terms of composite reliability, Cronbach's alpha and AVE. All these lead to the conclusion that, in the context of this research, PRNA is a valid extension of the health-related construct it builds on. Furthermore, all facets of the Perceived Risk of Adopting considered relevant in this research had a strong and significant influence (at least at $p < 0.001$) on the overall risk perception. In addition, no signs of multicollinearity were detected for this factor, hence PRA was not unstable from this point of view (Hair, Sarstedt, Ringle, & Mena, 2012). This means the second-order perceived risk construct is capturing appropriately the effects of the first-order risk facets (Turel, Serenko, & Bontis, 2007). Lastly, results in Figure 2 and Table 4 show that the majority of the hypotheses proposed were supported (i.e., 10 out of 12). Values of the path coefficients and of the variance explained (R^2) in the theoretical model were moderately high. A large proportion of significant paths between constructs and high R^2 values for the majority of the endogenous constructs are indicators of a good theoretical model (Bontis, Keow, & Richardson, 2000; Hair Jr, Hult, Ringle, & Sarstedt, 2017). All of the above lead to the conclusion that the theoretical model was reasonably appropriate to explain consumer intent to adopt the wireless text messaging application under scrutiny.

This study had some *limitations* that should be acknowledged and may point to future research directions. First, from a theoretical perspective, this research has focused on investigating the influence of risk perceptions of using or not using a health promotion mobile service application on its adoption without assessing the actual effects of this intervention on changing health behavior. Future broader research may also look at such effects by integrating an ICT adoption model with a health promotion theory or model such as Health Promotion Model (Pender, Walker, Sechrist, & Stromborg, 1988), Health Belief Model (Janz & Becker, 1984), or Protection Motivation Theory (Rogers, 1975). Second, from a methodological point of view, the study recruited a sample through a specialized Web-based surveying company from its already pre-registered panelists in Canada, reported on cross-sectional perceptions, and used system descriptions rather than an actual system. This process had the advantage of dealing with a realistic sample of users of various demographics all across an entire country but the disadvantage of using a convenience self-selected sample. The use of a scenario was also deemed appropriate; such approaches are well-established in IS and behavioral research (Hertzum, 2003; Jarke, 1999) due to the advantages of higher cost effectiveness and lower risk. Therefore, future research may use

a longitudinal design with a broader representation of other countries and populations, as well as consider using an actual ICT service after its implementation. Further, according to the scenario, users were supposed to cover their text messaging expenses involved by using the health promotion service. This was considered to be more realistic for the everyday use of mobile services but may have influenced a number of study respondents as, according to some opinions, public health interventions should be offered at no cost. Third, another potential extension is considering whether the ‘intensity’ of the activity targeted by the ICT (e.g., smoking habits and experience of the respondents in this case) is affecting the influence of PRNA in the adoption model. This can be addressed in future research by accounting for smoking pattern and health status effects on the ICT use decision and its antecedents. Lastly, it must be stressed here that PRNA proved to have a significant role for the case of an ICT used in health promotion. Healthcare is, very likely, the most sensitive social sector, so negative consequences of not using a support mobile service are, understandably, an additional motivation for adopting it. Future research should attempt to test this new concept in other, less socially sensitive, contexts of technology use for non-leisure purposes (e.g., mobile banking or mobile learning) to extend our understanding of its role in the information and communication technology use decisions.

Overall, this study presents first strides toward understanding the roles of complex adoption and non-adoption risk considerations in driving the adoption of health promoting ICTs. The main *theoretical contributions* of this research were (1) the inclusion of a new construct of risk of non-adoption (i.e., Perceived Risk of Not Adopting) in a framework explaining ICT adoption and use, and (2) showing that risk is a socially-situated construct that can be manipulated through social influences. These extensions are important as they not only extend our understanding of consumer decision processes in the health promoting ICT context, but also because they point to potential interventions which we discuss below. The new construct was tested in the context of using a mobile service application for health promotion. Previous studies showed that health promotion could use the support of several wired or wireless ICTs such as telephone, e-mail, Web portals, or social media (Chou, Hunt, Beckjord, Moser, & Hesse, 2009; Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009; Stephens & Allen, 2013; While & Dewsbury, 2011). We expect, nonetheless, PRNA to be relevant in virtually all of these various types of ICT-supported interventions since the construct captures the risk perception sourcing from not using the health promotion intervention itself and is technology-independent.

