

MOBILE ICT ACCEPTANCE IN LATE ADOPTER COUNTRIES

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Abstract

Despite the rapid global diffusion of the smartphone, some countries have experienced much slower uptake of the technology. The low smartphone penetration within Slovakia provides the opportunity to explore what drives smartphone use in late majority countries. Slovakia is a central European nation and part of the Eurozone. It has advanced telecommunications infrastructure and is subject to the same telecommunications regulations as other EU members. While neighbours have high smartphone penetration, Slovakia is a late majority adopter. This study uses Triandis' theory of interpersonal behavior to investigate the question: What drives the use of smartphones in late majority countries? By studying the differences between current and potential smartphone users, the study revisits Karahanna et al.'s research question: Do potential adopters and users of IT hold the same behavioral and normative beliefs? PLS analysis finds that habit, affect, and perceived social norms explain 66% of the intention to buy a smartphone. Surprisingly, perceived consequences, which measures the instrumental usefulness, is not significant. A comparison of users and non-users find that they differ in almost every attribute measured in the study, and that users intend to continue using a smartphone whereas non-users have more ambivalent intentions.

Keywords: Smartphone, mobile & wireless, technology acceptance, theory of interpersonal behavioral, late majority, partial least squares

1 Introduction

Much research investigates the adoption of new technology – ICT that is introduced for the first time or ICT that may have been introduced elsewhere but is available for the first time in a given setting. Little research has been conducted about the adoption of mobile technology after it has gone mainstream. While fashion waves may drive scholars to focus on novel technologies (Baskerville and Myers 2009), we still have much to learn about pervasive and mundane technologies (Dourish et al. 2010). Mobile ICT has been the fastest diffusing technology in history, but acceptance of wireless innovations has varied among countries.

The smartphone has been available since the 1990s, but it reached an inflection point in 2008 as 3G networks reached a critical mass and Apple introduced the iPhone, spurring consumer interest in smartphones. By 2012 smartphones represented 58% of mobile phones sold globally (BBC 2014). In Western countries like Norway and the United Kingdom, most of the population own smartphones (Google 2014). In countries such as these, smartphones have become the norm and are no longer novel. While ICT research generally focuses on novel technology, much can be learned by studying the use of technology that has become mainstream, even mundane (Dourish et al. 2010). Despite the rapid global diffusion of smartphones, some countries have experienced a much slower uptake of the technology. Slovakia, a Western nation belonging to the Eurozone, has experienced a slow uptake of

the smartphone. As a whole, the country can be considered what Rogers (1995) calls a late majority adopter. As of 2012, only 14% of its residents owned a smartphone (Google 2014). The low smartphone penetration within Slovakia gives us the opportunity to explore social, cultural, and personal factors that drive the use of an ICT that remains novel in the local context despite being a mundane technology in neighbouring countries. Little research has been conducted on late adopter countries within the Western world. Therefore, the low smartphone penetration in Slovakia provides the opportunity to explore our first research question: *What drives the use of smartphones in late majority countries?*

While Slovakia provides a setting for exploring the drivers of smartphone use, Karahanna et al. (1999) call for researchers to explore what differentiates the drivers of initial adoption from those influencing continued use. Similarly, Blechar et al. (2006) stress the need to study the underlying motives for adoption and use of mobile technology. This leads us to revisit Karahanna et al.'s research question: *Do potential adopters and users of IT [smartphones] hold the same behavioral and normative beliefs?*

Traditional studies of information and communication technology (ICT) often use theories such as Theory of Reasoned Action (Fishbein and Ajzen 1975), Theory of Planned Behavior (Ajzen 1985), the Technology Acceptance Model (Davis 1989), and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003). While these theories have made significant contributions, researching other theories can also enhance the understanding of new technology usage (Benbasat and Barki 2007; Venkatesh et al. 2007). This paper employs the Theory of Interpersonal Behavior (TIB) (Triandis 1980) as an alternative perspective for investigating the use of a mobile technology that is common in many countries but still novel in our focal country. According to TIB, attitudinal, normative, and identity beliefs form behavioral intention.

