

# Psychological Determinants and Consequences of Internet Usage: An Extension of the Technology Acceptance Model

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**Abstract:** The Internet, as a representation of pervasive technological platforms, has brought a series of effects on our everyday life. An exploration of the determinants and consequences of Internet use from the psychological and social perspectives can facilitate current information system studies. As such, this paper hypothesised and examined the effects of a number of psychological factors on technology acceptance. A comprehensive framework has been put forward and empirically tested with data collected from 615 Internet users. Statistical results support that the hypothesised antecedents, i.e. social inclusion and psychological needs satisfaction, have significant effects on users' beliefs and intentions of Internet usage. Also, the individuals' continuance intention of using the Internet significantly affects their emotional reactions, well-being, and perceived value of the Internet.

## 1 INTRODUCTION

Over the years, there has been an increasing interest in exploring the potential emotional influence of pervasive technologies, such as the Internet. Studies from a psychological perspective have largely been focused on the impact of excessive Internet use, especially its negative causes and effects (e.g. problematic Internet use, Internet addiction, compulsive Internet use). However, there has been little discussion about the wider emotional consequences that the Internet can bring to the public. As such this study's first objective is to make a contribution by exploring the emotional antecedents and outcomes of using the Internet. By tackling this objective this paper aims to make a second significant contribution related to technology acceptance. Over the years, the Technology Acceptance Model (TAM) has facilitated understanding of technology acceptance and has made possible extensions and elaborations for the contextualisation of information technology (IT) studies (Lee et al., 2003). At the same time, though, excessive focus on replication and the subtle adaptation of popular models such as TAM could restrict the progress of information system (IS) research (Venkatesh et al., 2007; Venkatesh et al., 2012). Integrating individual characteristics, rather than over-emphasising system and design characteristics, may offer a way to enhance IS and IT

studies (Ajzen, 2005; Benbasat and Barki, 2007; Venkatesh, 2000). To this end, a number of studies have incorporated psychological factors, such as cognitive absorption (Mohd Suki et al., 2008), flow (Hausman and Siekpe, 2009), psychological needs and self-determination (Partala and Saari, 2015; Partala, 2011), and emotions (Beaudry and Pinsonneault, 2010), etc. Still there is more much scope for considering psychological factors as antecedents and outcomes of acceptance. Given that psychological states and individual differences are gaining importance in technology acceptance studies, this article extends TAM by incorporating emotional constructs, i.e. social inclusion, basic psychological needs, well-being, perceived value, and emotions.

## 2 LITERATURE REVIEW

### 2.1 Technology Acceptance

TAM has been longitudinally found at the centre of technology acceptance. Compared with other technology acceptance theories. The first version of TAM includes five main constructs, namely, perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using (Attitude), behavioural intention to use (BI), and actual system use (USE) (Davis et al., 1989). (Davis et al., 1989)

showed that PU and PEOU have direct effects on BI instead of being mediated by attitude. The authors suggested omitting attitude to explain intention more concisely (Davis et al., 1989; Venkatesh et al., 2003). PU and PEOU are grounded on behavioural psychology and the observation of technology adoption (Davis et al., 1989). They are the two most influential determinants that represent human beliefs and represent the foundation of technology acceptance theories (Davis, 1989; Venkatesh and Davis, 2000; Davis et al., 1989). PEOU is the degree to which a person believes that using the Internet would be free of effort (Davis et al., 1989; Davis, 1989). PU refers to the degree to which a person believes that using the Internet would enhance performance in completing particular tasks (Davis et al., 1989; Davis, 1989). The relationships between PU, PEOU, and Intention have been retained in most TAM-based empirical studies (Lee et al., 2003). Additionally, a meta-analysis by (Lee et al., 2003) showed that the majority of the studies support the idea that PEOU affects PU, and both PU and PEOU have influences on Intention or USE. Our study examines the psychological impact on existing users, hence we have focused on the intentions to continue using the internet (continuance intention (CI)).