This study also shows that in contrast to perceived risk of adoption that expresses de-motivating views on the use of a new technology (Featherman & Pavlou, 2003; Lim, 2003; Pavlou, 2003), PRNA captures, through a double negation perception, consumer additional reasons for use which are motivated by the avoidance of possibly negative consequences of not utilizing an ICT designed to support them in a healthy activity. PRNA was integrated in a theoretical model investigating the adoption of wireless text messaging on cell phones as a support tool in smoking cessation and its influence was contrasted to that of the Perceived Risk of Adopting. Results demonstrate that Perceived Risk of Not Adopting reinforces the motivation of using an ICT mobile service for health promotion and could be, thus, termed as a *motivational risk belief*.

This study has also *managerial implications* related to risk perceptions and subjective norms. Making potential users clearly see the possible negative consequences of not using an ICT designed to support them, at least in a non-leisure activity, increases their motivation and, subsequently, intention to use the service. Therefore, educational efforts directed toward making consumers see the risks of not using that technology application appear as justified. Similarly, risk

perceptions regarding the use of such technologies should be reduced. In contrast to a number of technology adoption studies that demonstrated a significant impact of some demographic factors such as age, gender or technology related experience and use, this investigation did not detect such influences. This means that efforts to increasing adoption should focus on motivational and risk factors mainly without differentiating between consumers according to their demographics. Even though we did not test the technical features that contribute to these risk perceptions, it is reasonable to assume that higher security, quality assurance seals, transparent pricing schemas and quality delivery of the promised services should help service providers with minimizing the risk views of users. Even simple services such as qualified and efficient customer support may help in this regard. Similarly, our findings show that risk perceptions are influenced by subjective norms. Hence, interpersonal influence factors can prove to be efficacious means for increasing non-adoption risk perceptions. The capacity of such proposed mechanisms to promote the use of smoking cessation related mobile services, and perhaps other ICTs, should be examined in future research.

Acknowledgment

We would like to thank the Associate Editor and the two anonymous Reviewers of *Internet Research* whose valuable feedback and recommendations helped us improve this article before publication.

References

- Anna, V., Jose-Maria, B., Maria-Teresa, D., Caterina, G., Consolacion, D., Dulcis, S., Amparo, M. & Javier, C. (2004). The role of mobile phones in improving vaccination rates in travelers, *Preventive Medicine*, 38, 503-509.
- Baron, R. M. & Kenny, D. A. (1986). The moderator mediator variable distinction in social psychological-research - Conceptual, strategic, and statistical considerations, *Journal of Personality and Social Psychology*, 51(6), 1173-1182.
- Bock, G. W., Zmud, R. W., Kim, Y. G. & Lee, J. N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate, *MIS Quarterly*, 29(1), 87-111.
- Bontis, N. (1998). Intellectual capital: an exploratory study that develops measures and models, *Management Decision*, 36(2), 63-76.
- Bontis, N. (2004). National intellectual capital index: a United Nations initiative for the Arab region, *Journal of Intellectual Capital*, 5(1), 13-39.
- Bontis, N., Crossan, M. M. & Hulland, J. (2002). Managing an organizational learning system by aligning stocks and flows, *Journal of Management Studies*, 39(4), 437-469.
- Bontis, N., Keow, W. C. C. & Richardson, S. (2000). Intellectual capital and business performance in Malaysian industries, *Journal of Intellectual Capital*, 1(1), 85-100.
- Byrne, Z. S., Dvorak, K. J., Peters, J. M., Ray, I., Howe, A. & Sanchez, D. (2016). From the user's perspective: Perceptions of risk relative to benefit associated with using the Internet, *Computers in Human Behavior*, 59, 456-468.

