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Completed Research

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Abstract

By developing and testing a new conceptual model we extend prior research on smartphone addiction by accounting for the role of individuals' espoused cultural values. Specifically, we theorize that the major aspects of culture, namely uncertainty avoidance, individualism/collectivism, and power distance interact with one's personality aspects to determine the level of her major antecedents of smartphone addiction (i.e., self-regulation, anxious attachment style, and non-social app usage) thereby affecting the way she develops addictive behaviors. The model was validated using a sample of 257 college students and the results were promising.

Keywords

Culture, smartphone, addiction, mobile, technology.

Introduction

In line with the evolution of information and communication technologies (ICTs), mobile phones have become smarter in offering people a new form of interaction with their surroundings. Smartphones are entangled to our everyday lives and the number of individuals using them continues to rise. In 2014, 1.85 billion people around the world were using smartphones, the number reached 2.32 billion in 2017 and is anticipated to exceed 7 billion in 2026[1]. While variety of functionalities such as convenient commerce and education, instant communication, and enhanced personal and organizational performance are integrated into one rectangular technology the excessive and obsessive use of this device is becoming a social issue. Given that the widespread and pervasive smartphone use has become the social norm, it is important to understand how much of smartphone use is labeled as addiction rather than desirable use.

The Information Systems (IS) literature investigates different phases of new technology usage, such as adoption and continuance of use. The theorical framework of the Technology Acceptance Model (Davis 1985), has been widely used as the foundation of much research that seeks to explain users' technology adoption behaviors. Frequent usage of an artifact, in the medium or long-term, can form automatic usage behaviors, defined as habit in the IS literature (Limayem et al. 2007). Like any human habits, the habitual behavior toward technology artifacts can have positive or negative outcomes. If they lead to loss of control, the negative consequences can outweigh the positive ones (Soror et al. 2015).

Despite the unambiguous advantages of the smartphone, addiction to that device distorts its true purpose and can cause negative consequences such as poor academic performance, reduced social and recreational activities, relationship issues, poor parenting, depression, and lack of sleep (Kuss and Griffiths 2011). In addition, the association between the overuse of smartphone and users' mental and physical negative outcomes (Thomée et al. 2011), highlights the importance of prevention and intervention strategies. To offer effective preventive measures several studies have tried to investigate the antecedents of smartphone addiction (SA). Despite some differences, they have shown consensus on the significance of psychological and behavioral factors as determinants of the phenomenon (Thomée et al. 2011). While the identification of psychological risk factors of SA helps scholars to better understand that phenomenon, the effect of

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[1] https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/

cultural factors on the development of the addiction behavior have not been sufficiently investigated. This raises the question of whether SA antecedents are generalizable across all the cultures.

Human behavior is often regarded as the substructure of culture (Glenn 2004), which shapes the environment in which individuals live and therefore impacts their cognitions, behaviors, and emotions (Baloglu et al. 2007). The espoused culture of an individual has a crucial effect on how she interacts with others both offline and online (Arpaci et al. 2018). Research has shown that the cultural orientations of an individual has significant effect on her technology-related behavior including the form of internet use (Chen and Nath 2016), e-commerce (Elbeltagi and Agag 2016), or e-banking (Tam and Oliveira 2017). Plus, culture has often been coupled with habit, hence the process of developing SA as a type of excessive habit, could not be truly understood without considering the role of culture. In the context of Internet Addiction (IA), clinical studies have shown inconsistent results regarding the outcomes of IA treatments administered in different countries, this might be due to cultural differences (Winkler et al. 2013). SA, as another type of technology addiction could also be the subject of such conflicting results. The main objective of the present study is to fill the gap in prior research by studying the role of culture in the environment of SA. We posit that while psychological determinants of SA have been widely accepted globally, the importance of these factors may differ across cultures. Our research contributes to the literature as it could elucidate the best practice to diagnose and treat SA in different cultures.