*H1: An individual's (a) perceived ease of use, and (b) perceived usefulness of using the Internet has a significant positive influence on the intention to continue using it, while (c) perceived ease of use positively affects the perceived usefulness of the Internet.*

## 2.2 Social Inclusion and Information and Communication Technologies

Various definitions of social inclusion (SI) have been introduced over the years that offer different vantage points into this multi-dimensional phenomenon, e.g. (Secker et al., 2009; Sayce, 2001; Huxley et al., 2012; The Charity Commission, 2001). For the purpose of this study, social inclusion is defined as an individual's perceived opportunities and rights of access to the social and economic world and participation in socially valued activities (Richardson and Le Grand, 2002; Sayce, 2001). Although social inclusion is based on the concept of social exclusion, social inclusion cannot be simply viewed as "non-exclusion", but rather as creating opportunities proactively and having freedom in making choices (Andrade and Doolin, 2016; Selwyn, 2002; Phipps, 2000). Accordingly, social inclusion relates to the emotional and health benefits generated by access to social capital, social acceptance and social activity, as well as positive actions taken by an individual to

dealing with social exclusion, then enabling people to fully participate in the society (Andrade and Doolin, 2016; Sayce, 2001; Secker et al., 2009; The Charity Commission, 2001).

Not surprisingly, social inclusion/exclusion closely relates to digital inclusion/exclusion, with high digital inclusion being a catalyst for social inclusion (Hill et al., 2015; Selwyn, 2002; Tapia et al., 2011). With the proliferation of ICTs, digital inclusion has become an increasingly important issue as it describes how ICTs serve society and promote social inclusion (Tapia et al., 2011; Hill et al., 2015). Diffusion of new forms of technological breakthrough could potentially exacerbate existing social exclusion or even create new ways through which digital exclusion can be manifested (Andrade and Doolin, 2016). On the other hand, it can also bring many advantages. First of all, social inclusion motivates people to use connecting technologies such as mobile phones, social networking sites, and e-learning systems (Choi and Chung, 2013; Park, 2010; Park et al., 2013; Smith and Sivo, 2012). Empirical results suggest that social inclusion has positive effects on one's PU, PEOU, and CI of using mobile phones (Park et al., 2013). Social capital is a key element of social inclusion, which is generated through individuals' social activities and interactions, and offers benefits for their social participation (Choi and Chung, 2013; Secker et al., 2009). Perceived social capital positively and significantly correlates to perceived usefulness and ease-of-use on SNS among graduate students (Choi and Chung, 2013). Social presence and sociability facilitate users' degree of social inclusion as well, which has been found to positively correlate with PU, PEOU, and CI on using e-learning systems (Smith and Sivo, 2012). Moreover, the beneficial impact of social inclusion is also reflected in enhancing the well-being of citizens (especially those ICT-engaged individuals) via technology use. For instance, socially excluded people tend to shop online via computer or cell phone rather than in-store (Dennis et al., 2016). Such preferences can potentially mitigate the negative effects of social exclusion on well-being and the happiness of individuals with mobility difficulties (Dennis et al., 2016). It is worth noting that ICTs do not increase social inclusion automatically. They promote participation in social activities and communities, and in turn can help transform social inclusion into well-being (Andrade and Doolin, 2016).

*H2: Social inclusion positively influences the users' (a) perceived ease of use of, (b) perceived usefulness of, and (c) continuance intention of using the Internet.*

### 2.3 Self-determination Theory, Basic Psychological Needs, and Technology Acceptance

According to the Self-Determination Theory (SDT), when faced with new skills and ideas, people have innate needs to feel effective, agentic and being connected, which derive from the three basic psychological needs for competence (NC), autonomy (NA), and relatedness (NR) (Ryan and Deci, 2000c; Ryan and Deci, 2000b). These three psychological needs are the basis of maintaining an individual's intrinsic motivation and self-determining extrinsic motivation (Ryan and Deci, 2000b). Specifically, interpersonal activities can catalyse people's need for competence and fulfilling this need enhances their intrinsic motivation (Gagné and Deci, 2005; Ryan and Deci, 2000b). Intrinsic motivations could be diminished by external factors such as rewards, threats, deadlines, and competition pressure, which hinder the individuals' experienced autonomy (Gagné and Deci, 2005; Ryan and Deci, 2000b). The environmental and social contextual conditions that support or control the needs for autonomy and competence could facilitate or undermine intrinsic motivation and social functioning (Ryan and Deci, 2000c; Ryan and Deci, 2000b). Satisfying the need for relatedness is the main motivation driving people to perform activities which, per se, are less enjoyable or not of interest, but valued by people connected to them (Roca and Gagné, 2008).