This paper proceeds as follows. The next section provides an overview of theories used in extant literature and elaborates on the choice of TIB as our theoretical lens. The third section provides an overview to TIB and proposes six hypotheses. The fourth section details the method used for data collection and analysis. The fifth section presents the results, discusses the findings, and investigates the differences between smartphone users and non-users. Section six brings the paper to a close and suggests areas for future research.

2 Theoretical Background

Much of the literature regarding technology acceptance follows the Theory of Reasoned Action (TRA) tradition. TRA (Fishbein and Ajzen 1975) uses two primary constructs to predict behavior: a person's attitude toward the behavior and the subjective norm, which is the person's perception whether the behavior will meet with the approval of others. The Technology Acceptance Model (Davis 1989), which is the most widely used theory in IS research, argues that TRA's reliance on indirect influence of attitudes should be replaced by two more specific constructs: perceived usefulness and perceived ease-of-use. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003) proposes four criteria to predict technology adoption: performance expectancy, or the degree a potential adopter believes a technology will improve job performance; effort expectancy, which is the perceived ease-of-use; social influence, which is the perception that "important others" want the decision-maker to use the technology; and facilitating conditions, which represent a person's belief that the organization will support his or her use of the new technology.

Over the past decade, information systems researchers have expanded acceptance research to include the phenomenon of post-adoption technology acceptance. This research has placed a strong focus on what drives the continued use of a technology. While the volume of literature on the subject is relatively small, one of the most influential theories is Bhattacharjee's (2001) Information Technology Continuance (ITC) model. Based on Oliver's (1980) expectation-confirmation theory, ITC explains the intention to continue using a technology based on the user's satisfaction with the system. Satisfaction is determined by whether the user experience exceeds, meets, or falls short of pre-

adoption expectations (Bhattacharjee 2001). While research into information technology continuance has provided new insights into technology acceptance, it assumes that the drivers of initial use are the same as those that drive subsequent use (Ortiz de Guinea and Markus 2009). However, users can develop complex and paradoxical relationships with technology (Jarvenpaa and Lang 2005; Mick and Fournier 1998). For example, users who begin using a mobile device to gain freedom from their desk often find that with physical freedom comes a new obligation to be available irrespective of time and place (Jarvenpaa and Lang 2005). Often to confront these paradoxes, people change their attitudes and their behavior in ways that may not have been anticipated prior to using a new technology (Mick and Fournier 1998).

Mobile technology is always with the user and plays an increasingly large part in everyday life; therefore, it is increasingly more personal and is often viewed as an extension of the user. The intimate relationship between users and technology also suggests that a new technology age has dawned, one that requires us to search for new insights and different ways to understand it. The majority of technology acceptance research focuses on instrumental beliefs to the exclusion of personal determinants and social influences (Lu et al. 2005). Consequently, many scholars have called for different insights into consumer ICT because use may be an end to itself (Bagozzi 2007) and to investigate the role that non-utilitarian factors play in the decision to use information and communication technology (Magni et al. 2010; Van der Heijden 2004; Venkatesh and Brown 2001).

Bagozzi (2007) encourages scholars to employ new theoretical perspectives that help fill gaps in our understanding while bringing together many elements already used in existing researching. H.C. Triandis' theory of interpersonal behavior (TIB) (Triandis 1980) offers such a unifying approach. The theory encompasses many of the factors that influence behavior found in models such as the technology acceptance model, theory of reasoned action, theory of planned behavior, and UTAUT. At the same time, TIB considers extensive social, cultural, and personal factors, answering the calls for different insights into ICT research by providing a more encompassing understanding of what motivates behavior (Facione 1993; Gagnon et al. 2003).

3 Theory of Interpersonal Behavior

Inspired by Hofstede's work on culture, Triandis distinguishes between cultural (i.e. social) and individual influences (Triandis 2004). Triandis' theory of interpersonal behavior (TIB) encompasses many of the factors that influence behavior that are found in models such as the technology acceptance model, theory of reasoned action, and theory of planned behavior; however, TIB considers social, cultural, and moral factors that are not addressed in more widely used theories (Facione 1993; Gagnon et al. 2003). Triandis argues for expanding the understanding of Fishbein and Ajzen's (1975) "attitude" construct. As an alternative, Triandis argues that intention is formed by attitudinal, normative, and self-identity beliefs (Triandis 1980).