Background

Despite the ambivalence in relation to the concept of addiction, its territory has been expanded (Orford 2001) and now there is a growing movement which views a number of behaviors as addictive. That includes many behaviors which do not involve the ingestion of a drug. Holden (2001) used the knowledge gained by super-refined brain scan technology and showed that "as far as the brain is concerned, a reward is a reward, regardless of whether it comes from a chemical or an experience- p.980". Therefore, it was scientifically proven that addiction is an unusually high dependence on a particular medium. That includes gambling (Griffiths 1995), overeating (Orford 2001), videogaming (M. D. Griffiths, 2002), and Internet use (Griffiths 2000) with the distinct common components being salience, mood modification, tolerance, withdrawal, conflict, and relapse. Turel et al. (2011) define Technology Addiction as a psychological state of maladaptive dependency on the use of a technology to such a degree that some of the following typical behavioral addiction symptoms arise; salience, withdrawal, conflict, relapse and reinstatement, tolerance, and mood modification. The definition was welcomed by the IS community and was observed in numerous IS contexts. In line with the literature, in this study we accept the existence of nonchemical addictions and refer to the problematic use of smartphones as a type of behavioral addiction.

Culture is a difficult term to define. In 1952, the American anthropologists, Kroeber and Kluckhohn, critically reviewed concepts and definitions of culture, and compiled a list of 164 different definitions. In 1980, Geert Hofstede, a Dutch social psychologist, came up with one of the most accepted definitions of culture. According to him culture is the collective programming of the mind that distinguishes the members of one group or category of people from others (Hofstede 1980).

It is worth mentioning that confusion about levels of analysis is probably the biggest problem in the current development of cross-cultural psychology. The difficulty is that, many researchers fall victim to what Hofstede and others refer to as the ecological fallacy (i.e., thinking that relationships observed for groups necessarily hold for individuals) (Spencer-Oatey and Franklin 2012). Hence, in the case of culture, it is erroneous to assume that the culture of an individual is identical to that of her nation. This study addresses this deficiency by measuring culture at the individual level known as espoused national culture (Srite and Karahanna 2006). Espoused national culture (ENC) refers to the degree to which an individual embraces the values of his or her national culture. The four primary aspects of ENC, derived from Hofstede's model, are Individualism/Collectivism (the degree to which the individual emphasizes his/her own needs as opposed to the group needs and prefer to act as an individual rather than as a member of a group), Power Distance (the degree to which large differentials of power and inequality are accepted as normal by the individual), Uncertainty Avoidance (the level of risk accepted by the individual), and Masculinity/Femininity (the degree to which gender inequalities are espoused by an individual).

Prior studies have found that individual behaviors in the context of IT adoption and use do not hold the same across different cultures (Srite and Karahanna 2006). For example, it was shown that risk-averse individuals (i.e., individuals espousing high levels of uncertainty avoidance) tend to be less willing to

adopt new IS and that social norms play a significant role in those individuals' technology acceptance behaviors (Straub et al. 1997). According to Hill et al.(1998), other national cultural values such as the preference for face-to-face interaction, concepts of time, and gender relations also could facilitate or impede IS adoption.

While SA has been studied through the lenses of various personality and environmental factors, we could not find any prior studies examining the role of ENC values on addiction. Given the significance of behavioral risk factors, the fact that espoused cultural orientation has an important role in people's behaviors (Srite and Karahanna 2006) and that the culture in which a person lives is one of the most important environmental factors in shaping her personality (Triandis and Suh 2002), it is important to consider the effect of culture when investigating the underlying causes of SA. The present study makes a modest effort to close the gap in the literature through investigating the role of ENC values in the extended model of technology addiction proposed by Billieux (2012). Billieux has synthesized the findings of different studies into one integrative, psychological model that describes four pathways leading to dysfunctional mobile phone use. The four main pathways are 1) the impulsive pathway where addiction is driven by poor self-control; 2) the maintenance pathway where addiction occurs due to the intense need to obtain reassurance from others; 3) the extraversion pathway that is followed by people who hold an elevated desire to communicate; and 4) the cyber addiction pathway where addiction to Online Gambling, Games, etc. lead to smartphone addiction.

Research Model

The proposed conceptual model of the present study is explained in the subsections that follow, where definitions of the model's constructs and relationships between constructs are explicated.

