Exploring the Role of Online Social Network Dependency in Habit Formation

Completed Research Paper

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Abstract

Online social networking is perhaps the biggest phenomenon of the Internet. Recently, there has been a rising concern over technology dependency. Recognizing that little theoretical and empirical attention has been given to examine technology dependency in the IS discipline, this study aims to examine the role of technology dependency in habit formation in the context of online social networking sites (SNSs). The findings of an empirical study of 406 Facebook users indicate that online social network dependency (OSN dependency) is a significant antecedent of habit. The OSN dependency also plays a role in augmenting SNS users' perceptions, which indirectly influences habit. Our theoretical model of habit formation explains 47% of the variance. Implications of the findings are discussed.

Keywords: Technology Addiction, Facebook Addiction, Technology Dependent, Habit, Social Networking sites, Deficient Self-Regulation, Cognitive Bias

Introduction

Online social networking is perhaps the biggest phenomenon of the Internet. Facebook, MySpace, LinkedIn, and other similar social networking sites (SNSs) provide online spaces where individuals can create a profile and connect that profile to others to create a personal network. Recently there has been much public concern over social network dependency, especially Facebook. It is estimated that over 350 million people were bought with all kind of suffering from Facebook addiction (Sickfacebook.com). In a handful of cases, Facebook addiction/dependency has led to a mother to neglect her children and starve her dog to death (Apex News 2010). By now, there are more than 500 million people signed up to Facebook since its creation in 2004 (Facebook Statistics 2010). The total amount of time users spent on the social networking site is on the rise. From April 2008 to April 2009, the total minutes spent on Facebook in U.S., in particular, has increased from 1.7 billion minutes to 13.9 billion minutes (700% annual growth) (Nielsen Company 2009).

Indeed, technology dependency is a novel concept that has only been around for about one decade. The concept is a new and unexplored area in the IS discipline. Given the potential addictiveness of technologies, there have been recent calls for research on investigating technology dependency and its consequences by both academia (Griffiths 2001; Turel et al. 2008) and practitioners (American Medical Association). Our review of prior IS literature (see Thadani & Cheung 2010 for detail) has revealed that little theory-guided research has been undertaken to understand the nature of technology dependency, and its antecedents and consequences. The concept is still emerging in the literature, and we notice that researchers have difficulties in differentiating between technology dependency and habit. They also fail to identify the relationship between these two similar but conceptually different variables.

In response to these research gaps, we explore the concept of technology dependency in the context of online social networking sites. Borrowing the psychological insights, we identify the antecedents and consequences of technology dependency. Particularly, we believe that technology dependency is a key factor associated with habit formation. It plays a role in augmenting user perception, which indirectly influences habit. This research work is expected to make significant contributions to both IS researchers and practitioners. On the research side, we address an interesting research gap and use insights from other disciplines to develop a fruitful model to explain habit formation and how it is influenced by technology dependency. On the practice side, the result of this study informs social media marketers that technology dependency is a key antecedent that determines habit formation of the use of SNSs.

The rest of the paper is structured as follows. First, we address the theoretical background, discuss the concept of technology dependency, and propose a theoretical model of IS habit formation in social networking sites. Then, we describe an online survey with users of a social networking site (i.e., Facebook). Next, we discuss the findings of our empirical study. Finally, we conclude the paper by discussing the implications for both research and practice.

Theoretical Background

In this section, we first provide a brief review of research on technology dependency and describe the concept of online social network dependency. We then elaborate on the concept of habit and discuss the underlying theoretical framework.

Technology Dependency

The extant literature indicates that the interplay between computer and communication technologies may lead to a number of negative outcomes (e.g. Chen et al 2004). Perhaps one of the most critical negative outcomes is technology dependency which may impact one's life in multiple aspects (Serenko et al. 2009; Young 2007).

By definition, technology dependency is a form of behavioral non-substance addiction which includes excessive interaction with information technologies (i.e., both the technology and the content it provides) under conditions of psychological dependency (Griffiths 1999). In other words, technology

addicts/dependents feel compelled to interact with information technologies despite potentially negative consequences that make continuous use appear out of control or irrational (LaRose et al. 2003).

Over the past decade, technology dependency has been observed in various contexts and labeled under different terms including "Internet addiction" (Young 1998), "Internet addiction disorder" (Yang and Tung 2007), "Excessive Internet Use" (Widyanto and Griffiths 2006), "Computer Addiction"(Shotten 1991), "Pathological use of video game" (Keepers 1990), , "Problematic Internet Use" (Shapira et al 2000), "Pathological Internet Use" (Davis 2001), "Compulsive Internet Use", "Cyberspace Addiction", and "Online Addiction" (Douglas et al. 2008; Widyanto and Griffiths 2006). Although the concept has not been to arrive at a universally accepted terms and definitions, all these studies share the notion that the technologies can be pathologically addictive, and this psychological dependency of users on the examined technologies should not be overlooked (Serenk et al. 2009; Turel et al. Forthcoming). In this study, we will use the term "addiction" and "dependency" interchangeably.