While much of the technology research employing TIB has studied personal computer use (Al-Khaldi and Wallace 1999; McQuarrie and Langmeyer 1987; Pee et al. 2008; Thompson and Higgins 1991; Thompson et al. 1994), the theory has also provided insights into the use of executive information systems (Bergeron et al. 1995), student use of collaborative systems (Limayem and Hirt 2003), web surfing while at work (Chang and Cheung 2001), physician acceptance of telemedicine (Gagnon et al. 2003), and the adoption of mobile data services (Bina et al. 2007).

Triandis argues that *affect*, or the direct emotional response to the thought of a given behavior, brings about psychological arousal. Affect is the emotional driver of behavior that can be hard to explain rationally. Unlike other theories, such as the TRA, Triandis specifically separates affect from cognitive drivers of behavior. Positive affect motivates behavior (Triandis 1980). Prior research has found a strong relationship between affect and technology use (Al-Khaldi and Wallace 1999; Bergeron et al. 1995; Pee et al. 2008); therefore, we propose the following hypothesis:

H1: Affect is a predictor of intention to use smartphones.

Perceived consequences represent a cognitive evaluation of likely consequences of a given behavior. People are motivated by their desire to experience an expected outcome. The underlying premise is that people evaluate potential behavior in terms of potential rewards and take actions that are likely to bring desirable outcomes (Triandis 1980). Triandis' concept of perceived consequences is analogous to TAM's perceived usefulness concept (Gagnon et al. 2003). Prior research has shown that perceived consequences have a significant effect on behavioral intention (Bergeron et al. 1995; Limayem and Hirt 2003; Pee et al. 2008; Thompson and Higgins 1991). The role that perceived consequences is expected to play in decisions leads us to propose the following hypothesis:

H2: Perceived consequences are predictors of intention to use smartphones.

Triandis includes social factors in his theory of interpersonal behavior. He argues that people internalize implicit social contracts they have with others along with the subjective culture of their reference groups. Accordingly, people should act certain ways in certain situations (Triandis 2004). Prior research employing the TIB has found that social factors play a significant role in determining behavior (Limayem and Hirt 2003; Thompson et al. 1994). Triandis incorporates two dimensions of social factors: social norms and personal norms. Prior Triandis-based research has shown that norms play a key role in shaping the use of technology (Gagnon et al. 2003; Pee et al. 2008; Thompson et al. 1994).

Social norms are the internalization by a person of other people's opinions about a given behavior and also factor role beliefs. Role beliefs reflect how a certain type of person "should" behave, which causes people to act in a way that illustrates the kind of person they believe themselves to be. Together, role beliefs and normative social beliefs represent *perceived social norms*. The role that normative social factors play in determining behavior leads us to posit the following hypothesis:

H3: Perceived social norms are predictors of intention to use smartphones.

In addition to social norms, people base their behavior on whether or not an action matches their personal beliefs. These *personal normative beliefs* reflect whether a person feels obligated to perform (or not perform) a given act in order to adhere to his or her own belief system. Based on the TIB, we hypothesize the following:

H4: Personal normative beliefs are predictors of intention to use smartphones.

Whereas personal normative beliefs are based on the way a person is perceived by others, *self-concept/self-identity* is a private assessment of one's beliefs and values. The self is an active agent in the decision process that drives people to act in accordance with the behavior that they see appropriate for themselves. One's self-definition motivates behavior that is consistent with that definition (Triandis 1980; Triandis 1989). Prior research has shown that self-identity includes the factors of innovativeness, tech savviness, and opinion leadership (Hedman and Gimpel 2010). Self-identity has been shown to influence the acceptance and use of technology (Gagnon et al. 2003); therefore, we hypothesize:

H5: Self-identity is a predictor of intention to use smartphones.