- Canadian Wireless Telecommunications Association (2015). Facts & Figures, Available at: <http://cwta.ca/facts-figures>, Accessed June 22, 2015.
- Cenfetelli, R. T. (2004). Inhibitors and enablers as dual factor concepts in technology usage, *Journal of the Association for Information Systems*, 5(11-12), 472-492.
- Cenfetelli, R. T., & Bassellier, G. (2009). Interpretation of formative measurement in information systems research, *MIS Quarterly*, 33(4), 689-708.
- Cenfetelli, R. T. & Schwarz, A. (2011). Identifying and testing the inhibitors of technology usage intentions, *Information Systems Research*, 22(4), 808-823.
- Chang, I. C., Liu, C. C., & Chen, K. (2014). The effects of hedonic/utilitarian expectations and social influence on continuance intention to play online games. *Internet Research*, 24(1), 21-45.
- Chen, M. F., & Lin, N. P. (2018). Incorporation of health consciousness into the technology readiness and acceptance model to predict app download and usage intentions. *Internet Research*, 28(2), 351-373.
- Cheng, S. Y., Tsai, M. T., Cheng, N. C., & Chen, K. S. (2012). Predicting intention to purchase on group buying website in Taiwan: Virtual community, critical mass and risk. *Online Information Review*, 36(5), 698-712.
- Childers, T. L., Carr, C. L., Peck, J. & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior, *Journal of Retailing*, 77, 511-535.
- Chin, W. W. (1998). The Partial Least Squares approach for structural equation modeling, In *Modern Methods for Business Research* (Marcoulides A., Ed), pp. 295-336, Lawrence Erlbaum Associates, Mahwa, New Jersey.
- Chou, W. Y. S., Hunt, Y. M., Beckjord, E. B., Moser, R. P. & Hesse, B. W. (2009). Social media use in the United States: Implications for health communication, *Journal of Medical Internet Research*, 11(4), E48.
- Chow, C. K., Redfern, J., Hillis, G. S., Thakkar, J., Santo, K., Hackett, M. L., Jan, S., Graves, N., de Keizer, L., Barry, T. & Bompont, S. (2015). Effect of lifestyle-focused text messaging on risk factor modification in patients with coronary heart disease: A randomized clinical trial, *JAMA*, 314(12), 1255-1263.
- Chung, J. E. (2015). Antismoking campaign videos on YouTube and audience response: Application of social media assessment metrics, *Computers in Human Behavior*, 51, 114-121.
- Cocosila, M., Archer, N. & Yuan, Y. (2009). Early investigation of new information technology acceptance: A perceived risk - motivation model, *Communications of the Association for Information Systems*, 25(30), Available at: <http://aisel.aisnet.org/cais/vol25/iss1/30>.
- Cole-Lewis, H. & Kershaw, T. (2010). Text messaging as a tool for behavior change in disease prevention and management, *Epidemiologic Reviews*, 32(1), 56-69.
- Conchar, M. P., Zinkhan, G. M., Peters, C. & Olavarrieta, S. (2004). An integrated framework for the conceptualization of consumers' perceived-risk processing, *Journal of the Academy of Marketing Science*, 32(4), 418-436.