Consistent with other kinds of behavioral addictions (Brown 1997), technology dependency may be manifested through a number of symptoms including (1) *Tolerance*: engaging in the activity to achieve or maintain the desired positive emotion; (2) *Salience*: dominating user's thoughts and behavior; (3) *Withdrawal*: cessation of the activity leads to occurrence of unpleasant emotions or physical effects; (4) *Relief*: engaging in the activity offers relief ; (5) *Relapse and reinstatement:* inability to voluntarily reduce the engagement in the activity; (6) *Conflict*: engaging in the activity leads to conflict with other or oneself ; (7) *Euphoria* – engaging in the activity offers thrill or heightened emotion.

Unlike other forms of behavioral addictions, technology dependency is not officially included in a formal list of mental disorders (DSM-V) by the American Medical Association (AMA). It is not surprising because technology dependency is a novel concept that has only been around for a decade. More research is required for better understanding of the concept. Despite that technology dependency is not considered as a serious mental disorder by AMA, a number of scholars (e.g. Caplan 2002, 2010; LaRose et al. 2003, 2010) consider technology dependency as a form of self-regulatory disorder.

Technology dependency has attracted the attention of both researchers and practitioners due to the significant potential negative impact which could exert on individuals (Turel et al. Forthcoming). Three main areas with significant impact on individual's lives are identified as (1) *Psychological and psychological problems*: e.g. depression and seizure (e.g. Chung 2006). (2) *Compromised Performance:* e.g. lessened productivity, job and educational performance (Soule et al. 2003). (3) *Social problems:* e.g. marital discord (Young 1996), and social isolation (Lin and Tsai 1999; Chou and Hsiao 2000; Ng and Wiemer-Hastings 2005).

Online Social Network Dependency

With the proliferation of new social media technologies such as Facebook, Twitter, Friendster, etc…, the psychological profile and usage of internet users may have taken a different form. The new form of internet usage involves more social interactions and engagements. According to a report published by Nielsen Company in 2010, Americans spend nearly a quarter of their time on social networking sites, dominating all other forms of online activities. Among the social networking sites categories, an overwhelming 84.8 percent share of all online activities went to Facebook. Alongside this figure, research studies show that sociability of the Internet is responsible for the excessive amounts of time individuals spend having interactions via forum, online games, and blogs (Grohol 2005; Douglas et al. 2008).

In that sense, social networking sites (SNS) such as Facebook present a number of addictive features. These sites have implemented dynamic social contents in which online communities can be built and sustained easily through the facilitation of social connections and communications between users (Lee et al. 2012). The sense of re-connectedness/ connectedness, and social presence are the important motivators for SNS use (Cheung and Lee 2010).

In this study, online social network dependency (OSN Dependency) is defined *as a deficient in self-regulation with which an individual is unable to effectively regulate one's dependency on the social networking sites*. Deficient self-regulation is not an all-or-nothing condition, in which one is either classified as "normal" or "addicted" (LaRose 2003). Rather, it is possible to have varying degrees of deficient self-regulation. The OSN dependency is considered to be a form of technology addiction.

Social Cognitive Theory of Self –Regulation

Our definition of OSN dependency is based upon LaRose's (2003) social cognitive model of addiction. The model conceptualized media addiction as a deficient in self-regulation and the process of addiction as the struggle to maintain effective self-regulation. Based on social cognitive theory of self-regulation, human behavior is extensively motivated and regulated by ongoing self-influence (Bandura 1991; 2001). Social cognitive theory highlights the self-regulatory mechanism through which individual observe their own behavior (Self-observation), judge it in relation to personal and social standards (Judgmental process), and adjust their own behavior to environment (self-reaction). Empirically, deficit self-regulation breaks down into two dimensions – deficient self-observation and deficient self-reaction.

It is believed that users who suffer from online social network dependency (OSN Dependency) fail to provide oneself with accurate self-diagnostic information required for the judgmental process. OSN dependency may distort the way users perceive the system. Cognitive bias possesses by the addict/dependent is believed to play a role in distorting one's belief on the system at hand (Serenko et al. 2009; Turel et al. Forthcoming). Prior research indicated that addictive behaviors are usually accompanied by a number of psychobiological and psychological processes distorting user's perceptions of internal and external factors (Perl et al. 1997; Greenfield and Rogers 1999; Serenko et al. 2009). OSN dependent may see SNS as the only place they could maintain connectivity. They might have conditioned their mind with the benefits of using SNS. Indeed this pattern is implicit in the "salience" symptoms associated with technology dependency (Caplan 2010).

In addition, users who suffer from OSN dependency fail to adjust their own behavior to the environment. In this case, deficient self-regulation takes the form of compulsive use (Kim et al. 2009), and this pattern is implicit in the "Relapse and reinstatement" symptoms associated with technology dependency.