The Moderating Role of Individualism/Collectivism

The term self-esteem is often used generically, to refer to how people feel about themselves. Rosenberg (1986) defines it as one's overall sense of worthiness to be a person. In the framework of SA, low self-esteem was shown as a strong predictor of dysfunctional use of smartphone (Hsu et al. 2017). According to the literature, one mediating factor that could explain the psychological mechanisms between low self-esteem and SA is attachment style characterized by the specific way people relate to others in their relationships. In other words, how secure, or insecure a person feels in her relationships (Singh 1988). According to Billieux (2012), low self-esteem is associated with negative core beliefs about the self that take the form of maladaptive cognitions. This characteristic leads to the insecure attachment style (Anxious-Ambivalent) where individuals have a positive mental model of others and a negative mental model of themselves (Allen et al. 1994). As the result, they become highly dependent on the approval of others and in need of their constant reassurance (Bartholomew 1990). In that situation, phoning serves as a means of instant communication to obtain others' confirmation.

Additionally, individuals with low self-esteem tend to be more negative in their self-evaluation and more passive in interpersonal interactions (Baumeister et al. 2003), which make them suffer more social anxiety. The strong association between social anxiety and anxious attachment style (McCarty 2005) and the fact that people with anxious attachment style are more obsessed with contacting peers through mobile phones (Jang and Chae 2006), explains the maintenance pathway of SA. People would use smartphones as a substitute for social contact when they feel anxious in a real environment (Ha et al. 2008) which propels them to the overuse of the device and eventually, takes the form of addiction.

The fact that approval-seeking is the core mechanism of SA development in the maintenance pathway implies the relevance of the Individualism/Collectivism cultural dimension to our study. First, people in collectivist cultures, at the conflict situations, are especially concerned with maintaining their relationship with others, whereas Individualists are primarily concerned with achieving justice (Triandis and Suh 2002). Thus, the former group emphasize conformity and attempt to achieve others' approval to smooth over social situations (Haugh and Bargiela-Chiappini 2009). They are more response-inviting and more approval-seeking to maintain harmony (Merkin 2015), which reinforces the characteristics of anxious attachment style in their behavior. Second, people from collectivistic nations (e.g., Japan, China) compared to the individualistic ones (e.g., United States, Canada), typically score lower on self-esteem and place a high value on self-criticism. Hence, we would expect individuals who espouse collectivistic cultural values to demonstrate higher degrees of attachment anxiety, as it is negatively associated with

their self-esteem level. Consistent with our perception, research has shown that psychological dependence on others is integral to collectivist systems and points to the possibility of a higher rate of anxious attachment in that culture (Sorensen and Oyserman 2009). Hence, we hypothesize:

> **H1:** *Low self-esteem leads to higher level of anxious attachment style and this relationship is stronger in collectivist individuals*

> **H2:** *One's degree of anxious attachment is positively influencing her degree of SA.*

The Moderating Role of Uncertainty Avoidance

The cyber addiction pathway of the Billieux (2012) model denotes the online activities (e.g., gaming, shopping, …) which eventually lead to SA. That is, people who are addicted to one or more online activity show exaggerated smartphone use despite not being addicted to mobile communication per se. To better understand that pathway, we look into the motivations of smartphone use by categorizing them into social and non-social usage (Van Deursen et al. 2015). While the former involves social engagement features (e.g., social networking sites, messaging), the latter mainly relates to consuming content-based media (e.g., browsing news, watching videos). Prior research shows problematic smartphone use is more related to its non-social usage (Van Deursen et al. 2015). Although not investigated as much as other antecedents of SA, excessive non-social use of smartphone is expected to be driven by psychological causes. One cognitive factor that could drive this relationship is Intolerance of Uncertainty (IU).