According to the TIB, prior experience with a situation-behavior sequence influences a person's decisions. *Habit* represents a routinization of behavior that comes from frequent occurrence. The more common a behavior, the less deliberation one makes about whether to perform the action (Triandis 1980). Researchers have found habit to have a significant effect on the use of information technologies (Limayem and Hirt 2003; McQuarrie and Langmeyer 1987; Pee et al. 2008; Thompson et al. 1994), leading us to the following hypothesis:

H6: Habit is a predictor of intention to use smartphones.

The research model showing the constructs and the hypotheses discussed in this section are shown in Figure 1.

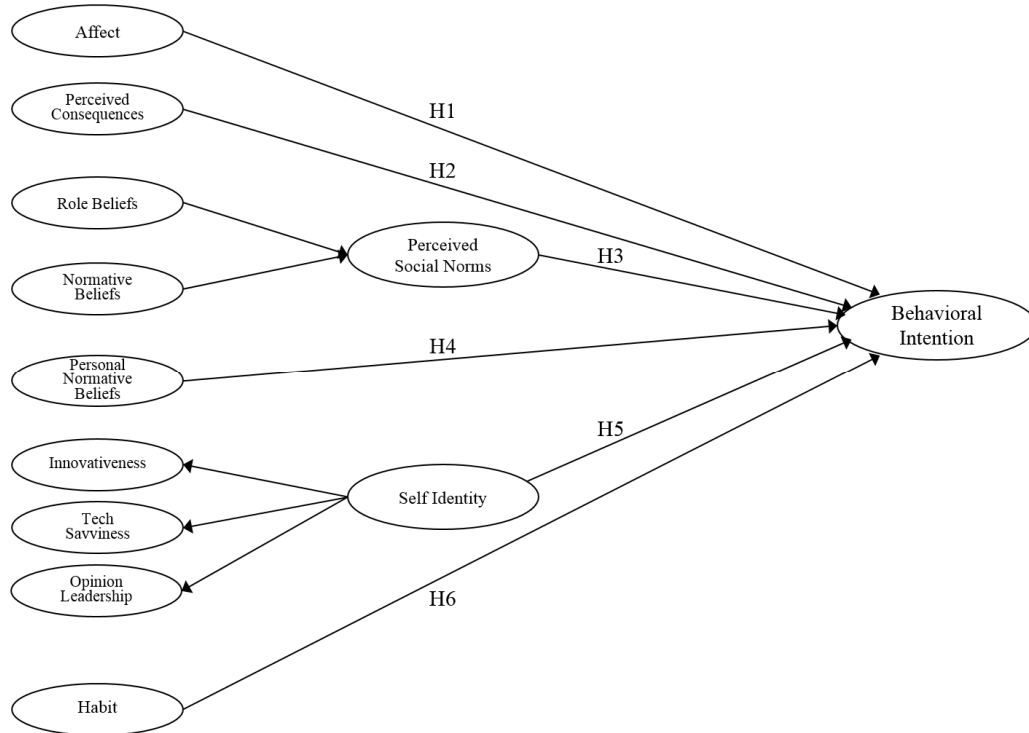


Figure 1. Research Model

4 Methodology

This study analyses survey data collected from university students in Slovakia in late 2012. There were 356 respondents (102 men, 252 women) of whom 185 had a smartphone and 171 did not. The survey was conducted using a paper-based questionnaire. The survey instrument was adapted from existing IT acceptance studies employing the theory of interpersonal behavior (Bergeron et al. 1995; Gagnon et al. 2003). The survey used Likert-type scales ranging from 1-7. Affect was measured on scales ranging from “boring” to “exciting” and “not satisfying at all” to “very satisfying.” All other constructs employed a disagree/agree dimensional scale. Habit was measured by prior experience: whether a participant already owned a smartphone. The intention to purchase a smartphone as one’s cellular phone was measured with a single question: “How likely are you to buy a smartphone the next time you buy a cellular phone?” The survey was translated from English into Slovak, then translated back to English to confirm that the translation was suitable.