Habit

The reasons users employ information system (IS) have long intrigued the IS research community. Over the years, the focus of this line of research has been shift from adoption decisions (Davis 1989) to IS continuance (Bhattacherjee 2001b) where habit plays a role (Limayem et al. 2007).

Habit is conceptualized as *"a tendency to repeat responses given a stable support context"* (Ouellette and Wood 1998, p.55). In the context of IS, Limayem et al. (2007) defined habit as *"the extent to which using a particular IS has become automatic in response to certain situations"* (p.709). Based on this definition, habit is not considered as a behavior or prior use but a mind-set that enhances the perceptual readiness for habit-related cues (Verplanken and Aarts 1999). These habit-related cues could be both external (e.g. highly socialized online environment) emphasized by context-dependent position and internal (e.g. goal-related cognition primed by internal states) emphasized by goal-dependent approach (Verplanken and Wood 2006).

Hence habit is both goal and context dependent. It is learnt through repetition of behavior in the stable context in response to stimulus or cues (Verplanken et al 1998). Repeat association between the behavior (e.g. updating status on Facebook) and a situation, triggered by contextual cues (e.g. the computer is switched on) and internal cues (e.g. social needs), make the mental representation highly assessable to memory (Aarts and Dijksterhuis 2000). In a stable context, contextual cues and relevant goals of individuals are similar or the same across consecutive situations (Limayem et al.2007). Though some authors believe that habit can be formed on the basis of a single experience, it is believed that development of habit required a certain amount or repetition or practice (Aarts et al. 1998; Orbell et al 2001). As a rule of thumb, a minimum of weekly repetition is required for habit formation (Ouellette and Wood 1998).

Thus, during the initial adoption of a technology, individuals are most likely involved in cognitive processing in determining their behaviors. Once a habit is established, conscious attention diminishes (James 1890); behavior is performed automatically (Orbell et al. 2001; Triandis 1980, p.204). Habitual behaviors require minimal cognitive processing and deliberate control which are both effortless and efficient (Lindbladh and Lyttkens 2002).

Research Model

In this study, we aim at exploring the concept of technology dependency and its relationship with habit formation. Building on the psychology literature, we develop a research model to explain habit formation, with a particular focus on the role of online social network dependency (See Figure 1).
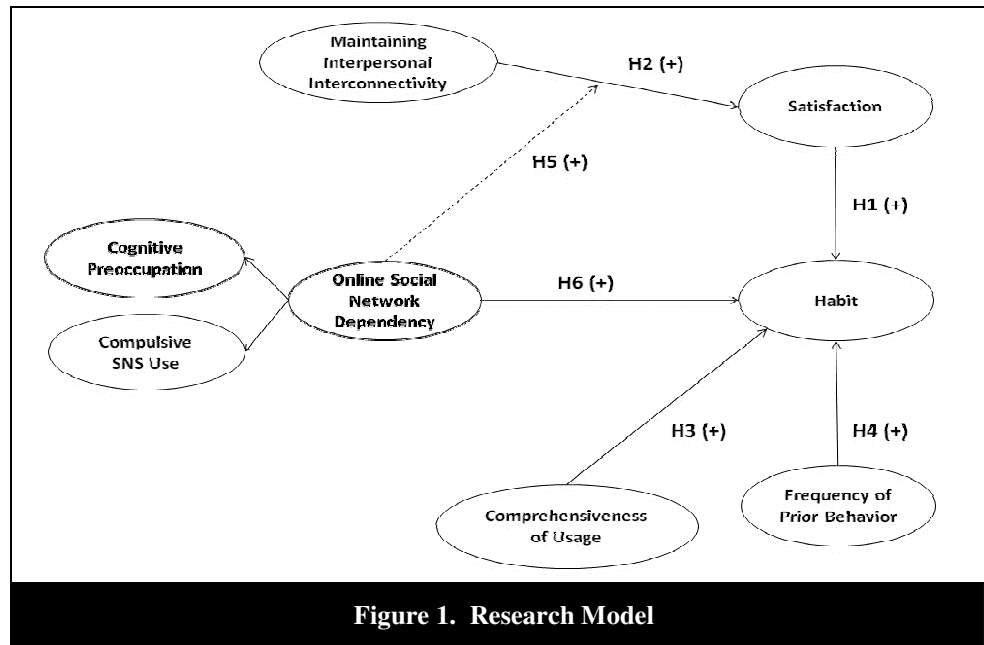

Figure 1. Research Model

Antecedents of Habit

From a thorough review of the IS habit literature (Limayem et al. 2007; Kim et al. 2005; Karahanna et al. 1999; Limayem and Hirt 2003; Thompson et al. 1991; Tyre and Orlikowski 1994), it has become evident that there are three primary antecedents to habit development: satisfaction, comprehensiveness of usage, and frequency of prior behavior.

