Technology Addictions and Technostress: An Examination of Hong Kong and the U.S.

Full Paper

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Abstract

In today's technology-centric world, people are becoming increasingly dependent on the Internet. The most common use of the Internet is through social media, which are used to communicate, share, collaborate, and connect. However, continued usage of a hedonic system can be linked with compulsion or addiction. Since problematic usage/behaviors can lead to negative outcomes, this manuscript aims to determine differential effects of Internet and social media addictions on social media-related technostress. This is examined in two different cultures: the U.S. and Hong Kong. The results support the association between Internet and social media addictions with increases in social media-related technostress. Additionally, these effects are moderated by culture. Implications for research and practice are discussed along with future directions for this stream.

Keywords

Technostress, Social Media, Addiction, Internet Addiction, Cross-Cultural

Introduction

In today's technology-centric world, people are becoming increasingly dependent on the Internet for their jobs, their information needs, and their entertainment. In 2014, the United States was estimated to have a broadband Internet penetration of over 70%, a number expected to increase even further (Laudon and Traver 2014). Additionally, the overall trend is towards spending ever-increasing amounts of time on the Internet. In 2013, it was estimated that the average U.S. Internet user spent at least 2 hours per day using the Internet (e.g. Laudon and Traver 2014).

The usage of social media has become one of the most popular activities on the Internet (Socialnomics.net 2012). In 2012, 86% of online adults in the U.S. and 79% of online adults in Europe used social media (Fleming 2012), and in 2011, it was estimated that there were a combined 2.3 billion registered users for the ten most popular social networking websites worldwide (Socialnomics.net 2011). As of 2015, Facebook alone had over 1.44 billion active users (Facebook 2015). On average, 27% of time spent using the Internet is with social media, more than for entertainment, email, and news combined (Tatham 2013).

Yet, despite (or because) of its widespread use, social media has given rise to various negative effects. In particular, social media has been associated with various "dark side" phenomena, such as addictive behavior (Kuss and Griffiths 2011; Patterson 2012), negative emotional states such as depression (e.g. Brooks and Longstreet 2015), and lower performance (Brooks 2015). While past research has provided a foundation for understanding this phenomenon, it is not understood if the findings are globally generalizable or if it varies by culture.

In this paper, we aim to determine the differential effects of Internet and social media addictions on social media-related technostress. Further, we investigate the influence of culture in these relationships. Drawing on the *Cognitive-Behavioral Model of Pathological Internet Use* (Davis 2001) and focusing on the cultural dimension of *Uncertainty Avoidance* (UA, Hofstede, 2001), we develop a model of technology addiction and test the model using participants from a high-UA culture, the United States and from a low-UA culture, Hong Kong.

In the following, we will provide a brief overview of Internet and social media addictions and technostress. Then, we will present the hypotheses that form our research model. Afterwards, we present the methodology and analysis, before discussing the results, implications for theory and practice, and future directions for this research.

Background

Internet and Social Media Addiction

In many cases, using information systems (IS) can be as intrinsically rewarding as taking substances, and can hence be addictive (Han et al. 2010, 2011). In the field of psychology, Internet addiction has been recognized as a mental disorder that could potentially affect millions of users (Block 2008; Young 1998). Internet Addiction is the state where use of the Internet becomes compulsive; the user starts to develop a dependence on the Internet for their psychological well-being, and the user experiences unpleasant feelings when deprived of the Internet. This creates a state where the user feels that they need the Internet to function in their daily lives, a state sometimes referred to as "pathological Internet usage" (PIU; Davis 2001).[1]