Partial Least Squares (PLS) was employed to assess the structural model using the SmartPLS software. PLS places minimal demand on sample size, making it appropriate for this study. Missing values are coded as -1; mean replacement is used as the missing value algorithm for both PLS and bootstrapping. The PLS algorithm uses the path weighting scheme (the default setting for the weighting scheme) and the default setting “Mean 0, Var 1” for the data metric. Bootstrapping uses the default setting of 500 samples and no sign changes.

We conducted a preliminary confirmatory factor analysis. The initial analysis showed that some of the personal normative belief questions had correlations below .40, so they were dropped from the analysis, leaving 3 questions for our analysis.

We compare the users and non-users in this study. Because some of our variables do not follow a normal distribution, we apply a Mann-Whitney U-test (Mann and Whitney 1947) to elucidate the differences between users and non-users.

5 Findings and Analysis

This section presents and discusses the results from the PLS analysis of the proposed model and then proposes a more parsimonious model with similar predictive and explanatory power. The section continues with an examination of the differences between the users and non-users in our sample, discussing the implications for research and practice.

5.1 Instrument Validation

We conducted a confirmatory factor analysis for PLS (Gefen and Straub 2005). All items in a construct load highly on distinct factors. Items load highest on their own factors. Internal consistency of constructs is tested using Cronbach's alpha (Nunnally et al. 1967). A value of 0.7 and above is considered acceptable (Nunnally 1978). Cronbach's alpha for affect is 0.7684, perceived social norms is 0.7683 (role beliefs is 0.7694 and normative beliefs is 0.6300), personal normative beliefs is 0.6474 and self-identity is 0.6778. No Cronbach's alpha is calculated for habit because it consists of one variable and the answer to the question whether someone owns a smartphone should be reliable by default. While personal normative beliefs and self-identity fall below the recommended 0.7, they are substantively above the 0.5 value that is considered unacceptable (George and Mallery 2003) and above the .60 level deemed acceptable in other confirmatory studies (e.g. (Bearden et al. 2006)).