Satisfaction

In the context of social networking sites, satisfaction refers to one's feeling of pleasure with the use of SNSs. Satisfactory experiences with a behavior are a key condition for habit development because they increase one's tendency to repeat the same behavior (Aarts et al. 1997). Thorngate (1976) summarized the relationship with the statement: *"If a response generated in an interaction is judged to be satisfactory, it will tend to be reproduced under subsequent, equivalent circumstances from habit rather than thought".* In line with this, Limayem et al. (2007) empirically showed that satisfaction had a direct positive impact on habit.

In the context of social networking sites, satisfaction means one's feeling of pleasure with the SNS use. SNS user is likely to repeat SNS use once he or she has accomplished successfully with his or her intended objectives. The positive feelings associated with the increased competence, from accomplishing one's intended goal(s), reinforce the level of satisfaction along the repeat use of SNS. Eventually, the automatic association between the satisfactory-cue and SNS use is established. Habit is formed with the aid of the habitual cue – Satisfaction. We believe that the stronger the habitual cue, the stronger the habit strength. Thus, with this notion, we propose that:

> *H1: The level of satisfaction in using online social networking sites (SNSs) has a positive direct effect on Habit.*

From the perspective of uses and gratifications (U & G), individuals are goal-oriented and aware of their needs (Katz, 1959). They are motivated to choose a medium which could accomplish their intended goal and fulfill their needs. Purposive value, Self-discovery value, Maintaining interpersonal interconnectivity, Social enhancement and Entertainment value are five key values (or needs) that are widely adopted to determine the use of virtual communities (Cheung and Lee 2009). Considering the difference between the context of virtual communities and SNSs, and maintaining interpersonal interconnectivity has always regarded as an important motive for using SNSs (Shi et al. 2010), the present study only focuses in examining the value, "maintaining interpersonal interconnectivity", instead of all of the five values.

Maintaining interpersonal interconnectivity is one of the most important motivations of using SNSs such as Facebook (Shi et al. 2010). Aforementioned, satisfaction is defined as one's feeling of pleasure by comparing between the perceived and actual performance of SNS use. SNS user possesses certain goals (e.g. maintaining interpersonal interconnectivity) prior using the SNSs. If the user confirms his expectation on SNSs by having their intended objectives accomplished through the SNS use, satisfaction is likely to be resulted. Thus, we propose

> *H2: The level of maintaining interpersonal interconnectivity of using online social networking sites (SNSs) has a positive direct effect on satisfaction in using online social networking sites (SNSs).*

Comprehensiveness of Usage

Limayem et al. (2007) defined Comprehensiveness of Usage as *"the extent to which an individual makes use of the various applications offered under the umbrella of a single IS system"*. It is relatively new concept in IS research which extends the concept of deep usage (Chin and Marcolin, 2001; Schwarz and Wynn 2007) and feature-centric view of technology (Jasperson et al. 2005). Comprehensiveness of Usage has been considered irrelevant in prior habit literature until Limayem et al. (2007) modeled it as an antecedent of habit. Comprehensiveness of usage was found to be a significant predictor of habit in Limayem et al. (2007)'s study.

We believe that comprehensiveness of usage is relevant and applicable to the SNS context. Most of the social networking sites such as Facebook are multifunctional systems in which user can choose among many different applications. For example, Facebook users can choose to play social games or chat with their friends on their walls. Extensive use of the SNS fosters user's familiarity with the site which, in general, should positively influence the user's satisfaction. Thus, we propose

> H3: *The level of comprehensiveness of usage in online social networking sites (SNSs) has a positive direct effect on the habit in using online social networking sites (SNSs).*

Frequency of Prior Behavior

A significant precondition for the development of habit is that the behavior in question should be performed repetitively (Kim et al. 2005; Limayem et al. 2007). In fact, with sufficient repetition, individual gains adequate practice and learning of the particular behavior. The increased familiarity through practice decreases the cognitive efforts one needs on performing that behavior (Limayem et al. 2007). Therefore, the more often one performs the behavior, the more likely that the behavior will become a habit (Charng et al. 1988; Wittenbraker et al. 1983). Apart from this, the strength of habit was empirically found to be directly related to the frequency with which the behavior is performed (Aarts and Dijksterhuis 2000; Limayem et al. 2007). In line with these empirically evidences, we propose that

> *H4: The frequency of using online social networking sites (SNSs) in the past has a positive direct effect on the habit in using the online social networking sites (SNSs).*

OSN Dependency as a Moderator

Aforementioned, OSN dependency is a form of deficient self-regulation with which SNS users are unable to effectively regulate their dependence in both cognitive and behavioral aspects. Referring to the social

cognitive theory of self-regulation, self-regulation is done through three processes – self-observation process, judgmental process, and self-reaction process (Bandura 1991; 2001).

Individual who suffers from OSN dependency lack ability to effectively self-observe in the self-observation process, he or she is likely to provide himself/ herself with poor self-diagnostic information. As a result, he or she is likely to come up with a biased judgment in the judgmental process. In the cognitive aspects, Caplan (2010) found that individual who is unable to self-regulate effectively demonstrate "salience" symptom. Specifically, OSN dependent is consciously preoccupied with thoughts about the social networking sites. They are unable to get their mind off the issue.