Studies based on SDT have reported close relationships between Internet use, needs satisfaction, and psychological states. Need fulfilment can indirectly lead to excessive Internet use, which is fully mediated by psychological distress (Wong et al., 2014). Psychological distress, such as social anxiety, has direct influences on excessive Internet use as well (Casale and Fioravanti, 2015). For males, this influence can be partially mediated by the satisfaction of the need for self-presentation, which can be met through social networking service use (Casale and Fioravanti, 2015). In addition, the basic psychological need satisfaction perceived online and in daily life both significantly predicts Internet use behaviour and the emotional effect among elementary school children (Shen et al., 2013). Participants who fulfilled their psychological needs online tend to spend more time on and more frequently use the Internet, and they will also experience more positive outcomes (Shen et al., 2013). In the context of e-learning system use, users can be intrinsically motivated by fulfilling the three psychological needs, which in turn affects their well-being and emotional responses (Gagné and Deci,

2005; Roca and Gagné, 2008; Ryan and Deci, 2000b; Ryan and Deci, 2000a). The need for autonomy is one of the salient needs that could be satisfied to a significantly larger extent by technology use, especially in successful cases of technology adoption (Partala, 2011; Partala and Saari, 2015). Previous work which incorporated the SDT with technology acceptance theories supported a number of significant relationships between the three psychological needs and technology acceptance constructs. More specifically, although PEOU has been found to be positively affected by the three psychological needs, their influences on PU and intentions are relatively ambiguous. The majority of the empirical studies suggest that the three needs have significant positive influences on PU and BI. Still, the needs for competence and autonomy were not found to significantly relate to PU in three of the studies (Nikou and Economides, 2017; Sørø et al., 2009; Roca and Gagné, 2008). Notably, these studies were conducted in different contexts, with models featuring additional determinants, such as intrinsic motivation (Sørø et al., 2009), perceived enjoyment (Lee et al., 2015), perceived playfulness (Roca and Gagné, 2008), etc.

*H3: The users' need for competence positively affects their (a) perceived ease of use of, (b) perceived usefulness of, and (c) continuance intention of using the Internet.*

*H4: The users' need for autonomy positively affects their (a) perceived ease of use of, (b) perceived usefulness of, and (c) continuance intention of using the Internet.*

*H5: The users' need for relatedness positively influences their (a) perceived ease of use of, (b) perceived usefulness of, and (c) continuance intention of using the Internet.*

### 2.4 Well-being, Perceived Value, and Social Inclusion

An individual's degree of well-being can be affected by social inclusion and the satisfaction of basic psychological needs (Andrade and Doolin, 2016; Dennis et al., 2016; Broadbent and Papadopoulos, 2013; Ryan and Deci, 2000c; Deci and Ryan, 2000; Tay and Diener, 2011). The positive influences of social inclusion and need fulfilment on well-being can be enhanced by technology use (Roca and Gagné, 2008; Gagné and Deci, 2005; Andrade and Doolin, 2016). Accordingly, this study defines well-being as the degree of need satisfaction and life quality enhancement by using the Internet. Empirical studies have explored the role of well-being in technology

acceptance. For instance, in studying the mobile money service agents' technology readiness and acceptance, subjective well-being has been found to be a positive outcome of mobile money service use, which was directly affected by PU and PEOU (Rahman et al., 2017). Well-being can act as both a driver and an outcome of social networking service (SNS) use (Munzel et al., 2017). Subjective well-being can only increase the highly extraverted individuals' time spent on SNS when they are unhappy, which consequently improves their general well-being (Munzel et al., 2017). In addition, well-being can also be measured from the perspective of psychological flourishing (psychological wealth, positive emotions, and life satisfaction) and mental health ("the lack of depressive symptoms") (Partala and Saari, 2015). Regarding the users' most influential experiences of successful and unsuccessful technology adoptions, psychological flourishing well-being has been found to be largely dependent on the fulfilment of needs and concordance of value (Partala and Saari, 2015).