Carleton (2016) defines IU as an individual's incapacity to endure the aversive response triggered by the perceived absence of sufficient information that is associated with uncertainty. Individuals with the IU characteristic generalize all ambiguous situations as problematic ones by referring to the notion of any negative events and their inability to predict such events (Carleton et al. 2007). In the context of SA, research has shown that people with higher IU may experience higher social anxiety (Carleton et al. 2010, 2012), which may lead to social withdrawal and could manifest in more frequent use of non-social smartphone features. Moreover, people with higher IU tend to consume more alcohol to cope with negative emotions and to conform with social groups (Kraemer et al. 2015). Research has shown that addictive behaviors share a similar brain circuitry as with alcohol use (Turel and Qahri-Saremi 2016). Therefore, we argue that non-social use of smartphones helps people deal with ambiguous situations by providing them information relevant to their concerns. Hence, it is reasonable to expect people with IU to become more attached to their smartphones for the purpose of online information acquisition.

There is a very strong bond between what the espoused cultural dimension of Uncertainty Avoidance (UA) measures and what psychopathology construct of IU explains. The UA aspect of a culture explains the extent to which people feel threatened by ambiguous situations and have created beliefs and institutions that try to avoid those situations (Srite and Karahanna 2006). It was shown in the literature that the level of UA is related to the level of stress in a society in the face of an unknown future (Hofstede and Minkov 2010). Hence, we theorize:

> **H3:** *Non-social smartphone use frequency has a positive relationship with Smartphone Addiction and this relationship is stronger in individuals with high Uncertainty Avoidance*

The impulsive pathway of SA describes individuals who use smartphones mainly due to the poor self-control (Joël Billieux 2012). Billieux divides the impulsive behavior into four sub-groups characterized by urgency, lack of premeditation, lack of perseverance, and sensation seeking. Depending on the underlying mechanism, impulsiveness can lead to different types of problematic smartphone use such as antisocial use (Fennell 1998), risky use (Joël Billieux 2012) or addictive use (Billieux et al. 2008). In this pathway, individuals do not consider possible future results of their decisions due to lack of premeditation. This results in deficient self-regulation ability which leads to excessive use of smartphones. The addiction symptoms associated with lack of premeditation could be inability to postpone using a phone in situations consisting of experiencing intense emotions, prohibited use, and risky use (e.g., driving).

The fact that people with a high level of impulsivity often prefer mobile phone use without fully thinking through consequences of their actions, links the addiction phenomenon to the UA dimension of culture. In fact, impulsive behaviors describe the opposite characteristics of individuals who espouse a high level of UA. Such people tend to need more information before they act and resist innovation and change, and therefore are less impulsive (Leo et al. 2005). Plus, Mooij and Hofstede (2011) have shown that high

impulsive buying is more related to sensation seeking and stimulation, and these matters are related to the low degree of UA. We therefore hypothesize:

> **H4:** *Lack of Premeditation leads to poor self-regulation and this relationship is stronger in individuals with low Uncertainty Avoidance index.*

Power Distance

The last pathway of our model consists of the psychological factors that act as impulse controls and could prevent the development of SA. Locus of Control (LoC), is a construct that refers to the extent to which people feel they have control over the events that influence their lives (Rotter 1954). External LoC is relevant to the belief that events result from some factors out of an individual's control such as luck, task difficulty, or the behaviors of other people (Stipek 1993). People with an external LoC believe that situations are controlled by external sources such as powerful others, chance, or God (Lee et al. 2017). It is shown that the individual's sense of control plays a significant role in development of behavioral addictions (Vaghefi and Lapointe 2014) both directly and indirectly. Murray et al.(2007) argue that perceived lack of autonomy causes many externals to be more likely to immerse themselves on the internet or become drawn to online game playing (Koo 2009). On the other hand, it is shown that LoC and self-regulation correlate significantly and negatively with each other (Sidola et al. 2020).