- Dabholkar, P. A. & Bagozzi, R. P. (2002). An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors, *Journal of the Academy of Marketing Science*, 30(3), 184-201.
- Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace, *Journal of Applied Social Psychology*, 22(14), 1111-1132.
- Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models, *Management Science*, 35(8), 982-1002.
- Deci, E. L. & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*, New York, NY, USA: Plenum Press.
- Dimoka, A., Hong, Y. & Pavlou, P. A. (2012). On product uncertainty in online markets: Theory and evidence, *MIS Quarterly*, 36(2), 395-A15.
- Downer, S. R., Meara, J. G. & Da Costa, A. C. (2005). Use of SMS text messaging to improve outpatient attendance. *Medical Journal of Australia*, 183(7), 366-368.
- Featherman, M. S. & Pavlou, P. A. (2003). Predicting e-services adoption: A perceived risk facets perspective, *International Journal of Human-Computer Studies*, 59, 451-474.
- Fjeldsoe, B. S., Marshall, A. L. & Miller, Y. D. (2009). Behavior change interventions delivered by mobile telephone short-message service, *American Journal of Preventive Medicine*, 36(2), 165-173.
- Free, C., Knight, R., Robertson, S., Whittaker, R., Edwards, P., Zhou, W. & Roberts, I. (2011). Smoking cessation support delivered via mobile phone text messaging (txt2stop): A single-blind, randomised trial, *The Lancet*, 378(9785), 49-55.
- Gefen, D., Rigdon, E. R., & Straub, D. (2011). Editorial comment: An update and extension to SEM guidelines for administrative and social science research, *MIS Quarterly*, 35(2), iii-xiv.
- Gefen, D. & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example, *Communications of the Association for Information Systems*, 16, 91-109.
- Gerber, B. S., Stolley, M. R., Thompson, A. L., Sharp, L. K. & Fitzgibbon, M. L. (2009). Mobile phone text messaging to promote healthy behaviors and weight loss maintenance: A feasibility study, *Health Informatics Journal*, 15(1), 17-25.
- Gewald, H. & Dibbern, J. (2009). Risks and benefits of business process outsourcing: A study of transaction services in the German banking industry, *Information & Management*, 46, 249-257.
- Glover, S. & Benbasat, I. (2010). A comprehensive model of perceived risk of e-commerce transactions, *International Journal of Electronic Commerce*, 15(2), 47-78.
- Grazioli, S. & Jarvenpaa, S. L. (2000). Perils of Internet fraud: An empirical investigation of deception and trust with experienced Internet consumers, *IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans*, 30(4), 395-410.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R.E. (2009). *Multivariate data analysis*. Prentice Hall, Upper Saddle River, NJ.
- Hair, J. F., Ringle, C. M. & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet, *Journal of Marketing theory and Practice*, 19(2), 139-152.

- Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, 40(3), 414-433.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C. & Sarstedt, M. (2017). A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), Thousand Oaks, CA: SAGE Publications.
- Health Canada (2015). Smoking in Canada: An overview, Available at: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutc_fs-if/2003-smok-fum-eng.php, Accessed: June 22, 2015.
- Hertzum, M. (2003). Making use of scenarios: A field study of conceptual design, *International Journal of Human-Computer Studies*, 58, 215-239.
- Horne, R., Graupnera, L., Frosta, S., Weinmanb, J., Wright S. M. & Hankins, M. (2004). Medicine in a multi cultural society: The effect of cultural background on beliefs about medications, *Social Science & Medicine*, 59(6), 1307-1313.
- Horne, R., Weinman, J. & Hankins, M. (1999). The Beliefs about Medicines Questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication, *Psychology & Health*, 14(1), 1-24.
- Igarria, M., Iivari, J. & Maragahh, H. (1995). Why do individuals use computer technology? A Finnish case study, *Information & Management*, 29(5), 227-238.
- Igarria, M., Parasuraman, S. & Baroudi J. J. (1996). A motivational model of microcomputer usage, *Journal of Management Information Systems*, 13(1), 127-143.
- Im, I., Kim, Y. & Han, H.-J. (2008). The effects of perceived risk and technology type on users' acceptance of technologies, *Information & Management*, 45, 1-9.
- Janz, N. K. & Becker, M. H. (1984). The health belief model: A decade later, *Health Education Quarterly*, 11(1), 1-47.
- Jarke, M. (1999). Scenarios for modeling, *Communications of the ACM*, 42(1), 47-48.
- Jarvenpaa, S. L., Shaw, T. R. & Staples, D. S. (2004). Toward contextualized theories of trust: The role of trust in global virtual teams, *Information Systems Research*, 15(3), 250-267.
- Jarvenpaa, S. L., Tractinsky, N. & Vitale, M. (2000). Consumer trust in an Internet store, *Information Technology and Management*, 1, 45-71.
- Johnston, A. C., & Warkentin, M. (2010). Fear appeals and information security behaviors: An empirical study. *MIS Quarterly*, 34(3), 549-566.
- Lapointe, L. & Rivard, S., (2005). A multilevel model of resistance to information technology implementation, *MIS Quarterly*, 29(3), 461-491.
- Lapointe, L. & Rivard, S. (2006). Learning from physicians' resistance to CIS implementation, *Canadian Medical Association Journal*, 174(11), 1573-1584.
- Laroche, M., McDougall, G. H. G., Bergeron, J. & Yang, Z. (2004). Exploring how intangibility affects perceived risk, *Journal of Service Research*, 6(4), 373-389.