*H6: Users' continuance intention to use the Internet has a positive impact on their well-being.*

Researchers have developed a number of constructs to represent different values affecting technology acceptance and use, such as performance/utilitarian value (e.g. PU and PEOU), hedonic value (e.g. cognitive absorption, perceived enjoyment, and playfulness), social value (e.g. subjective norm and social influence), and monetary value (e.g. price value) (Lowry et al., 2013; Agarwal and Karahanna, 2000; Venkatesh et al., 2012; Davis et al., 1989). Turel et al. (2007) decomposed users' overall perceived value to a multi-dimensional determinant of short messaging service acceptance. Their study demonstrated that the hedonic and monetary values significantly influence behavioural intention, that performance value was a potential moderator on use intentions and that the social value did not show a significant impact on use intentions (Turel et al., 2007). On the other hand, perceived performance value, which describes the perceived benefits and profits offered by the IS/IT, has been found to be an antecedent of acceptance of hotel front office systems (Kim et al., 2008). (Wang, 2014) investigated utilitarian and monetary aspects of perceived value, which illustrated the user's "overall assessment of the utility" regarding the mobile government system. Results indicated that mobility, security, and PU were antecedents of the overall perceived value, while technology satisfaction, trust in technology, trust in the agent, and trust in

government were the consequences (Wang, 2014). Users' perceived benefits, i.e. perceived usefulness, perceived enjoyment, and social image, and perceived sacrifice, i.e. perceived risk, were all found to have a positive effect on their overall assessment of the perceived value of media tablet adoption (Yu et al., 2015). Taking into account that this study aims to examine the emotional and psychological factors related to the adoption of a pervasive technological paradigm, i.e. the Internet, the users' perceived value is investigated from a comprehensive perspective. As such, perceived value is defined as the justification of the experience of using the Internet in individuals' daily life, regardless of whether this is for work or for personal purposes (Okada, 2005).

*H7: Users' continuance intention to use the Internet has a positive impact on their perceived value.*

## 2.5 Emotional Responses to Internet Use

An emotional response is defined as a set of emotional reactions elicited during IT/IS use or by use experiences, such as happiness, anger, anxiety, and excitement (Westbrook and Oliver, 1991; Beaudry and Pinsonneault, 2010). Prior studies provide evidence that users' emotions critically affect beliefs, intentions, and behaviours in technology acceptance and adoption contexts (Beaudry and Pinsonneault, 2010; Kim and Lennon, 2013; Chang et al., 2014). For instance, positive emotions such as happiness and excitement were found to positively relate to information technology use, either directly or indirectly (Beaudry and Pinsonneault, 2010). However, negative emotions, e.g. anger and anxiety, also have an indirect positive influence on technology use.

This article adopts (Beaudry and Pinsonneault, 2010) classification of the emotional responses, specifically toward information technologies. Their framework has been developed by combining two appraisals of technology assessment which determine users' emotional reactions toward a new IT (Beaudry and Pinsonneault, 2005; Beaudry and Pinsonneault, 2010). The primary appraisal is whether a user perceives a new technology as constituting an opportunity or a threat, which is in line with the individual's goal achievement (Bagozzi, 1992; Beaudry and Pinsonneault, 2010). Fundamentally, the goal or outcome of an individual can be either achieved or not, which in turn triggers pleasant or unpleasant feelings toward events in both planned and unplanned cases (Bagozzi, 1992). This primary appraisal determines the users' emotional reactions as

positive (they perceive the technology as an opportunity, they achieve the goal) or negative (they perceive the technology as a threat, and do not achieve the goal). Notably, individuals can experience both positive and negative emotions, triggered by the same external stimulation, thus the levels of these two dimensions of emotions can be measured separately (Chang et al., 2014; Partala and Kujala, 2015; Russell and Carroll, 1999). The emotions aroused by the adoption of a given IT may vary among individuals depending on their unique psychological evaluations (Beaudry and Pinsonneault, 2010).

The second appraisal refers to the degree of users' perceived control over the achievement of the expected outcome of accepting a technology (Beaudry and Pinsonneault, 2010; Lazarus and Folkman, 1984). This dimension further classified the emotions triggered by an IT event into four categories, i.e. achievement, challenge, loss, and deterrence emotions. The achievement and challenge emotions are experienced when the users perceived an IT as an opportunity that would generate positive outcomes, such as happiness and excitement (Beaudry and Pinsonneault, 2010). The achievement emotions refer to the users' pleasant feeling when they are able to achieve their goal by using the IT with very little effort (Lee et al., 2012; Beaudry and Pinsonneault, 2010). Challenge emotions could enhance users' positive attitudes toward the technology and help them achieve their goals (Lee et al., 2012; Beaudry and Pinsonneault, 2005). A new IT which is perceived as a threat would be likely to trigger loss or deterrence emotions (Beaudry and

Pinsonneault, 2010). When individuals lack control over their expected outcomes of the new technology, they are likely to experience loss emotions such as anger, disappointment and frustration (Beaudry and Pinsonneault, 2010). Finally, when users have some control over their expected outcomes, their emotional reactions fall into the deterrence aspect, represented by anxiety, fear, worry, distress, etc. (Beaudry and Pinsonneault, 2010).