Prior research empirically showed that addictive behaviors are often accompanied by a number of psychological processes which are responsible for forming cognitive bias which affects and distort user's perceptions of external and internal factors (Perl et al . 1997; Greenfield and Rogers 1999) including one's belief on the system at hand (Serenko et al. 2009; Turel et al. 2010). Often, addicts/dependents' perception is distorted to an extent in which they might impair their views of reality so as to justify their own behaviors (Coombs 2004; Serenko et al. 2009). The cognitive bias, which takes the form of preoccupation, and exerts a positive "framing effect" on the benefit they could obtain from using the social networking sites. Addicts/dependents are only able to see the positive side of using the system but ignore or minimize the negative views.

As mentioned in prior session, maintaining interpersonal interconnectivity is one of the significant values perceived by individuals in using the SNSs (Shi et al. 2010). OSN addicts/dependents are very likely to condition their mind with the benefits of using the SNS site, overstating the value they could obtain from using the SNSs. Thus, we propose that

> *H5: The Online social network dependency positively moderate the relationship between the level of maintaining interpersonal interconnectivity and the satisfaction in using online social networking sites (SNSs).*

OSN Dependency as a Direct Effect

According to social cognitive theory of self-regulation, individual who suffers from OSN dependency does not only lack ability to effectively self-observe but also the ability to self-react to the environment. As a result, the individual is not able to consciously control his or her behaviors. In the behavioral aspects, Caplan (2010) found that individual who is unable to self-react demonstrate "relapse and reinstatement" symptom.

Habit strength is likely to be increased when a behavior is not under conscious control (LaRose 2003). Human information processing and learning not only take place when a behavior is consciously repeated, they will also take place when a person is inattentive to the behavior in question (LaBerge and Samuels 1974). Similarity, the increased familiarity through practice decreases the cognitive efforts one needs on performing that behavior (Limayem et al. 2007).

The repeated failure in attempting to self-react to the environment could be recognized situational cue that aid the formation of habit. With this notion, we propose that

> *H6: The Online social network dependency has a positive direct effect on the habit in using the online social networking sites (SNSs).*

Study Design and Method

This session below describe in detail the data collection procedure employed, the measurements used, and the type of data analysis performed.

Data Collection

Facebook (www.facebook.com), an online social networking site, was used in this study. We believe that Facebook is appropriate for the current study due to the surge of its popularity globally. Facebook has surpassed MySpace and become the most popular social networking site.

Data was collected through a web-based field survey to test and empirically validate the research model. A convenience sample of Facebook users were created by inviting volunteers to participate in our study. An invitation message with the URL to the online questionnaire was posted on a number of platforms including Facebook, MySpace, MSN, and weblogs. A screening question was used to ensure that the respondents were current active users of Facebook. A total of 406 usable questionnaires were collected. There were no missing values in the questionnaire. Among the respondents, 50.2 percent were female. Over 70 percent of the respondents aged between 21 and 30.

Measurement

Measurements in this study were based on validated seven-point Likert scales. We modified the wordings of the questionnaire in order to fit the Social networking site context. Online social network dependency (OSN dependency) was measured by two subconstructs – (1) Cognitive preoccupation and (2) Compulsive use of SNSs (CU). Items for both sub-constructs were adapted from Caplan et al. (2002; 2010). Habit was assessed using the measures from Limayem et al. (2003). Items for satisfaction were adapted from Bhattacherjee, 2001. The scale for comprehensive of usage and frequency of prior behavior includes items adapted from Limayem et al. (2007). Items for maintaining interpersonal connectivity were adapted from Dholakia et al. (2004). See Appendix for the full items used.

Data Analysis

The data analysis was performed in a holistic manner using partial least square (PLS) path modeling. PLS technique is chosen because of its ability to model latent constructs under conditions of non-normality and in small-to medium sized samples (Ringle et al 2005, Chin 1998, Chin and Gopal 1995, Compeau and Higgins 1995). It allows one to both specify the relationships among the conceptual factors of interest and the measures underlying each constructs, resulting in a simultaneous analysis of the measurement model and structural model. The technique is appropriate for testing theories that are in an early stage of their development. In our analysis, the path weighing scheme was used. Test of significant of all path were performed with using the bootstrap resampling procedures with 200 iterations. Finally, the item product-indicator approach, as suggested by Chin et al. (2003), was used to test the moderating effect of online social network dependency. SmartPLS version 2.0 was used.

Measurement Validity

As we modeled online social network dependency (OSN dependency) as a second-order construct, we first analyze the measurement properties of the reflective construct and sub-constructs of the instrument. Then we replaced first-order reflective constructs with their latent variable scores, as suggested by Wang and Benbasat (2005). This allowed us to test for the validity of the second-order construct and the analysis of the structural paths.