The Cognitive-Behavioral Model of Pathological Internet Use explains how Internet usage can become pathological Internet usage for a subset of all Internet users (Davis 2001). For this subset, PIU can be classified as either generalized (involving the Internet as a whole) or specific (involving a subset of specific activities on the Internet). For both forms of PIU, behavioral symptoms will manifest, recursively influencing the maladaptive cognitions that helped to form the PIU. These behavioral symptoms are often investigated as cognitive symptoms, but emotional effects can result as well (Davis 2001). In this paper, we investigate both the general PIU and a specific PIU—that of social media. In particular, social media is examined due to its widespread use and potentially addictive qualities. By investigating a specific platform within the Internet, a deeper understanding of the factors underlying PIU can be gained. For example, social media is a primarily hedonic technology that users voluntarily use in the pursuit of enjoyment. However, many uses of the Internet are utilitarian rather than hedonic, and users do not gain enjoyment from their usage. Paying bills, reviewing literature, and examining the weather forecast may all be utilitarian uses of the Internet, and would likely have different effects.

Given the ubiquitous nature of Internet technologies in the modern environment, social media addiction—a subset of Internet addiction—has become especially prevalent. Individuals are using various Internet connected devices to check for status updates, friend requests, news feed updates, and much more. Often, the user is performing these actions in pursuit of diversion, self-presentation, and relationship building, pursuits that have been shown to be positively related with social media addiction (Chen and Kim 2013).

Social Media-Related Technostress

Technostress is any negative impact on attitudes, thoughts, behaviors, or body physiology that is caused by technology (Weil and Rosen 1997). Symptoms of technostress include the inability to focus one's attention, increased irritability, and the feeling of loss of control (Ibrahim et al. 2007). Technostress can be caused by overuse of a technology in a particular situation, particularly when the technology involved is not primary task-related (Brooks 2015).

Of the five technostress creators identified by Tarafdar et al. (2007), three are of specific interest, namely overload, invasion, and complexity. Overload occurs when users have to spend more time working (or have to work faster) due to social media use, and can lead to multitasking and trying to accomplish different information-processing tasks simultaneously. Multitasking in excess can lead to hurried and ineffective information processing, resulting in reduced performance (Fisher and Wesolkowski 1999). Invasion occurs as social media enable people to be reached anytime; due to continuous connection to social media, the boundaries between work and personal life blur, leading to negative effects on both work performance and personal lives. Invasion may impair performance because of unnecessary interruptions to work. Complexity describes situations where users need to invest time and cognitive resources to understand and master social media due to increasing intricacy of the technologies. These three conditions were selected as they are directly applicable to the context

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[1] For the purposes of this study, both terms (Internet Addiction and PIU) are treated as synonymous.

of the study. The other two creators identified by Tarafdar et al., insecurity and uncertainty, were not included because they are not applicable to the sample. In particular, insecurity is refers to users feeling threatened about job security, and uncertainty arises from users' perceived needs to constantly learn about new social media. Insecurity and uncertainty would be primarily applicable for situations where the users' primary job functions revolved around social media usage. Since the sample being investigated does not use social media as part of their job functions, these two creators are not applicable.

Hypothesis Development

Internet and Social Media Addiction

With its focus on enjoyment and hedonic aspects, social media use can lead to the development of a strong use habit (Limayem et al. 2007; Limayem and Cheung 2011) and a diminished sense of volitional control (Thomée et al. 2007), which in turn serves as a prerequisite for the formation of high levels of compulsive and addictive usage (Thomée et al. 2007; Turel and Serenko 2012). Synthesizing introspective essays about Facebook, Patterson (2012) concluded that:

> "...the most striking theme to initially emerge was how deeply immured, how intractably integrated Facebook had become in each of their [the interviewees] lives. To say that many of them displayed symptoms of near psychotic dependence on Facebook akin to that of a drug addict, would not be to overstate the case. The site's addictive nature was specifically mentioned no less than 131 times in the data set. Getting a daily, hourly, even minute by minute, Facebook fix was incredibly important..."

The continued rapid growth and penetration of Internet-connected devices and end-user computing enhances the severity of technostress (Brillhart 2004). Studies have supported this statement by providing support for the positive relationship between technology usage (smartphones) (Lee et al. 2014) and social media usage in the classroom (e.g. Brooks 2015) with increases in technostress. Compulsive behaviors concerned with technology usage share similarities with other compulsive behaviors such as drug and alcohol addiction (Haynes and Ayliffe 1991) and credit card exploitation (Watson 2009). Each of these compulsions result in negative outcomes including stress.