*H8: An individuals' continuance intention to use the Internet has a positive impact on their (a) achievement and (b) challenge emotions, and has a negative impact on their (c) loss and (d) deterrence emotions.*

Based on the above hypotheses, Figure 1 presents the emotional-TAM model (E-TAM) which depicts the main effects.

### 3 METHODOLOGY

#### 3.1 Data Collection and Sampling

A quantitative approach was adopted. The questionnaire was made available online and data collected using a consumer panel. The sample respondents were Internet users in the United States. 670 full questionnaires were initially received. Prior to the main survey, a pilot study was carried out with 10 participants. Based on evaluation of this pilot study and the average completion time of the main study, collected questionnaires that had been completed in less than five minutes were excluded

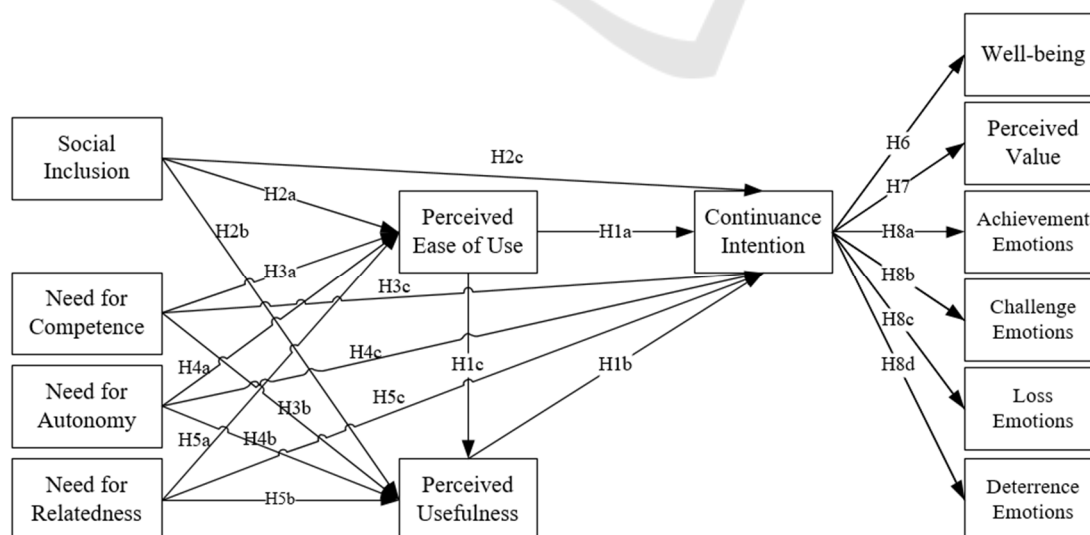


Figure 1: Research framework: E-TAM.

Table 1: Demographic profile of respondents

Demographic characteristic	Frequency (n=615)	Percentage (%)
Gender		
Male	266	43.3%
Female	349	56.7%
Age		
20-29	69	11.2%
30-39	127	20.7%
40-49	114	18.5%
50-59	139	22.6%
60 or over	166	27.0%
Current employment status		
Full-time employed	258	42.0%
Part-time employed	64	10.4%
Out of work (looking for work)	26	4.2%
Out of work (not looking for work)	6	1.0%
Homemaker	77	12.5%
Student	16	2.6%
Retired	125	20.3%
Unable to work	43	7.0%
Ethnicity		
African American	65	10.6%
Native American	6	1.0%
USA White	452	73.5%
Asian American	28	4.6%
Hispanic American	37	6.0%
Multiracial	8	1.3%
Other White Background	15	2.4%
Other	4	0.7%
Education attainment		
Some high school or less	12	2.0%
High school graduate or equivalent	118	19.2%
Vocational/technical school	54	8.8%
Some college, but no degree	157	25.5%
College graduate	156	25.4%
Some graduate school	22	3.6%
Graduate degree	78	12.7%
Professional degree	18	2.9%
Residence area		
Urbanized area	256	41.6%
Urban cluster	231	37.6%
Rural area	128	20.8%
Household income		
\$0- \$24,999	114	18.5%
\$25,000-\$49,999	161	26.2%
\$50,000-\$74,999	138	22.4%
\$75,000-\$99,999	95	15.4%
More than \$100,000	107	17.4%