- Lee, Y., Lee, J. & Hwang, Y. (2015). Relating motivation to information and communication technology acceptance: Self-determination theory perspective, *Computers in Human Behavior*, 51, 418-428.
- Lindell, M. K. & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs, *Journal of Applied Psychology*, 86(1), 114-121.
- Lim, N. (2003). Consumers' perceived risk: Sources versus consequences, *Electronic Commerce Research and Applications*, 2, 216-228.
- Lohmoller, J.-B. (1989). Latent Variable Path Modeling with Partial Least Squares, Physica-Verlag, Heidelberg, Germany.
- Lowry, P. B., Gaskin, J. & Moody, G. (2015). Proposing the Multi-Motive Information Systems Continuance Model (MISC) to better explain end-user system evaluations and continuance intentions, *Journal of the Association for Information System*, 16(7), 515-579.
- Møldrup, C. (2007). Individualised health marketing using SMS - A smoking cessation case, *Journal of Medical Marketing*, 7(3) 255-259.
- Moon, J.-W. & Kim, Y.-G. (2001). Extending the TAM for a World-Wide-Web context, *Information & Management*, 38(4), 217-230.
- Muthithcharoen, A. M., Palvia, P. C. & Grover, V. (2011). Building a model of technology preference: The case of channel choices, *Decision Sciences*, 42(1), 205-237.
- Naughton, F., Prevost, A. T., Gilbert, H. & Sutton, S. (2012). Randomized controlled trial evaluation of a tailored leaflet and SMS text message self-help intervention for pregnant smokers (MiQuit), *Nicotine & Tobacco Research*, 14(5), 569-577, DOI: 10.1093/ntr/ntr254.
- Neville, R., Greene, A., McLeod, J., Tracy, A. & Surie, J. (2002). Mobile phone text messaging can help young people manage asthma, *British Medical Journal*, 325(7364), 600-600.
- Obermayer, J. L., Riley, W. T., Asif, O. & Jean-Mary, J. (2004). College smoking-cessation using cell phone text messaging, *Journal of American College Health*, 53(2), 71-78.
- Ou, C. X., Pavlou, P., & Davison, R. (2014). Swift guanxi in online marketplaces: The role of computer-mediated communication technologies. *MIS Quarterly*, 38(1), 209-230.
- Patrick, K., Raab, F., Adams, M., Dillon, L., Zabinski, M., Rock, C., Griswold, W. & Norman, G. (2009). A text message-based intervention for weight loss: Randomized controlled trial, *Journal of Medical Internet Research*, 11(1), e1.
- Pavlou, P. A. (2003). Consumer acceptance of electronic commerce - Integrating trust and risk with the Technology Acceptance Model, *International Journal of Electronic Commerce*, 7(2), 101-134.
- Pavlou, P. A., Liang, H. G. & Xue, Y. J. (2007). Understanding and mitigating uncertainty in online exchange relationships: a principal-agent perspective, *MIS Quarterly*, 31(1), 105-136.
- Pender, N. J., Walker, S. N., Sechrist, K. R. & Stromborg, M. F. (1988). Development and testing of the Health Promotion Model, *Cardio-Vascular Nursing*, 24(6), 41-43.
- Podsakoff, P. M., Mackenzie, S. B., Lee, J. Y. & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies, *Journal of Applied Psychology*, 88(5), 879-903.