Convergent Validity

Convergent validity indicates the extent to which the items of a scale that are theoretically related are also related in reality. Table 1 presents information about the loadings of the measures of our research model. All items have significant path loadings at the 0.01 level. All our measures fulfill the recommended levels concerning composite reliability and average variance extracted. As shown in Table 1, all items were higher than 0.50 as recommended by Fornell and Larcker (1981). All the values of composite reliability and average variance extracted are considered satisfactory, with composite reliability at 0.850 or above and average variance extracted at 0.535 or above.

Discriminant Validity

Discriminant validity involves checking whether the items of a scale measure the construct in question or other related constructs. Discriminant validity was verified with the squared root of the average variance extracted for each construct higher than the correlations between it and all other constructs (Fornell and Larcker, 1981). Table 2 shows that each construct shares greater variance with its own block of measures than with the other constructs representing a different block of measure.

Test for Common Method Bias

To test for the common method variance (CMV), we first conducted Harman's single-factor test (Podsakoff et al .2003), we did not find any single factor emergence to explain the variance in our analysis, inferring that the common method bias is not high in our study. We then conducted a second test by following the technique suggested by Podsakoff et al. (2003) and Widaman (1985). This technique suggested that the addition of a method factor to the latent construct model must not significantly improve the fit over the model with just the latent constructs specification. The LISREL analyses were run on 12 indicators (4 from the Satisfaction measure, 8 from the habit measure) with two latent constructs (satisfaction and habit) and a method factor. Result showed that the fit of the model did not improve significantly with the addition and specification of method parameters over the latent construct specification alone. Therefore, common method bias was considered not to be a problem with this dataset.

Table 1. Psychometric Table of Measure					
Construct	**Item**	**Loading**	**St. Error**	**t-value**	
Second Order Construct:					
Online Social Network Dependency					
CR=0.930	CP	0.959	0.031	133.257	
AVE=0.870	CU	0.906	0.030	61.160	
First Order Construct:					
Online Social Network Dependency: Cognitive Preoccupation (CP)					
CR=0.941	CP1	0.881	0.016	53.970	
AVE=0.763	CP2	0.899	0.015	60.953	
	CP3	0.876	0.016	54.203	
	CP4	0.860	0.028	30.290	
	CP5	0.849	0.030	28.192	
Online Social Network Dependency: Compulsive SNS Use (CU)					
CR=0.923	CU1	0.912	0.012	76.490	
AVE=0.752	CU2	0.878	0.022	40.223	
	CU3	0.749	0.054	13.926	
	CU4	0.920	0.010	87.923	
Maintaining Interpersonal Interconnectivity (MII)					
CR=0.850	MII1	0.873	0.024	36.28 2	
AVE=0.739	MII2	0.847	0.032	26.81 1	
Frequency of Prior Behavior (FREQ)					
CR=0.860	FREQ1	0.856	0.032	26.245	
AVE =0.754	FREQ2	0.890	0.021	41.97 2	
Comprehensiveness of Usage (UCOMP)					
CR=0.882	UCOMP1	0.700	0.031	22.654	
AVE=0.535	UCOMP2	0.634	0.038	16.824	

| | UCOMP3 | 0.803 | 0.020 | 39.820 | |
	UCOMP4	0.779	0.023	33.153	
	UCOMP5	0.707	0.033	21.729	
	UCOMP6	0.545	0.059	5.851	
	UCOMP7	0.601	0.038	15.624	
	UCOMP8	0.700	0.031	22.683	
	UCOMP9	0.651	0.040	16.445	
	UCOMP10	0.573	0.047	12.135	
Satisfaction (SAT)					
CR=0.916	SAT1	0.858	0.017	16.824	
AVE=0.733	SAT2	0.885	0.015	39.820	
	SAT3	0.844	0.025	33.153	
	SAT4	0.835	0.024	21.729	
Habit (HAB)					
CR= 0.960	HAB1	0.866	0.020	42.751	
AVE=0.798	HAB2	0.910	0.012	74.407	
	HAB3	0.921	0.011	85.328	
	HAB4	0.851	0.025	34.058	
	HAB5	0.883	0.015	60.293	
	HAB6	0.928	0.009	102.51	
	HAB7	0.934	0.009	102.423	
	HAB8	0.846	0.020	41.468	

Table 2. Corrections Between First Order Constructs with Reflective Measures (Diagonal Elements are Square Roots of the Average Variance Extracted)							
	CU	CP	MII	FREQ	UCOMP	SAT	HAB
Compulsive SNS use (CU)	0.873						
Cognitive Preoccupation (CP)	0.743	0.867					
Maintaining Interpersonal Interconnectivity (MII)	0.265	0.386	0.860				
Frequency of Prior Behavior (FREQ)	0.171	0.232	0.226	0.86/8			
Comprehensiveness of Usage (UCOMP)	0.313	0.456	0.548	0.292	0.731		
Satisfaction (SAT)	0.171	0.273	0.390	0.171	0.407	0.856	
Habit (HAB)	0.345	0.460	0.536	0.349	0.534	0.532	0.893

Result

Figure 2 shows the results of testing of our research model with overall explanatory powers, estimated path coefficients (all significant paths are indicated with an asterisk), and associated t-value of the paths.

