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

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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 is 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 study 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 China. The results support the association between the 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

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

1. INTRODUCTION

In today's technology-centric world, people are becoming increasingly dependent on the internet for their jobs, their information needs, and their entertainment. By 2016, the United States had a broadband internet penetration of 73%, a number expected to increase even further (Pew Research Center, 2017a). Additionally, the overall trend is toward spending ever-increasing amounts of time on the internet. By 2013, it was estimated that the average U.S. internet user spent at least 2 hours per day using the internet (Laudon & Traver, 2014).

The usage of social media has become one of the most popular activities on the internet (Socialnomics.net, 2012). In 2016, 69% of online adults in the U.S. were social media users (Pew Research Center, 2017b). As of 2018, Facebook alone had over 2.23 billion monthly active users (Facebook, 2018). On average, 27% of time spent using the internet is with social media, more than for (non-social media) 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 behaviour (Kuss & Griffiths, 2011; Patterson, 2012), negative emotional states such as depression (e.g., Brooks & Longstreet, 2015), and reduced 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 the effects of social media use differ across cultures.

In this paper, we aim to examine differential effects of internet and social media addictions on social media-related technostress. Further, given the differences between cultures (Hofstede, 2001), we investigate the influence of culture in these relationships. To the best of our knowledge, no other study has investigated the links between internet and social media addiction to technostress using culture as a lens for examination. Drawing on the Cognitive-Behavioural Model of Pathological Internet Use (Davis, 2001) and focusing on the cultural dimension of individualism (Hofstede, 2001), we develop a model of internet and social media addiction and test the model using participants from the United States (a highly individualistic culture – Hofstede cultural score of 91) and China (a highly collectivistic culture – Hofstede cultural score of 20).

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 stream of research.

2. LITERATURE REVIEW

2.1. 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 psychiatry, internet addiction has been recognized as a mental disorder that could potentially affect millions of users. Internet addiction is being put forth by many for inclusion in the Diagnostic Statistical Manual (e.g., Block, 2008; Young, 1998). Reports have placed the percentage of the internet-using population at risk of internet addiction between 6% and 18.5% in the US and Europe (Young, 2011). China was the first country to officially recognize internet addiction disorder, and along with South Korea, supports education, research, and treatment (Block, 2008), and has even built numerous treatment facilities. 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 he or she needs the internet to function in their daily lives, a state sometimes referred to as 'pathological Internet usage' (PIU; Davis, 2001)[1].

The Cognitive-Behavioural 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, behavioural symptoms will manifest, recursively influencing the maladaptive cognitions that helped to form the PIU. These behavioural 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 (van der Heijden, 2004). 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 & Kim, 2013). Little prior research has examined internet and social media addictions concurrently. Longstreet and Brooks (2017) found that both addictions are affected by life satisfaction at different strengths, and found a correlation between the two constructs of .61. This implies that there are conceptual differences between the two constructs, and that social media addiction needs to be considered in addition to internet addiction, not as a part of it. In examining both of these addictions, we aim to obtain a more nuanced understanding of these constructs.

2.2. Social Media-Related Technostress

Technostress is any negative impact on attitudes, thoughts, behaviours, or physiology that is caused by technology (Weil & 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 primarily related to the task at hand (Brooks, 2015).

Tarafdar et al. (2007) identified five technostress creators, namely overload, invasion, complexity, insecurity and uncertainty. Of these, 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 & 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. We chose to focus on these three conditions, as they are directly applicable to the context of the study. The other two creators identified by Tarafdar et al. (2007), insecurity and uncertainty, were not included because they are not applicable to the sample. In particular, insecurity refers to users feeling threatened about job security, and uncertainty arises from users' perceived needs to constantly learn about new social media for their job. Insecurity and uncertainty would be primarily applicable for situations where the users' primary job functions revolved around social media usage, indicating usage for utilitarian purposes. Given the hedonic nature of social media use, these two technostress creators are not applicable in the present study.

3. HYPOTHESIS DEVELOPMENT

3.1. 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 & 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 & 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), social media usage in the classroom (e.g., Brooks, 2015), and increases in technostress. Compulsive behaviours concerned with technology usage share similarities with other compulsive behaviours such as drug and alcohol addiction (Haynes & Ayliffe, 1991) and credit card exploitation (Watson, 2009). Each of these compulsions results in negative outcomes including stress.