from the dataset. Additionally, this study removed questionnaires completed by selecting the same answer for most of the scaled measurement items, including the 11 reversed ones. By applying the above-stated criteria in the data screening process,

615 completed questionnaires were entered into the analysis. Table 1 illustrates the participants' profile.

### 3.2 Measurement Items

Table 2 presents the constructs' factor loadings and reliability, which describes the variability of independent variables explained by the measurement model. Items for the TAM variables, i.e. PEOU, PU, and CI, were adapted from (Venkatesh, 2000; Fishbein and Ajzen, 1975; Davis, 1989). Social inclusion items were adopted from (Richardson and Le Grand, 2002), while items for the psychological needs for competence, autonomy, and relatedness were adapted from the Work-related Basic Need Satisfaction scale (Van den Broeck et al., 2010). Items measuring the well-being and perceived value were adapted for the Internet users in the post-adoption context from (El Hedhli et al., 2013) and (Okada, 2005) respectively. Lastly, we included ten potential emotional responses to using the Internet (Beaudry and Pinsonneault, 2010). The majority of the items were measured using a 7-point Likert scale ("Strongly disagree" to "Strongly agree").

### 3.3 Data Analysis Strategy

SPSS v.23 and SPSS Amos v.24 were used for the statistical analysis of the main hypotheses. A confirmatory factor analysis was undertaken to ensure construct reliability and validity. The composite reliability, Cronbach's  $\alpha$ , and model fit indices were satisfactory (Table 2). There was no convergent validity issue with the model (Table 3). A structural model has been established to test hypotheses H1-H8 (Table 4).

## 4 RESULTS

The E-TAM framework satisfied the model fit criteria (Table 4), with the majority of hypotheses being accepted except for H2b, H3c, and H4b. More specifically, all TAM relationships (H1) were statistically supported. PEOU showed significant and strong influence on CI (H1a) and PU (H1c). The path Perceived Usefulness  $\rightarrow$  Continuance Intention (H1b) was the weakest among the three hypothesised effects. The proposed antecedents, i.e. social inclusion and the three basic psychological needs, were found to significantly affect users' perceptions of and continuance intention of using the Internet (H2-H5 partially supported). When comparing standardised coefficients, the four antecedents

showed overall stronger effects on PU and PEOU than on CI. Among the four antecedents, social inclusion was the most significant factor influencing PEOU, and the users' need for competence most strongly affects PU. When it came to CI, the effect of the need for competence was not significant. Lastly, the statistical analysis supported the significance of the six-proposed psychological and emotional

outcomes of using the Internet (H6-H8 all significant at <0.01 level). The users' continuance intention of Internet use strongly and positively affected their well-being, perceived value, achievement emotions, and challenge emotions. Negative emotions, i.e. loss emotions and deterrence emotions, were negatively affected by CI, with path estimates much smaller than positive outcomes.

Table 2: Item loading and reliability.