As a subset of Internet addiction, social media addiction (Tamir and Mitchell 2012) likely shares a multitude of negative impacts on an addict's life, including depression (Iacovelli and Valenti 2009), loneliness (Morahan-Martin and Schumacher 2000), and increased stress (Whang et al. 2003). Excessive social media usage can result in negative internal effects (e.g., emotional states) as well as external effects (e.g., lost time and decreased performance) (Turel and Serenko 2012). Since social media addiction is conceptually a part of Internet addiction, the two constructs will likely be highly correlated. However, given the specific uses of social media as a hedonic technology, we argue that Internet addiction will not be able to fully explain the effects on technostress. Thus, both Internet addiction and social media addiction, which pertains to overuse and dependency on a technology, should lead to increases in technostress.

H1: Internet addiction will have a positive relationship with social media-related technostress.

H2: Social media addiction will have a positive relationship with social media-related technostress.

Cultural Differences

People in different countries or regions may have different patterns of using social media. Therefore, it is important to examine how Internet and social media addiction influence technostress in different countries. McCoy et al. (2005) also suggest that as "globalization of businesses and systems continues to increase, our understanding about the adoption and use of IT needs to apply to other cultures" (p. 211).

One lens to understand the differences between countries or regions is national cultures, which refer to "the collective programming of the mind that distinguishes the members of one group or category of people from another" (Hofstede 2001, p. 9). Hofstede (2001) proposes five dimensions of national cultures: power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity, and long/short term orientation. Hofstede's culture dimensions have been widely applied in various contexts in previous cross-cultural IS studies, such as customer satisfaction (Lee et al. 2009) and

purchase behavior (Park et al. 2004) in e-commerce, Instant Messaging use (Li et al. 2010), and security awareness (Schmidt et al. 2008).

Among the five dimensions of national cultures proposed by Hofstede (2001), uncertainty avoidance—defined as "the extent to which individuals feel threatened by ambiguous situations" (p. 161)—is particularly relevant for our study. People with high uncertainty avoidance tend to establish formal rules and reject deviant ideas and behaviors to avoid all forms of uncertainty, while those with low uncertainty avoidance are comfortable with ambiguity and uncertain situations. Tarafdar et al. (2011) state that "technostress describes the stress that users experience as a result of ... information overload, frequent system upgrades and *consequent uncertainty* [italics added] ... and technical problems associated with the organizational use of ICT" (p. 304-305). They find that technostress is negatively related to end user satisfaction and performance. In the context of this study, creators of technostress include overload, invasion, and complexity, all of which involve general ambiguity and uncertainty.

As these three technostress creators are associated with feelings of uncertainty and ambiguity, it stands to reason that cultural differences may influence the effects of Internet and social media addiction and technostress. In other words, as people have a higher ability to cope with uncertainty, technostress is less likely to arise. In particular, social media addiction and Internet addiction are likely to result in a high level of technostress for people from cultures high in uncertainty avoidance. In contrast, for people from cultures low in uncertainty avoidance, social media addiction and Internet addiction are likely to result in lower levels of technostress. Therefore, we hypothesize that:

H3a & b: Culture will moderate the effects of a) Internet addiction and b) social media addiction on social media-related technostress, such that the effects will be stronger for people from cultures high in uncertainty avoidance than for people from cultures low in uncertainty avoidance.
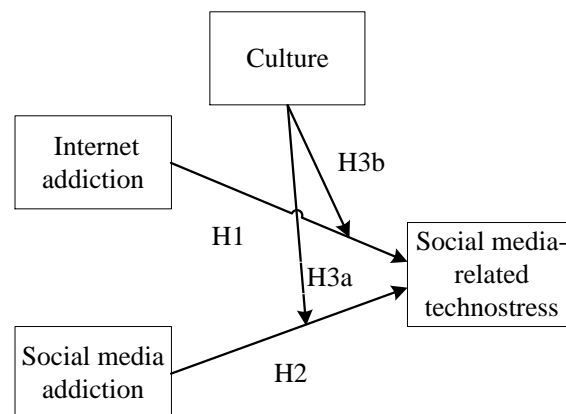
Figure 1. Research Model