5.2 Structural Model

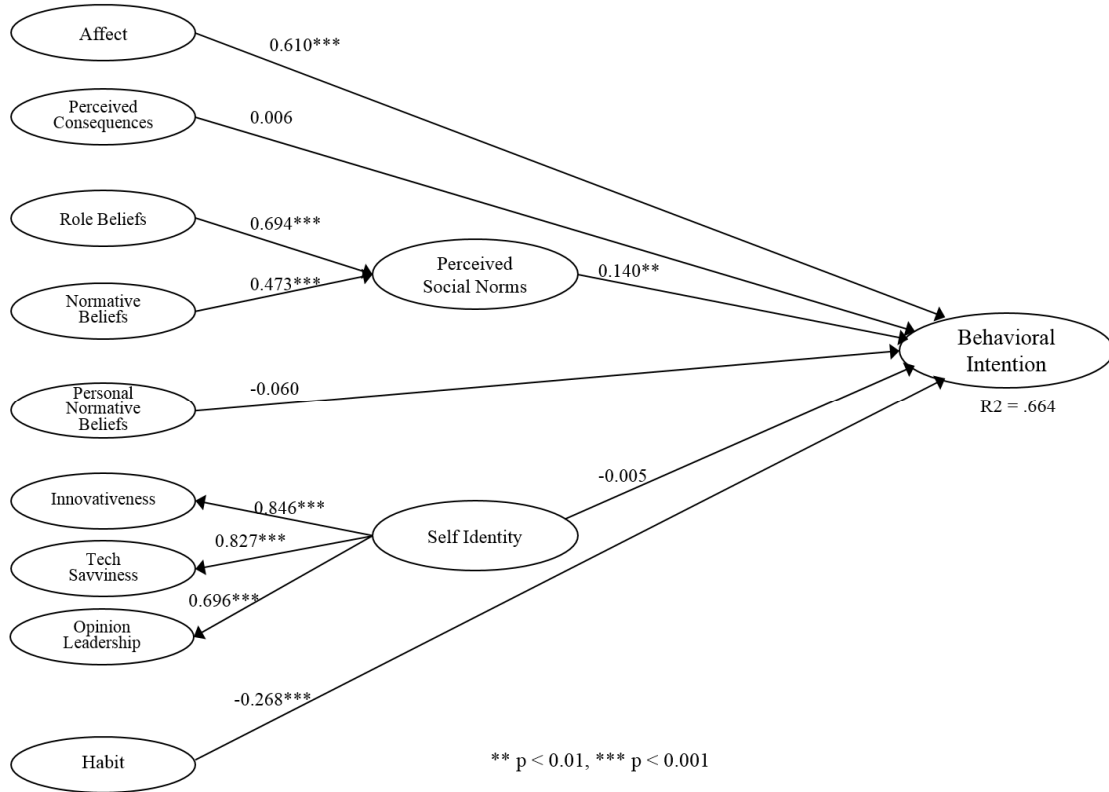


Figure 2. Path Coefficients of the model

PLS analysis shows that our proposed model explains 66.4% of the intention to buy a smartphone as one's next phone. This demonstrates that TIB is an acceptable and useful model for predicting smartphone acceptance. At the same time, our analysis shows that only half of our hypotheses are supported. (See Table 1.)

Hypothesis	Results
H1: Affect is a predictor of intention to use smartphones.	Supported
H2: Perceived consequences are predictors of intention to use smartphones.	Not supported
H3: Perceived social norms are predictors of intention to use smartphones.	Supported
H4: Personal normative beliefs are predictors of intention to use smartphones.	Not supported
H5: Self-identity is a predictor of intention to use smartphones.	Not supported
H6: Habit is a predictor of intention to use smartphones.	Supported

Table 1. Summary of Findings

The biggest surprise is that perceived consequences do not matter. The Perceived consequences construct is similar to TAM's perceived usefulness construct. Given the plethora of information systems studies that find "usefulness" drives the intention to use technology, the results of this study warrant closer examination.

Prior applications of Triandis' TIB perceived consequences construct have yielded mixed results. Thompson et al.'s (1991) study of PC use in work situations found a significant relationship between perceived consequences and utilization. Similarly, Pee et al.'s (2008) study of PCs in non-work contexts found that perceived consequences play a significant role in shaping the intention to use ICT. Lu et al.'s (2005) examination of mobile internet finds that perceived usefulness is a significant driver of use, but they redefine the traditional concept of usefulness to incorporate subjective norms, image, and self-identity, TIB constructs that are usually separate from perceived consequences/usefulness. The findings of other prior applications of TIB are closer to those of the study presented in this paper. Limayen and Hirt's (2003) study of electronic bulletin board use as part of student work found that only one out of six consequences significantly influenced system use. Bergeron et al. (1995) find that perceived consequences do not significantly influence how frequently executives use information systems. Al-Khaldi and Wallace (1999) did not find a significant link between perceived long-term consequences of PC use and actual PC utilization. Gagnon et al. (2003) did not find a significant link between perceived consequences and physician adoption of telemedicine.

The non-significance of perceived consequences and/or usefulness is not limited to TIB-based studies, but also has a growing presence within mobile technology research. Wireless ICT researchers argue that perceived usefulness may not provide an appropriate tool for studying wireless technologies and services because the impact on everyday routines may be more influential than the technology itself (Bouwman et al. 2007). Studies have found perceived usefulness has only weak influence on the intention to adopt mobile data services (Hong and Tam 2006) and a negative influence on student acceptance of mobile information systems (Gao et al. 2010). Research into the use of mobile communication tools by police officers found that other considerations, not perceived usefulness, drive use (Bouwman and van de Wijngaert 2009). Other mobile research has found instrumental factors to be non-significant drivers for hedonic tasks like playing mobile games (Fang et al. 2005; Ha et al. 2007). The findings in this study closely resemble prior research that found that the adoption of iPhones is driven by social and emotional factors rather than the instrumental attributes of the device (Hedman and Gimpel 2010). Unlike the iPhone study, the data in this study suggest that instrumental considerations are neither significant drivers of initial adoption nor continued use. A possible explanation could be that study participants do not evaluate the usefulness of generic technology such as smartphones, whereas they might evaluate a specific application or service. Another plausible explanation could be that smartphones duplicate the functions of other ICT that study participants may own and use (e.g. mobile phone and laptop), therefore mitigating the perception of special utility.