- Ringle, C., Wende, M. S. & Will, S. (2005). SmartPLS 2.0 (M3) Beta, Available at: <http://www.smartpls.de>.
- Rodgers, A., Corbett, T., Bramley, D., Riddell, T., Wills, M., Lin, R.-B. & Jones, M. (2005). Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging, *Tobacco Control*, 14, 255-261.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change, *The Journal of Psychology*, 91(1), 93-114.
- Ryan, R. M. & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions, *Contemporary Educational Psychology*, 25(1), 54-67.
- Sharma, R., Yetton, P. & Crawford, J. (2009). Estimating the effect of common method variance: the method-method pair technique with an illustration from TAM research, *MIS Quarterly*, 33(3), 473-490.
- Shearer, J. & Shanahan, M. (2006). Cost effectiveness analysis of smoking cessation interventions, *Australian and New Zealand Journal of Public Health*, 30(5), 428-434.
- Shibchurn, J. & Yan, X. (2015). Information disclosure on social networking sites: An intrinsic–extrinsic motivation perspective, *Computers in Human Behavior*, 44, 103-117.
- Sobel, M. E. (1982.) Asymptotic intervals for indirect effects in structural equations models, In Leinhardt, S. (Ed.), *Sociological methodology* (pp. 290-312), San Francisco: Jossey-Bass.
- Song, H., Kim, J., Kwon, R. J. & Jung, Y. (2013). Anti-smoking educational game using avatars as visualized possible selves, *Computers in Human Behavior*, 29(5), 2029-2036.
- Stephens, J. & Allen, J. (2013). Mobile phone interventions to increase physical activity and reduce weight: A systematic review, *The Journal of Cardiovascular Nursing*, 28(4), 320-329.
- Stone, R. N. & Grønhaug, K. (1993). Perceived risk: Further considerations for the marketing discipline, *European Journal of Marketing*, 27(3), 39-50.
- Stone, R. N. & Mason, B. J. (1995). Attitude and risk: Exploring the relationship, *Psychology and Marketing*, 12(2), 135-153.
- Sun, Y., Bhattacharjee, A. & Ma, Q. (2009). Extending technology usage to work settings: the role of perceived work compatibility in ERP implementation, *Information and Management*, 46(6), 351-356.
- Tan, X., Qin, L., Kim, Y., & Hsu, J. (2012). Impact of privacy concern in social networking web sites. *Internet Research*, 22(2), 211-233.
- Tang, Q., Zhao, X., & Liu, S. (2016). The effect of intrinsic and extrinsic motivations on mobile coupon sharing in social network sites: The role of coupon proneness. *Internet Research*, 26(1), 101-119.
- Thakur, R., & Srivastava, M. (2014). Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India. *Internet Research*, 24(3), 369-392.

- Thomas, R. D., Lu, I. R. R. & Cedzynski, M. (2005). Partial Least Squares: A Critical Review and a Potential Alternative, In Proceedings of Administrative Sciences Association of Canada (ASAC) Toronto, Ontario, Canada.
- Turel, O. & Serenko, A. (2012). The benefits and dangers of enjoyment with social networking websites, *European Journal of Information Systems*, 21(5), 512-528.
- Turel, O., Serenko, A. & Bontis, N. (2007). User acceptance of wireless short messaging services: deconstructing perceived value, *Information & Management*, 44, 63-73.
- Turel, O., Serenko, A. & Bontis, N. (2010). User acceptance of hedonic digital artifacts: a theory of consumption values perspective, *Information & Management*, 47, 53-59.
- van Der Heijden, H. (2004). User acceptance of hedonic information systems, *MIS Quarterly*, 28(4), 695-704.
- van Der Heijden, H., Ogertschig, M. & van Der Gaast, L. (2005). Effects of context relevance and perceived risk on user acceptance of mobile information services, Thirteenth European Conference on Information Systems, Regensburg, Germany.
- Venkatesh, V. (1999). Creation of favorable user perceptions: Exploring the role of intrinsic motivation, *MIS Quarterly*, 23(2), 239-260.
- Venkatesh, V. & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions, *Decision Sciences*, 39(2), 273-315.
- Venkatesh, V. & Davis, F. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies, *Management Science*, 46(2), 186-204.
- Venkatesh, V., Speier, C. & Morris, M. G., (2002). User acceptance enablers in individual decision making about technology: Toward an integrated model, *Decision Sciences*, 33(2), 297-316.
- Venkatesh, V., Morris, M. G., Davis, G. B. & Davis, F. D. (2003). User acceptance of information technology: toward a unified view, *MIS Quarterly*, 27(3), 425-478.
- Venkatesh, V., Thong, J. Y. L. & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology, *MIS Quarterly*, 36(1), 157-178.
- Warshaw, P. R. (1980). A new model for predicting behavioral intentions: An alternative to Fishbein, *Journal of Marketing Research*, 17, 153-172.
- Wells, J. D., Campbell, D. E., Valacich, J. S. & Featherman, M. (2010). The effect of perceived novelty on the adoption of information technology innovations: A risk/reward perspective, *Decision Sciences*, 41(4), 813-843.
- While, A. & Dewsbury, G. (2011). Nursing and information and communication technology (ICT): A discussion of trends and future directions, *International Journal of Nursing Studies*, 48(10), 1302-1310.
- Whittaker, R., Borland, R., Bullen, C., Lin, R. B., McRobbie, H. & Rodgers, A. (2009). Mobile phone-based interventions for smoking cessation, *Cochrane Database of Systematic Reviews*, 4, CD006611, DOI: 10.1002/14651858.CD006611.pub2.