Methodology

Sample and Data Collection

To test our hypotheses, we conducted a survey of social media users in the U.S. and Hong Kong (HK). Following Hofstede (2013), the U.S. has a higher uncertainty avoidance index than HK (46 vs. 29). In other words, people from Hong Kong are more comfortable with ambiguity and uncertainty than people from the US.

The American participants were undergraduate students from a northwestern public university in the U.S.; the HK participants were from an urban university in Hong Kong (almost all being natives of Hong Kong). The same sampling procedure was used in both study sites to establish sample equivalence (Karahanna et al. 2002). For participants from the U.S., bonus course credit (about 1% of their final grades) was provided to motivate participation.

Some cross-cultural studies translate instruments developed in one language into another language (Brislin 1986). However, following previous literature (e.g., Li, Chau, & Van Slyke, 2010), we used the English questionnaire for both samples rather than translating the questionnaire into Chinese for the HK participants for two main reasons. First, Triandis (1994) argues that "it is ideal to gather the data in each culture by using the same procedures but without translating specific items" (p. 81) to

maintain cross-cultural equivalence. Also, a term in one language may not have an equivalent term in another language (Zhao, Flynn, & Roth, 2006). Therefore, it may not be possible to maintain the original meaning in English after translation. Second, the participants from HK were from a university where English was used as the language of instruction, and the survey administrators were available to clarify any misunderstandings about the wording of the questions to the participants. Therefore, it is reasonable to assume that our participants did not have trouble understanding the questionnaire.

We carefully examined each record and removed careless and incomplete responses. In total, we obtained 300 valid responses: 245 for the U.S. sample and 55 for the HK sample. Table 1 provides sample demographics.

	Gender	Age	Social Media Usage (hours/week)
Hong Kong	38% Male	Mean = 23.2	Mean = 22.3
United States	56% Male	Mean = 24.5	Mean = 17.4

Table 1: Sample Demographics

Measures

We adopted measures from previous research. Social media addiction (SMA) was measured using items from Pelling and White (2009). Items in this scale are measured on a 7-point Likert-type scale anchored at strongly disagree and strongly agree. The items include "I often think about social media sites when I am not using them," and "I often use social media sites for no particular reason." Internet addiction (IA) was measured using the IAT (Young 1998), a scale that is frequently used in studies of internet addiction (e.g. Widyanto and McMurran 2004).

Technostress is frequently measured using instrument developed by Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2007). However, as the original items were written to be applicable for working professionals, we reworded the questions to be based on social media to make the items applicable for this study. These reworded items are our instrument for social media-related technostress (SMRT).

Additionally, we included age and gender in the analysis as control variables.

Data Analysis and Results

We used SmartPLS 2.0 (Ringle et al. 2005) for our data analysis. Our choice of PLS was based on the following considerations (Hulland 1999): First, PLS works well with small-to-medium sample sizes; in this study, data analysis was conducted for the whole sample as well as for separate samples, and the HK sample has a relatively small sample size. Second, PLS is well suited to exploratory research. Consistent with prior research, we analyzed our model in two stages (Gefen and Straub 2005): measurement model assessment and structural model assessment.

To begin, items with insignificant primary loadings (t < 1.96) and/or items with path weights lower than .5 were removed from the model. To assess the measurement model, convergent validity was established by satisfying the following three criteria (Gefen & Straub, 2005; Hulland, 1999): First, each remaining item loaded significantly on their respective constructs, and none of the items loaded on their constructs below the cutoff value of 0.5 (Table 3). Second, the composite reliabilities (CRs) of all constructs were above .7 (Table 2). Finally, the average variance extracted (AVEs) of all constructs was above the threshold value of 0.5 (Hair et al. 2013) (Table 3). Discriminant validity was confirmed by ensuring that the correlations between constructs were below .85 (Brown 2012) and that for each construct, the square root of its AVE exceeded all correlations between that factor and any other construct (Table 3). Thus, our measures demonstrate good psychometric properties. Next, we discuss the results of our hypothesis testing.