Furthermore, given that smartphones are globally in a “late adopter” phase, much of the functionality could be taken for granted, even by those who do not currently use one.

According to the data, the personal normative beliefs that reflect whether people feels obligated to perform (or not perform) a given act in order to adhere to their personal belief system, do not play a significant role in the intention to purchase and use a smartphone. One plausible explanation would be that people in Slovakia, a late adopter country, have already adapted their personal normative beliefs based on the widespread adoption of smartphones in their neighbouring EU countries. Another explanation would be that the perceived social norms simply overpower their personal attitudes.

The data show that study participants’ self-identity does not determine whether they intend to use a smartphone. While in innovator or early adopter countries, one’s self-identity as an innovative person (or not) might drive his or her decision to adopt new ICT, such self-perception may not matter when over half of the people around the world who buy a new mobile phone are buying smartphones. A smartphone simply may no longer be viewed as a way to demonstrate tech savvy.

The model originally proposed includes three non-significant factors. Consequently, we re-estimate the model using only the significant predictors (Gagnon et al. 2003). Our revised model, which includes habit, affect, and perceived social norms, provides a more parsimonious model. PLS analysis shows that the revised model offers greater parsimony and essentially the same explanatory and predictive power.

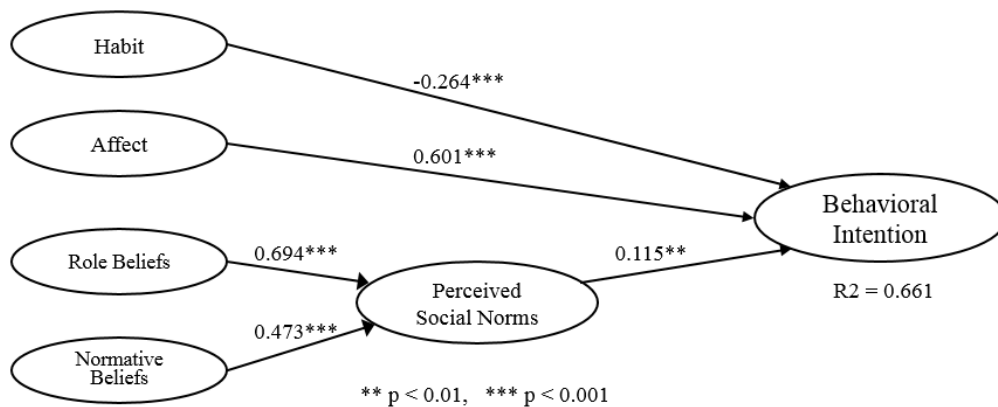


Figure 3. Path Coefficients of the streamlined model

The PLS analysis of the study data demonstrates the suitability of the TIB for researching the adoption of consumer-oriented ICT such as smartphones. What we have learned is that in a late adopter country, habit (i.e. prior behavior), affect and perceived social norms, which are comprised of role beliefs and normative beliefs, are the significant determinants of whether a person’s next mobile device will be a smartphone. Our analysis suggest that a streamlined, more parsimonious operationalization of the TIB may be appropriate for studying ICT adoption in similar contexts.

5.3 Users vs. Non-users

The data show the suitability of using TIB to explore the adoption and use of ICT. We also have the opportunity to explore the differences between users and non-users. Because some of our variables do not follow normal distribution, we follow Karahanna, Straub, and Chervany (1999) and apply a Mann-Whitney U-test to elucidate the differences between users and non-users in the revised model. Table 2 shows that significant differences between the two groups exist in every dimension measured.