As a subset of internet addiction, social media addiction (Tamir & Mitchell, 2012) likely shares a multitude of negative impacts on an addict's life, including depression (Iacovelli & Valenti, 2009), loneliness (Morahan-Martin & 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 & Serenko, 2012). Since social media addiction is conceptually a part of internet addiction, the two constructs will likely be highly correlated, but the two constructs are not the same. Research has shown that individuals can become addicted to different aspects of internet usage, such as social media, online video gaming, pornography, texting, and online shopping (Andreassen et al., 2013, 2016; Chiu, Hong, & Chiu, 2013; Davenport, Houston, & Griffiths, 2012; Durkee et al., 2012; Ferguson, Coulson, & Barnett, 2011; Kuss, Griffiths, Karila, & Billieux, 2014; Maraz et al., 2015; Van Deursen, Bolle, Hegner, & Kommers, 2015). Given the specific uses of social media as a hedonic technology whereas internet usage can stretch the gamut from hedonic to utilitarian, we argue that internet addiction will not be able to fully explain the effects on technostress in this model. Thus, both internet addiction and social media addiction, which both pertain to overuse and dependency on a technology, should lead to increases in technostress.

H1: Social media addiction will have a positive relationship with social media-related technostress.
H2: Internet addiction will have a positive relationship with social media-related technostress.

3.2. 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) proposed dimensions of national cultures that have been widely applied in various contexts in previous cross-cultural IS studies, such as customer satisfaction (Lee et al., 2009) in e-commerce, Instant Messaging use (Li et al., 2010), health information seeking and sharing (Li et al., 2018) and security awareness (Schmidt et al., 2008).

Among the dimensions of national cultures proposed by Hofstede (2001), individualism / collectivism (as opposite ends of a spectrum) is particularly relevant for our study. Individualism / collectivism describes the relationship between individuals and a group, and whether individuals' interests are prioritized over those of a group (Hofstede, 2001). These cultures are different in several ways. One of the distinctions is people's self-construal (Markus & Kitayama, 1991), referring to whether people perceive themselves as independent or interdependent. People from collectivistic cultures are often 'attending to and fitting in with others and the importance of harmonious interdependence and relationships with them' (Markus & Kitayama, 1991, p. 224). In such a context, people put connectedness between themselves and others at the centre. As one of the main purposes of using social media is to build and maintain social relationships with others, people from a collectivistic culture are more likely to take advantage of social media and maintain their social

relationships. Therefore, the effect of social media addiction is likely stronger for those from cultures high in collectivism.

Another difference is people's personality orientation (idiocentric or allocentric) (Triandis, 1989). People from individualistic cultures are idiocentric, and feel comfortable to 'do their own thing,' emphasizing personal achievement and productivity. On the other hand, people from collectivistic cultures are more allocentric and share the interests of the group. Social media allow individuals to be part of multiple groups, and the pressures from these groups could force users to increase their internet and social media usages. The increased focus towards group interests could lead to higher internet and social media addictions compared to users from individualistic cultures.

To summarize, we hypothesize that culture will have moderating effects on the relationships investigated.

H3a: The effect of social media addiction on social media-related technostress will be stronger for those from cultures high in collectivism.
H3b: The effect of internet addiction on social media-related technostress will be stronger for those from cultures high in individualism.

Based on these hypotheses, our model is shown in Figure 1.

4. METHODOLOGY

4.1. Sample and Data Collection

To test our hypotheses, we conducted a survey of social media users in the U.S. and China. Following Hofstede et al. (2010), the U.S. has a much higher individualism index than China (U.S.: 91; China: 20). In other words, people from the U.S. tend to focus more on personal productivity while those from China tend to be more interdependent and share the interests of the group.

The American participants were undergraduate students from a public university in the northwest U.S.; the Chinese participants were from a public university in northeast China. The same sampling procedure was used in both study sites to establish sample equivalence (Karahanna et al., 2002). Both groups of participants were members of an Introduction to Management Information Systems course and bonus course credit (about 1% of their final grades) was provided to motivate participation. The course at the American university was a required course for anyone pursuing a Business-related degree and was attended by sophomores through seniors. As a number of non-traditional students also take the course each semester, the average age of the class is higher than if it only contained "traditional" students. Students in the college of business are primarily local to the northwest U.S., with approximately ten percent originating from other countries. For this study, everyone was allowed to participate and receive the course credit, but only data from U.S. natives was used for the analysis. The course at the Chinese university is offered for Chinese juniors, who directly entered the university after high school. The survey was not compulsory for either student body and students took the survey voluntarily.