Item	Mean	S.D.	Loading	AVE	CR
SMA1	3.52	1.66	0.73		
SMA3	3.31	1.84	0.71		
SMA4	3.48	1.71	0.80	0.57	0.89
SMA6	3.96	1.62	0.64		
SMA8	3.31	1.74	0.81		
SMA11	3.25	1.62	0.79		
IAT2	2.31	1.19	0.71		
IAT4	2.40	1.15	0.77		
IAT5	2.23	1.20	0.74		
IAT6	2.30	1.20	0.81		
IAT7	2.51	1.10	0.67		
IAT8	2.41	1.16	0.78		
IAT9	2.43	1.16	0.79		
IAT10	2.59	1.17	0.81	0.59	0.95
IAT11	2.65	1.33	0.70		
IAT12	2.24	1.10	0.75		
IAT14	2.27	1.17	0.85		
IAT17	2.42	1.18	0.73		
IAT19	2.70	1.16	0.76		
IAT20	2.03	1.11	0.78		
SMRT2	2.11	1.03	0.77		
SMRT3	2.49	1.14	0.77		
SMRT4	2.91	1.16	0.68		
SMRT5	2.46	1.07	0.80		
SMRT6	2.36	1.19	0.72	0.59	0.93
SMRT7	2.73	1.17	0.67		
SMRT8	2.30	1.13	0.77		
SMRT10	2.38	1.06	0.76		
SMRT14	2.42	1.08	0.81		

Table 2: Items and Descriptive Statistics

	ITA	SMA	SMRT
ITA	**0.77**		
SMA	0.75	**0.76**	
SMRT	0.75	0.71	**0.77**

Table 3. Correlations between Constructs and Square-root of AVEs (on diagonal)

We assessed the structural model with R^2 measures (Gefen et al. 2000), which represents the amount of variance in the dependent variable explained by the independent variables, and path coefficients, which indicate the strength and significance of relationships between constructs. We first examined the whole sample. As gender and age were not significantly correlated with social media-related technostress, they were removed from the subsequent analysis. As shown in Figure 2, both Internet addiction ($\beta = .505$, $p < .001$) and social media addiction ($\beta = .332$; $p < .001$) are positively related to social media-related technostress, supporting H1 and H2.
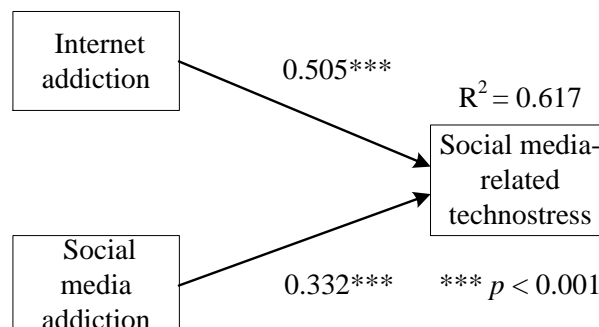
Figure 2. Path Model Results

To examine differences between the two cultural samples, the structural model was analyzed using SmartPLS Multi-Group Analysis. As can be seen from Table 4, the relationships of social media addiction and Internet addiction to SMRT were both significant for both samples. We conducted SmartPLS's multi-group analysis to test for significance of the differences between the groups' paths in the model. However, in contrast to H3, the differences were not significant.

	U.S. (n = 245) Path Weight (SE)	H.K. (n = 55) Path Weight (SE)	Multi-Group Analysis p-value
Internet Addiction --> SMRT	.502*** (.0639)	.356* (.1522)	P = .22
Social Media Addiction --> SMRT	.346*** (.0671)	.305*(.1429)	p = .45
R²	.632	.362	

$* p < 0.05, ** p < 0.01, *** p < 0.001$

Table 4. Path Model Results for Each Sample

Discussion

This study examined how Internet and social media addiction influence social media-related technostress. Based on data collected from U.S. and HK, we found that Internet and social media addiction are positively related to technostress. While the patch coefficients for the Hong Kong sample appear to be smaller, the differences were not significant. Next, we will discuss the theoretical and practical implications of our study.