Variable	Users		Non-users		Mann-Whitney U-Test	
	mean	std.dev.	mean	std.dev.	z-score	p-value
Intention to buy	6.2649	0.1188	4.0936	0.1236	10.3229	0.000000
Affect	5.7649	0.0934	4.5643	0.0971	8.4195	0.000000
Normativebeliefs	4.3811	0.0894	4.0307	0.0930	2.7502	0.005856
Rolebeliefs	4.9986	0.0949	4.3260	0.0987	4.8056	0.000001
Perceivedsocialnorms	4.6899	0.0774	4.1784	0.0805	4.3896	0.000011

Table 2. U-Test Comparison of Users and Non-Users

A closer look at the differences show that those who already own a smartphone indicates that they have a strong intention to continue using a smartphone, whereas non-users are neutral about whether they will buy a smartphone or traditional feature phone. Current users have much stronger affect for smartphones. They attribute a strong sense of satisfaction to their smartphones and are excited about the devices. Non-users also believe they will be satisfied with smartphones and have a sense of excitement; however, the affect they have for smartphones, while positive, is much weaker than those who already own them.

Social beliefs play a significant part in the intention to buy a smartphone. Those who use smartphones have a stronger belief that people at their status level – career, education, income, age – should be using smartphones that those who do not have a smartphone. Similarly, current users believe that others hold smartphone users in high regard; whereas non-owners are more neutral. While these social beliefs, which comprise the perceived social norms construct, are significant drivers of the intention to use a smartphone, the difference between users and non-users is much smaller than that of affect.

People throughout the developed world – and much of the rest of the world – know about smartphones. In late majority countries that are behind their peer countries (i.e. other Western democracies), firms promoting smartphones should focus on those who do not currently use smartphones. Marketing campaigns should seek to raise the perception that smartphone ownership is exciting and a very satisfying experience. These affect-based marketing messages will have the most impact. Secondly, marketing campaigns should portray smartphones as objects of admiration and social status. Prior research has shown these factors to be important drivers of smartphone adoption and use (Bødker et al. 2009; Rahmati and Zhong 2013). The findings in this study also support the significant role perceived social norms play in smartphone adoption.

The non-significance of perceived consequences (utilitarian functions) and self-identity suggest that campaigns appealing to what can be accomplished with a smartphone will not increase acceptance. Appealing to someone's self-identity, their self-perceptions about their innovativeness, tech savvy, or status as opinion leaders, will also likely be ineffective. According to the data, it is the extrinsic opinions of others – not the intrinsic image of oneself – that leads to adoption.

6 Conclusion

This paper investigates the drivers of the intention to purchase a smartphone by residents in a late majority country. The study, which includes current smartphone users as well as potential adopters, employs Triandis' (1980) theory of interpersonal behavior to investigate the factors that drive the adoption and use of smartphones by people living in a EU country with a penetration rate far below many of its neighbours.

Survey data indicate that habit (prior smartphone ownership), affect (the emotional response to the thought of using a smartphone), and perceived social norms (how one thinks others expect him or her to act) determine a person's behavioral intention. Perceived consequences (usefulness) is found to be non-significant, suggesting that the adoption of personal mobile technologies are driven by different

factors than workplace technology. An analysis of the differences between current smartphone owners and non-owners shows that the two groups differ in every dimension measured in field study. The implications for organizations trying to increase the ownership of smartphones are discussed.

The study faces certain limitations. First, conducting survey research in one "late majority" country may limit the generalizability of the conclusions. Research replicating this study in other late majority countries can separate country-specific characteristics from generalizable traits. The sample consists of students, who may have a different level of tech-savviness and different financial constraints than the general population. Additionally, a substantially higher proportion of our sample own smartphones than the population at large. Furthermore, the cross-sectional study design does not afford the opportunity to study the facilitating conditions that Triandis (1980) argues mediate intended behavior from actual behavior.

This study reports the findings from a late adopter country that were collected in late 2012. The researchers intend to continue this avenue of research by comparing the findings presented in this paper with unpublished findings from data collected using the same survey instrument in an early adopter country during the spring of 2009. Other research studies can apply Triandis' theory to other technological artifacts and can compare it directly with mainstream adoption and use models to compare the explanatory power.

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