Yang, Q., Pang, C., Liu, L., Yen, D. C. & Tarn, J. M. (2015). Exploring consumer perceived risk and trust for online payments: An empirical study in China's younger generation, *Computers in Human Behavior*, 50, 9-24.

Zhou, T. (2017). Understanding location-based services users' privacy concern: An elaboration likelihood model perspective. *Internet Research*, 27(3), 506-519.

Appendices

Appendix A - Measurement items for the theoretical model

Perceived psychological risk (adapted from (Stone & Grønhaug, 1993) and (Stone & Mason, 1995))

The thought of signing up for the quit-smoking SMS service makes me feel uncomfortable.

The thought of signing up for the quit-smoking SMS service gives me an unwanted feeling of anxiety.

The thought of signing up for the quit-smoking SMS service causes me to experience unnecessary tension.

Perceived time risk (adapted from (Stone & Grønhaug, 1993) and (Stone & Mason, 1995))

Using the quit-smoking SMS service could lead to an inefficient use of my time.

Using the quit-smoking SMS service could involve important time losses.

The demands on my schedule are such that using the quit-smoking SMS service concerns me because it could create even more time pressures on me that I don't need.

Perceived privacy risk (adapted from (Featherman & Pavlou, 2003))

My use of the quit-smoking SMS service would cause me to lose control over the privacy of my information.

Signing up for and using the quit-smoking SMS service would lead to a loss of privacy for me because my personal information could be used without my knowledge.

Internet hackers (criminals) might take control of my information if I used the quit-smoking SMS service.

Perceived financial risk (adapted from (Stone & Grønhaug, 1993) and (Stone & Mason, 1995))

Signing up for the quit-smoking SMS service would be a poor way to spend my money.

I would be concerned about how much I would pay if I subscribed to the quit-smoking SMS service.

If I subscribed to the quit-smoking SMS service, I would be concerned that I would not get my money's worth.

Perceived risk of not adopting (adapted from (Horne et al., 2004) and (Horne et al., 1999))

Without the help of the quit-smoking SMS service smokers who decide to quit smoking would be less able to do it.

If not using the help of the quit-smoking SMS service smokers who decide to quit smoking might see their health diminished.

Without the help of the quit-smoking SMS service smokers who decide to quit smoking might live poorer quality lives.

In most cases, if not using the help of the quit-smoking SMS service the negative consequences would be more significant than the positive consequences for smokers who decide to quit smoking.

Subjective norm (adapted from (Venkatesh & Davis, 2000))

People who influence my behavior would think I should use the quit-smoking SMS service.

People who are important to me would think I should use the quit-smoking SMS service.

Extrinsic motivation (adapted from (Venkatesh et al., 2002))

Using the quit-smoking SMS service would help me to refrain from smoking every day, if I decided to quit smoking.

Using the quit-smoking SMS service would help me not to forget about smoking cessation, if I decided to quit smoking.

Using the quit-smoking SMS service would help me to stop smoking, if I decided to quit smoking.

I expect to find the quit-smoking SMS service useful in supporting me to quit smoking, if I decided to quit smoking.

Intrinsic motivation (adapted from (Venkatesh et al., 2002))

I expect to find the quit-smoking SMS service enjoyable.

The actual process of using the quit-smoking SMS service would be pleasant.

I would have fun using the quit-smoking SMS service.

Adoption intention (adapted from (Venkatesh & Davis, 2000))

Assuming I had access to the quit-smoking SMS service, I would intend to use it, if I decided to quit smoking.

Given that I had access to the quit-smoking SMS service, I predict that I would use it, if I decided to quit smoking.