We believe the role of the Power Distance(PD) cultural dimension should be considered for the present discussion, since the cultural context plays an important role in the decision making process (Wei et al. 2016). The PD index is a measure of the acceptance of a hierarchy of power and wealth by the individuals who make up the general population of a nation. In societies with high PD, the superior more often makes decisions without the subordinates' participation (Wei et al. 2016). Individuals in such cultures have a lower belief in their capacity to execute the behaviors necessary to produce specific performance attainments (Albert Bandura 2006). Given these facts, we postulate that:

> **H5:** *External locus of control leads to less self-regulation and this relationship is stronger in people with high power distance perception.*

> **H6:** *One's self-regulation is negatively influencing her degree of smartphone addiction.*

Method

Sample

To examine the hypotheses a cross-sectional survey was administered to a group of around 500 undergraduate and MBA students from a midwestern US institution. We targeted college students because people in this age group are reported to have high rates of problematic smartphone use in the US (Davazdahemami et al. 2016). A total of 289 responses (257 valid) were collected. The demographics were 58% male, 80.6% under 30 years old, 79.8% white, 79% single, and the majority were working on completing their bachelor.

Measures

We employed well-stablished measures from the literature to test the structural model. The measures for SA were adopted from Turel (2011). For self-esteem we used the measures proposed by Heatherton and Polivy (1991). The ENC aspects were measured using the instrument proposed by Srite and Karahanna (2006). For self-regulation we adopted the items proposed by Eysenck and Eysenck (1978). Also, anxious attachment, premeditation, LoC, and non-social application use were measured using the proposed instruments by Brennan et al. (1998), Cyders et al. (2014), Sapp and Harrod (1993), and van Deursen et al. (2015), respectively. In addition, we included multiple control variables that had been found to influence the hypothesized relationships. These included age, gender, race, marital status, and education.

Results

Measurement Model

Partial least squares (PLS) was used to examine the reliability and validity of the measures as well as to test the hypotheses. Reliability of a measure can be established if its Chronbach's alpha(CAR) and Composite Reliability(CR) scores exceed the 0.7 threshold (Nunnally et al. 1967). As shown in Table 1, all measures were reliable. We used Average Variance Extracted (AVE) to assess convergent and discriminant validity. Convergent validity was established since all AVE scores were greater than the recommended threshold of 0.5 (Gefen and Straub 2005). Also, according to Fornell and Larcker (1981), discriminant validity is established if the square root of AVE (diagonal values in Table 1) for each construct is greater than its inter-construct correlation with all the other constructs. Table 1 shows that this condition held across all the constructs.

Hypotheses Testing

The model results are summarized in Table 2 (standardized path coefficients). The model explained 42.7% of the variance in SA. As indicated, both hypothesized direct effects were significant, providing support for H2 and H6. In addition, our data provided support for two of the four hypothesized interaction effects (i.e., H1 and H4). To better highlight the importance of culture in explaining SA, in Table 2 we indicate the path coefficients in the absence and presence of the cultural factors as well as the hypothesized interactions for the three corresponding dependent variables (i.e., Self-regulation, anxious attachment, and SA). As shown, including the three ENC factors increased the R^2 for the dependent variables by 0.065, 0.022, and 0.007, respectively. Also, including the interactions, the R^2 values increased for another 0.013, 0.014, and 0.033, respectively.

Table 1. Reliability and validity measures of the constructs

Construct	Mean	SD	AVE	CR	CAR	Anx-Attch	Ind-Col	LoC	NS-App	PD	Premed	Addiction	Self-Esteem	Self-Reg	UA
Anx-Attch	3.37	1.71	0.770	0.909	0.851	0.877									
Ind-Col	3.66	1.44	0.915	0.956	0.909	0.256	0.957								
LoC	2.99	1.43	0.54	0.854	0.796	0.34	0.095	0.735							
NS-App	5.14	1.50	0.596	0.88	0.833	0.343	0.2	0.248	0.772						
PD	2.66	1.39	0.602	0.816	0.736	-0.01	0.123	0.206	0.034	0.776					
Premed	5.49	1.02	0.729	0.915	0.875	-0.19	-0.06	-0.23	-0.16	-0.08	0.854				
Addiction	3.07	1.79	0.539	0.891	0.858	0.25	0.149	0.299	0.592	0.09	-0.24	0.734			
Self-Esteem	4.25	1.78	0.645	0.916	0.89	-0.60	0.321	0.362	0.418	0.004	-0.20	0.332	0.803		
Self-Reg	3.41	1.81	0.783	0.935	0.908	0.285	0.169	-0.25	0.179	-0.08	0.59	-0.30	0.276	0.885	
UA	5.81	0.93	0.783	0.877	0.771	0.016	0.017	-0.15	0.129	-0.23	0.182	0.135	0.076	0.118	0.885