Implications for Theory

Our study makes two primary theoretical contributions. First, we extend the Cognitive-Behavioral Model of PIU and literature on technostress by demonstrating that a subset of Internet addiction, namely social media addiction, is associated with increases in technostress separately from Internet addiction. Given the size, complexity, and numerous uses of the Internet, it is worthwhile to identify specific aspects that contribute both positively and negatively towards a user's well-being beyond that of the generalized Internet.

In contrast to our hypotheses, our cross-cultural comparison shows no significant cultural differences in the effects of Internet and social media addictions. We argued that uncertainty avoidance, one of Hofstede's culture dimensions, can be relevant to understanding the effects of Internet and social media addiction on technostress. As people with a lower level of uncertainty avoidance feel more comfortable with uncertainty and ambiguity, we argued that the effects of social media addiction and Internet addiction on social media-related technostress should be stronger for people from the U.S. than for people from HK. However, the results of a comparison between U.S. and HK participants are not consistent with this hypothesis. Though we were unable to detect statistically significant differences in this sample, there are many additional factors that should be analyzed to uncover the existence of potential cultural differences.

Implications for Practice

Our study also has important practical implications. First, the results from two datasets show that Internet and social media addiction are positively related to technostress. Therefore, practitioners should be aware that excessive use of the Internet and social media, whether addicted or not, can cause users to feel anxious and stressful, regardless if they are from U.S. or HK. When designing social media sites, developers may want to add reminders for users so that users may not use the sites too much. For example, if users stay a long time on a site during one day, the site can pop up a reminder message for users.

Second, our results show that the effect of Internet and social media addiction may be similar for people from different countries or regions. Developers can make design choices that impact multiple different constituencies with a degree of confidence given that similar results should occur.

Limitations and Opportunities for Future Studies

Our study also has limitations. First, while we attempt to address generalizability to additional environments by collecting data from two countries/regions, our results can still be limited, and future studies are needed to test our model in additional countries with other cultural backgrounds. Additionally, all respondents were students, so the findings may not be generalizable to the greater population. It is possible that the overall negative effects supported are amplified by students' constant need to use the Internet for their studies, and that other factors are confounding the results. As a counterpoint, it is also possible that the effects of this study are understated due to well-known issues with student subjects. Future studies in this research stream should use non-student samples such as working professionals and stay-at-home parents to determine generalizability.

Second, there are numerous culture-related factors that may impact the strength of the differences between the two cultures examined here. By not including measures of cultural differences in the structural model, our findings need additional support. Future research should include specific, measurable cultural factors in the model to determine specific cultural differences. Additionally, the sample size of HK participants is relatively small, which may not give us enough statistical power to detect possible cultural differences.

Finally, all measures were gathered using self-report items. Though self-reported perceptions are traditionally used in the collection of cognitive constructs, pairing the addiction variables with longitudinal measures of Internet and social media usage as direct measures would be beneficial. These direct measures paired with self-report scales could be used to provide more robust findings.

Notwithstanding these limitations, our findings open up a number of interesting opportunities for future research. One opportunity might be to further examine how other social factors can influence users' technostress. Future studies can also explicitly collect cultural as well as other country-level variables and examine their moderating effects.

Conclusions

Both Internet and social media addictions are significantly associated with increases in social media-related technostress. Interestingly, the strength of these relationships is not significantly stronger for users from the U.S. than users from HK. As we argued that the differences in culture between the two locations should have affected differences in relationship strength, this points to additional relevant factors that need to be examined to determine the true nature of these relationships. Either way, researchers and practitioners both must remember to take culture into consideration when examining behavior across countries.

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