Variable	Loading	Reliability	References
Perceived Ease of Use (PEOU)	0.821	Cronbach's $\alpha$ = 0.925 C.R. = 0.927	(Venkatesh, 2000)
	0.840		
	0.932		
	0.892		
Perceived Usefulness (PU)	0.880	Cronbach's $\alpha$ = 0.936 C.R. = 0.938	
	0.935		
	0.924		
Continuance Intention (CI)	0.877	Cronbach's $\alpha$ = 0.868 C.R. = 0.868	
	0.875		
Social Inclusion (SI)	0.807	Cronbach's $\alpha$ = 0.898 C.R. = 0.884	(Richardson and Le Grand, 2002)
	0.867		
	0.660		
	0.705		
	0.836		
Need for Competence (NC)	0.866	Cronbach's $\alpha$ = 0.913 C.R. = 0.915	(Van den Broeck et al., 2010)
	0.917		
	0.870		
Need for Autonomy (NA)	0.869	Cronbach's $\alpha$ = 0.889 C.R. = 0.890	
	0.921		
Need for Relatedness (NR)	0.876	Cronbach's $\alpha$ = 0.921 C.R. = 0.927	
	0.936		
	0.885		
Well-being (WB)	0.875	Cronbach's $\alpha$ = 0.783 C.R. = 0.857	(El Hedhli et al., 2013)
	0.856		
Perceived Value (PV)	0.906	Cronbach's $\alpha$ = 0.806 C.R. = 0.829	(Okada, 2005)
	0.749		
	0.694		
Achievement Emotions (AE)	0.895	Cronbach's $\alpha$ = 0.899 C.R. = 0.899	(Beaudry and Pinsonneault, 2010)
	0.847		
	0.851		
Challenge Emotions (CE)	0.778	Cronbach's $\alpha$ = 0.761 C.R. = 0.765	
	0.796		
Loss Emotions (LE)	0.922	Cronbach's $\alpha$ = 0.890 C.R. = 0.892	
	0.872		
Deterrence Emotions (DE)	0.895	Cronbach's $\alpha$ = 0.940 C.R. = 0.941	
	0.941		
	0.916		

Notes: Items measured by 7-point Likert scale: Strongly disagree; Disagree; Somewhat disagree; Neither agree nor disagree; Somewhat agree; Agree; Strongly agree.

Reliability test: C.R. = composite reliability (>0.7); Cronbach's  $\alpha$  (>0.7).

Method: M.L.; Model fit:  $\chi^2$  (551) = 1200.367, CMIN/DF = 2.179, GFI = 0.904, CFI = 0.967, RMSEA = 0.044.

Table 3: Convergent validity test.

	AVE	SI	NC	NA	NR	PEOU	PU	CI	WB	PV	AE	CE	LE	DE
SI	0.607	0.779												
NC	0.783	0.284	0.885											
NA	0.802	0.291	0.852	0.895										
NR	0.809	0.199	0.693	0.623	0.899									
PEOU	0.761	0.343	0.570	0.568	0.461	0.872								
PU	0.834	0.295	0.674	0.589	0.606	0.672	0.913							
CI	0.767	0.334	0.527	0.537	0.394	0.762	0.590	0.876						
WB	0.749	0.199	0.667	0.592	0.814	0.508	0.645	0.411	0.866					
PV	0.621	0.324	0.661	0.655	0.580	0.688	0.664	0.734	0.672	0.788				
AE	0.748	0.414	0.662	0.639	0.552	0.699	0.591	0.688	0.602	0.756	0.865			
CE	0.619	0.230	0.658	0.661	0.683	0.461	0.572	0.339	0.703	0.568	0.633	0.787		
LE	0.805	-0.221	-0.158	-0.142	-0.062	-0.348	-0.156	-0.347	-0.093	-0.276	-0.336	0.064	0.897	
DE	0.842	-0.203	-0.076	-0.077	0.037	-0.262	-0.086	-0.328	0.012	-0.212	-0.293	0.126	0.840	0.918

Note: AVE = average variance extracted (>0.5), abbreviations of the constructs were present in Table 2.

Table 4: Statistical results of hypotheses test: structural equation model (H1-H8).

Hypotheses	Path	Coef. (t-test)
H1a	Perceived Ease of Use → Continuance Intention	0.480 (12.052***)
H1b	Perceived Usefulness → Continuance Intention	0.114 (2.836**)
H1c	Perceived Ease of Use → Perceived Usefulness	0.406 (10.376***)
H2a	Social Inclusion → Perceived Ease of Use	0.183 (4.842***)
H2b	Social Inclusion → Perceived Usefulness	0.038 (1.166ns)
H2c	Social Inclusion → Continuance Intention	0.095 (3.607***)
H3a	Need for Competence → Perceived Ease of Use	0.228 (2.543*)
H3b	Need for Competence → Perceived Usefulness	0.358 (4.720***)
H3c	Need for Competence → Continuance Intention	0.121 (1.914ns)
H4a	Need for Autonomy → Perceived Ease of Use	0.251 (3.026**)
H4b	Need for Autonomy → Perceived Usefulness	-0.096 (-1.374ns)
H4c	Need for Autonomy → Continuance Intention	0.157 (2.764**)
H5a	Need for Relatedness → Perceived Ease of Use	0.111 (2.167*)
H5b	Need for Relatedness → Perceived Usefulness	0.223 (5.132***)
H5c	Need for Relatedness → Continuance Intention	0.171 (4.704***)
H6	Continuance Intention → Well-being	0.711 (14.730***)
H7	Continuance Intention → Perceived Value	0.875 (15.278***)
H8a	Continuance Intention → Achievement Emotions	0.859 (19.242***)
H8b	Continuance Intention → Challenge Emotions	0.653 (11.286***)
H8c	Continuance Intention → Loss Emotions	-0.333 (-7.101***)
H8d	Continuance Intention → Deterrence Emotions	-0.258 (-5.979***)