Even though our data did not support two of the hypothesized moderating effects (H3 and H5), still the individual direct effects of PD (on self-regulation) and UA (on SA) turned out significant and in the expected direction. Specifically, according to Table 2, higher degrees of PD lead to lower levels of self-regulation in an individual (-0.148, $p<0.05$). That is, people with high espoused PD index have a strong belief that most decisions in their lives are made by a superior power, hence have a lower sense of self-control. Also, UA turned out to have a significant positive direct effect on SA (0.14, $p<0.01$). This suggests that the more one feels threatened by ambiguous situations and have created beliefs and institutions to try to avoid those situations, the higher likely it is that she develops addictive behaviors to her smartphone.

This dependency is perhaps an additional measure taken by the individual to remain constantly connected to the world and be informed about what matters to her.

Table 2. Results of Testing Hypotheses (***p<0.001, **p<0.01, *p<0.05)

Description	Variable	DV: Self-Reg			Variable	DV: Anx-Attch			Variable	DV: SA		
		Direct Effects	Direct Effects+ Culture	Direct + Int.		Direct Effects	Direct Effects+ Culture	Direct + Int.		Direct Effects	Direct Effects+ Culture	Direct + Int.
Main Effects	LoC	-0.12*	-0.16*	-0.14*	SE	-0.60**	-0.57**	NA	Slf-Reg	-0.19***	-0.20***	-0.19***
	PD	-	-0.13*	-0.15*	I/C	-	0.07*	NA	UA	-	0.12**	0.14**
	Premed	0.56**	0.59**	NA					NSApp	0.55**	0.54***	0.56***
	UA	-	0.12*	NA					Anx-Attch	0.22**	0.22**	0.24**
Interactions	PD×LoC	-	-	n.s.	I/C×SE	-	-	0.09*	UA×NSApp	-	-	n.s.
	UA×premed	-	-	0.10*								
R²		0.33	0.40	0.41	R²	0.33	0.36	0.37	R²	0.39	0.394	0.427

Discussion

In this study, we developed a new conceptual model of smartphone addiction by extending prior research and considering the role of individuals' cultural aspects for explaining addictive dependency on smartphones. Specifically, we showed that cultural aspects such as uncertainty avoidance and individualism-collectivism had intensifying moderating effects in determining the level of two well-established direct antecedents of SA (i.e., self-regulation and anxious attachment), which thereby determine one's level of addictive behaviors towards smartphone. According to our results, the strong positive relationship between level of (or lack of) premeditation and (poor) self-regulation is significantly stronger for individuals with a low degree of uncertainty avoidance. In other words, controlling for the level of premeditation, individuals who are not generally worried about (and not trying to avoid) ambiguous situations tend to have poorer self-regulation compared to those who try to avoid uncertainty. Additionally, our results suggest that controlling for the level of self-esteem and considering its significant negative effect on one's level of anxious attachment, this effect is stronger for a person from a collectivist culture compared to one from a more individualist cultural background. We believe that this interaction effect is mostly driven by the fact that people from collectivist cultures have a higher tendency of seeking approval from others, thereby espousing greater degrees of social anxiety and more likelihood of developing an anxious attachment style.

Even though our data did not provide support for the two other hypothesized moderating effects of cultural dimensions on SA and its antecedents, those factors were shown to have significant direct relationships with their corresponding dependent variables.

We used a sample of college students to test our research model. Whereas people in that age group are highly likely to have problematic smartphone usage, using a more diverse sample, both age- and culture-wise, could probably better highlight the role of the cultural aspects in developing SA.

Overall, our study contributes to the theory of technology addiction in general, and SA in particular, by shedding light on the important role of individuals' cultural backgrounds in leading them towards becoming psychologically dependent on their smartphones.

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