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 Chinese participants for two main reasons. First, Triandis (1994) argues, '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. In addition, 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 China were from a university where English was used as the language of instruction, and the survey administrators were

Figure 1. Research model
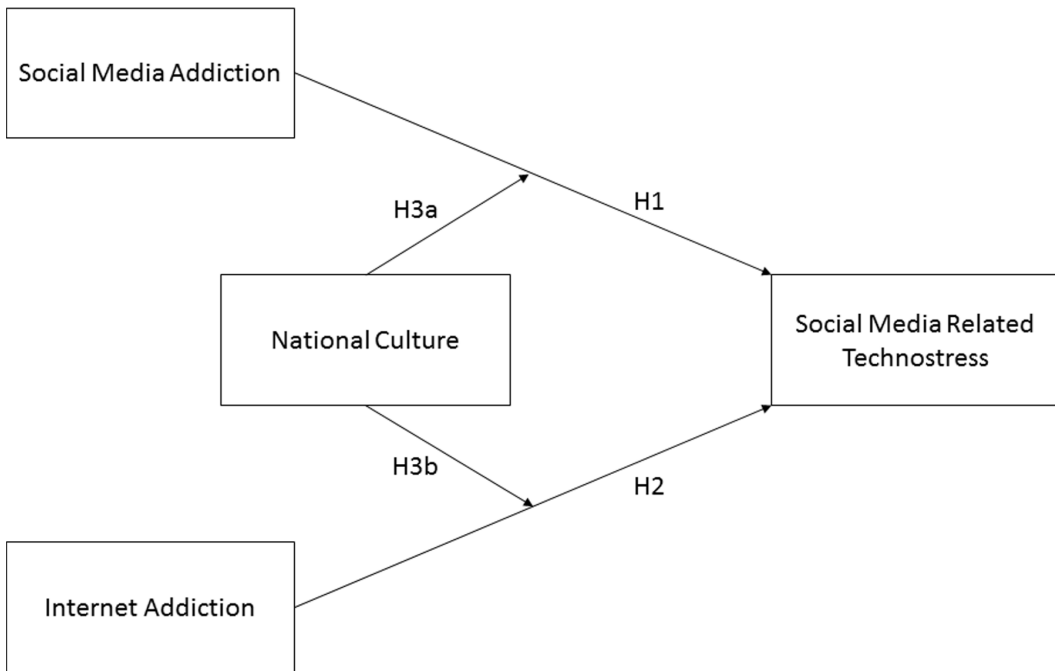
available to clarify any misunderstandings about the wording of the questions to the participants. Therefore, it is reasonable to assume that our participants did not have trouble understanding the questionnaire.

We carefully examined each record and removed careless and incomplete responses. In total, we obtained 363 valid responses: 245 for the U.S. sample and 118 for the Chinese sample. Table 1 provides sample demographics. An independent *t*-test showed that there was no significant difference in social media usage.

4.2. Measures

Where possible, we adopted measures from previous literature (all items are provided in Appendix A). Specifically, we measured social media addiction using items from Pelling and White (2009), and measured internet addiction using the 20-question internet addiction scale (Young, 1998), a scale that has been rigorously tested for psychometric properties and is frequently used in studies of internet addiction (Widyanto & McMurran, 2004). To properly evaluate this scale, the provided values for each of the twenty questions from each participant must be summed to provide a composite score. This means that for analysis, the internet addiction scale has a single item

Technostress is frequently measured using the instrument developed by Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2007). However, the original items were written to be applicable for

Table 1. Sample demographics

	Gender	Age	Social Media Usage (hours/week)
China	58% Female	21.4 (SD = .83)	20.8 (SD = 17.9)
United States	44% Female	24.0 (SD = .87)	17.4 (SD = 8.0)

working professionals and are thus not appropriate for the sample and context of our study. Therefore, we reworded the questions and generated additional questions of relevance to the sample to make the items applicable for this study. To verify that our reworded and new items were valid for use in this study, we conducted a pilot test with a different student sample (N = 141). The results of the pilot test were used to verify and refine our new items for Technostress.

Perceived ease of use was measured using the items provided by Venkatesh and Davis (2000). Perceived usefulness was measured using reconfigured items based on previous instruments (Davis, 1989; Sarker & Valacich, 2010). Perceived enjoyment was measured using the items provided by van der Heijden (2004). Hedonic Utility was measured using the items provided by Gu, Fan, Suh, and Lee (2010). Loneliness was measured with the UCLA Loneliness scale (Russell, Peplau, & Ferguson, 1978). The items were configured to fit the social media nature of the study and to be applicable to the student subject base.