This model accounts for 18.9 percent of variance in satisfaction and 47.0 percent of the variance in habit. As such, the findings lead support to the proposed research model, and demonstrate how online social network dependency, comprehensiveness of usage, frequency of prior behaviors and satisfaction play a role in predicting habit.

Figure 2. Standardize Path Coefficient for the Structural Model
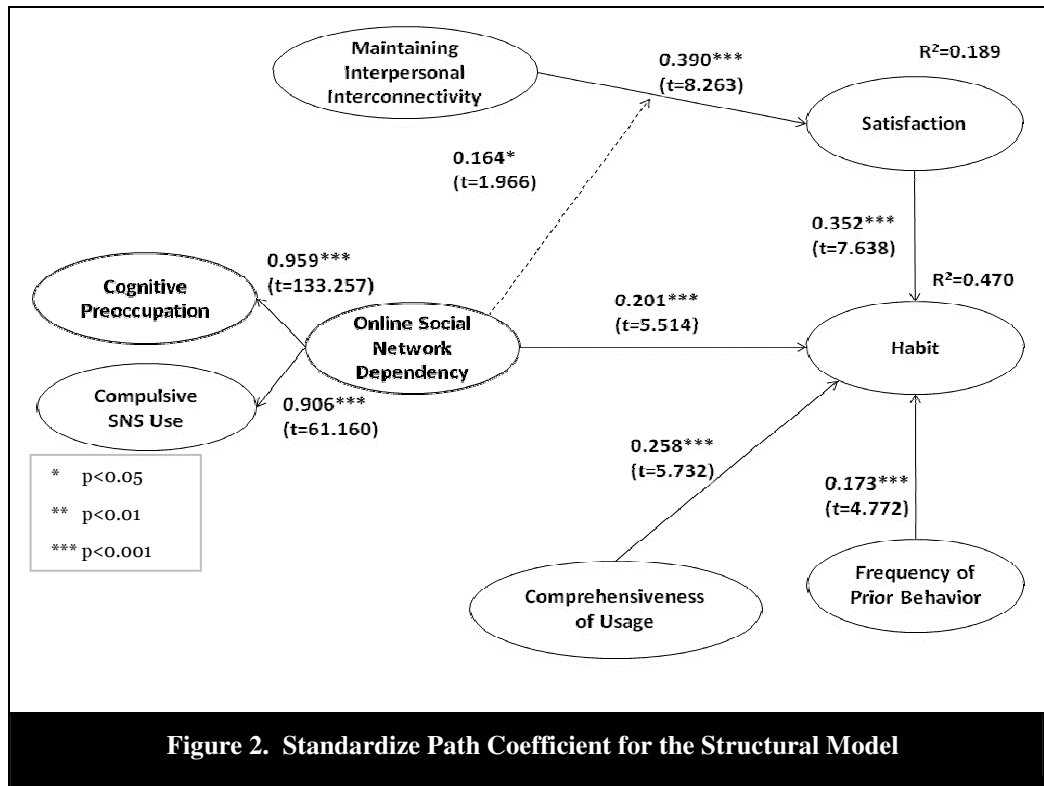
As shown in figure 2, all hypothesized paths (H1 to H6) in the research model were found statistically significant. Thus, all the hypotheses were supported.

The result of the study indicated that online social network dependency have both positive direct and indirect effect on habit. Satisfaction was the most significant exogenous variables of habit with a path coefficient of 0.352 and t-value of 7.638. Then followed by comprehensiveness of usage ($\beta= 0.258$, t=5.732), and online social Network Dependency ($\beta= 0.201$, t=5.514). Frequency of prior behavior was the least significant variable with a path coefficient of 0.179 and t-value of 4.772.

When testing for interaction effects (H5) using PLS, chin et al. (1996) recommend following a hierarchical process where one compares the results of two models – (i.e. one with and one without the interaction construct). We have also checked our procedure, data, and interpretation against a check list provided by Carte and Russell (2003), and have met the nine conditions indicating no error of commission have been made.

The R^2 of Satisfaction for the main effect model was 0.153. When including the interaction term, R^2 for satisfaction is 0.189. Overall effective size F^2 was calculated by formula suggested by Cohen (1998). $F^2 = [R^2 \text{ (interaction model)} - R^2 \text{ (main effect model)}]/ [1 - R^2 \text{ (main effect model)}]$. We found F^2 to be 0.044

which represents a medium effect (Chin et al.2003). The inclusion of the interaction effects indicates an equally strong beta of 0.164 increasing the R^2 to 0.189.

Discussion and Conclusion

The objective of this study is to investigate the role of online social network dependency in habit formation. Social cognitive theory of self-regulation is adopted to explain the phenomenon. The results show that online social network dependency significantly predicts habit. It also positively moderates the relationship between maintaining interpersonal connectivity and satisfaction, impacting habit indirectly via satisfaction.