Method: M.L.; Model fit:  $\chi^2 (602) = 2530.516$ ,  $CMIN/DF = 4.204$ ,  $CFI = 0.901$ ,  $RMSEA = 0.072$ .

Significant at p: ns = > .05; \* = < .05; \*\* = < .01; \*\*\* = < .001

## 5 DISCUSSION

### 5.1 Technology Acceptance

This study has extended TAM using a number of psychological antecedents and outcomes. As the majority of the hypotheses (H1-H8) were accepted,

this study further corroborated the robustness, flexibility for extension, and explanatory power of TAM (Mathieson, 1991; Venkatesh et al., 2003; Davis, 1989). Path analysis results suggested that PEOU had a stronger influence than PU on CI. This research did not support previous literature which suggested that PEOU is less influential than PU when



it comes to affecting technology acceptance, e.g. (Chau, 1996; Chau and Hu, 2001; Davis et al., 1989). One possible interpretation may be that the users' increasing familiarity with the Internet may alter their expectations on new ICTs (Mathieson, 1991).

## 5.2 Social Inclusion and Satisfaction of Needs

This paper has provided evidence for the relationships between social inclusion and technology acceptance (i.e. PEOU and CI), which is broadly consistent with previous findings (Choi and Chung, 2013; Park, 2010; Park et al., 2013; Smith and Sivo, 2012). Two of the main effects between psychological need satisfaction and TAM were not supported, namely Need for Competence → Continuance Intention and Need for Autonomy → Perceived Usefulness. The overall effects of the need for competence on TAM were in line with previous results (Huang et al., 2016; Lee et al., 2015; Roca and Gagné, 2008). The influence of the need for autonomy on PEOU and CI partially supported the studies of (Hew and Kadir, 2016; Huang et al., 2016; Nikou and Economides, 2017; Roca and Gagné, 2008). Statistical results reported significant relationships between the need for relatedness and TAM, which were broadly consistent with (Huang et al., 2016; Lee et al., 2015; Nikou and Economides, 2017). The effects of the needs for autonomy and relatedness on ones' continuance intention were significant, which partially corroborated the viewpoint that the psychological need fulfilment perceived online enhances Internet use (Shen et al., 2013).

## 5.3 Psychological Outcomes

This paper has investigated six psychological outcomes of using the Internet. Path coefficients indicated that the intention to continue using the Internet positively affected the positive outcomes, i.e. well-being, perceived value, and positive emotions. The negative coefficients between intention and negative emotions offered additional evidence that the outcome of using the Internet is, overall, beneficial. These findings also agreed with previous studies suggesting that users could experience both positive and negative emotions triggered by the same technology (Beaudry and Pinsonneault, 2010; Chang et al., 2014; Partala and Saari, 2015; Partala and Kujala, 2015). The results presented a strong relationship between continuance intention and well-being, which is consistent with (Rahman et al., 2017; Munzel et al., 2017; Partala and Saari, 2015). The

correlation between the continuance intention of Internet use and perceived value was significant and strong, which confirmed the finding of (Kim et al., 2008; Partala and Saari, 2015).

## 6 LIMITATIONS AND FUTURE RESEARCH AVENUES

This article is not without limitations. First of all, longitudinal studies are required with the aim of elaborating how the big changes in technological paradigms transform individuals' emotional states. Secondly, this paper posited direct effects between psychological factors and TAM-based constructs. Further tests and validations such as the interactions and crossover effects between these emotional variables are required. Lastly, the data was collected from consumers in the U.S. to elaborate the influential emotional states and consequences of using the Internet. The compatibility of the E-TAM framework should be examined in other contexts, such as users in societies with different cultural backgrounds.

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