Our results are consistent with the prior research on habit (Limayem et al 2007). Frequency of prior behavior, comprehensiveness of usage and satisfaction are found to be significant predictors of habit in the context of online social networking sites. Frequency of prior IS use has been postulated as the most significant factor affecting the formation of habit in the IS context. However, our results indicate that frequency of prior behavior was the least significant exogenous factors of habit, offering an alternative view to the issue.

Besides, the explanatory power of habit has improved a lot when compared to the results of prior studies. Limayem et al (2007) modeled frequency of prior behavior, comprehensiveness of usage and satisfaction as the antecedents of habit in the context of university undergraduate student's World Wide Web use. The model explains only 22 percent of the variance, while we include online social network dependency in our current investigation of SNSs, the explanatory power of habit has doubled (R^2=0.470).

In addition, prior research in psychology discipline suggests that addiction distorts one's perceptions. Consistent with this argument, we found that addicts/dependents overstate the value they could obtain from SNSs through positive framing. This positive lens biases the addicts/dependents towards the view that the social networking sites could best fulfill their needs for interpersonal connection.

Theoretical and Practical Implications

This study makes several important contributions to future research. First, this study is one of the very first studies which attempt to understand the formation for habit through the lens of technology dependency. To date, there is a lack of understanding of the concept of technology dependency and little theoretical and empirical attention has been given to how technology dependency relates to the formation of habit in the context of SNSs. As habit is an important factor in IS continuance study, further elaboration on habit formation helps enriching the existing literature of IS continuance. Significant improvement in predictor power of habit also suggests that we have contributed in deriving a comprehensive model in examining the antecedents of IS habit in the context of SNSs. Second, this study has successfully applied the psychological insights into the explanation of the concept of technology dependency, how it relates to habit formation, and how it distorts the relationship between maintaining interpersonal interconnectivity and satisfaction. Furthermore, this study adheres to the calls by American Medical Association as well as Serenko et al. (2008) to further investigate the concept of addiction and its consequences. Our results highlight the important of this line of inquiry and have introduced potential link to new theory. Finally, this study provides social media marketers a better understanding of how habit can be formed in SNSs. Particularly, individuals who have high technology dependency will tend to exert a positive "framing effect" on the benefit they could obtain from using the SNSs, and thus have a higher tendency to form habit.

Limitations and Future Research

While this study focused on dependency to a single technology – social networking sites, it is certainly plausible that similar links exist in other technology settings such as mobile technology. We believe that habit involves different stages of formation. Technology dependency may play different roles in determining the habit formation, thus a longitudinal design is needed in the future.

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Appendix

Construct	List of Items
Online Social Network Dependency: Cognitive Preoccupation (CP)	CP1: I am preoccupied with Facebook if I cannot log on for some time. CP2: I miss being on Facebook if I cannot go on it. CP3: When not on Facebook, I wonder what is happening there. CP4: I feel lost if I cannot go on Facebook CP5: It is hard to stop thinking about what is waiting for me on Facebook
Online Social Network Dependency: Compulsive SNS Use (CU)	CU1: I want to, or have made unsuccessful efforts to, cut down or control my use of Facebook CU2: I feel guilty about the amount of time I spend on Facebook CU3: I have tried to stop using Facebook for long periods of time. CU4: I have attempted to spend less time on Facebook but have not been able to
Maintaining Interpersonal Interconnectivity (MII)	MII1: To have something to do with others MII2: To stay in touch
Frequency of Prior Behavior (FREQ)	USE1: On average, how frequently have you visited Facebook over the past month? USE2: Approximately how many times have you visited Facebook over the past month?
Comprehensiveness (UCOMP)	UCOMP1:Writing my feelings/thoughts on News Feed UCOMP2:Reading my friends' profiles/pictures/videos UCOMP3: Writing comments on my friends' Facebook activities (e.g., photos, videos, news feed, and etc.) UCOMP4: "Like" my friends' activities (e.g. photos, videos, news feed, and etc.) UCOMP5: Posting things on Facebook (e.g. photos, videos, notes, link, and etc.) UCOMP6: Playing online games UCOMP7: Communicating with friends (e.g. online chat/"inbox") UCOMP8: Participating in Facebook groups/Fans/Events Pages UCOMP9: Sending friend requests on Facebook UCOMP10: Managing profile settings on Facebook (e.g. friend lists, privacy, page outlook, and etc.)
Satisfaction (SAT)	My Experience with Facebook is: SAT1: Extremely satisfying/dissatisfying SAT2: Extremely displeasing/pleasing SAT3: Extremely frustrating/contented SAT4: Extremely terrible/delighted
Habit (HAB)	HAB1: I use Facebook automatically HAB2: I use Facebook as a matter of habit HAB3: Using Facebook has become automatic to me HAB4: I normally use Facebook without explicitly planning to do so HAB5:Using Facebook is natural to me HAB6:Using Facebook has become a habit to me HAB7:It is a habit of mine to use Facebook HAB8:I visit Facebook whenever I use Internet browser