4.3. Control Variables

We included seven control variables in our study: perceived ease of use, perceived usefulness, perceived enjoyment, hedonic utility, loneliness, age and gender. Perceived ease of use and perceived usefulness are included since previous literature has consistently shown that those two variables are important for understanding technology adoption and usage (Venkatesh et al., 2003). As the internet and social media have a higher level of perceived ease of use and usefulness, people are more likely to adopt them and form an addiction to use them. Perceived enjoyment is included as it has been shown to be an important determinant of hedonic technology adoption and usage (van der Heijden, 2004). The internet and social media have both utilitarian and hedonic attributes. Hedonic utility, a subset of perceived usefulness, is included to represent the other end of the spectrum (Gu, Fan, Suh, & Lee, 2010). Further, loneliness is included as it is commonly shown to be related to internet-related addictions (Özdemir, Kuzucu, & Ak, 2014). Finally, age and gender are also included following the literature of technology adoption (Venkatesh et al., 2003).

5. DATA ANALYSIS AND RESULTS

Since our study uses a survey to collect all of the variables from a single data source, common method bias is a potential issue (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). To assess whether a common method bias is a problem, we employed two statistical tests. First, Harmon's single-factor test (Podsakoff et al., 2003) resulted in six factors explaining 71.53 percent of the variance, with no single factor having significant ($p < 0.05$) loading for all items. Second, an unmeasured latent method factor was added and all items were loaded on both their theoretical constructs and the method factor (Bagozzi, 2011). This model fit well: $\chi2$ (252) = 389.26, $p < .00$, RMSEA = .036, SRMR = .036, and CFI = .97. All item loadings on the common method factor were much lower than the loadings on their respective constructs. Additionally, there were no qualitatively differences for all path coefficients after introducing the method factor. Therefore, CMV is likely not a concern.

We used SmartPLS 2.0 (Ringle et al., 2005) for our data analysis. Our choice of PLS was based on the following considerations: first, PLS is well suited to exploratory research. Second, Shapiro-Wilk tests were significant, showing that the measurements were not normally distributed. According to Hair et al. (2014), PLS is more appropriate with non-normally distributed data. Consistent with prior research, we analysed our model in two stages (Gefen & Straub, 2005): measurement model assessment and structural model assessment.

To assess the measurement model, convergent validity was established by satisfying the following three criteria (Gefen & Straub, 2005; Hair et al., 2014): first, all indicators were significant at the p < .05 level and loaded significantly on their respective constructs with primary loadings more than .5 (Table 2). 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

(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 demonstrated good psychometric properties. Next, we discuss the results of our hypothesis testing.

We assessed the structural model with R^2 values, which represent 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. As gender and age were not significantly correlated with social media-related technostress, they were removed from the subsequent analysis (see Table 4).

The effect of social media addition is insignificant for the U.S. ($\beta = .07, p > .05$) but is significant for China ($\beta = .30, p < .001$), supporting H1 for Chinese participants. Further, internet addiction was positively related to technostress for both the U.S. ($\beta = .44, p < .001$) and China ($\beta = .29, p < .01$), supporting H2. Our post-hoc analysis shows that when internet addiction is excluded from the model, the effect of social media addiction is larger for China and becomes significant for U.S. In other words, internet addiction captures the effect of social media addiction on social media-related technostress fully for U.S. and partially for China.

We then conducted cross-culture comparisons. Specifically, we used the formula of Keil et al. (2000) to assess the statistical differences of the path coefficients between countries (where m is the sample size for group 1 and n is the sample size for group 2). This approach is fully consistent with literature. First, according to Baron and Kenny (1986), when the moderator is dichotomous and the independent variable is a continuous variable, the moderation effect can be tested by assessing the difference of path coefficients from the independent variable to the dependent variable. Second, previous cross-cultural studies have also tested the moderation effect of culture by comparing path coefficients from different countries in their models (e.g., Chen and Zahedi, 2016; Keil et al., 2000; Liu and Wang, 2018).

$$t = \frac{\text{Path coefficient}_{\text{Group1}} - \text{Path coefficent}_{\text{Group2}}}{\left[\sqrt{\frac{(m-1)^2}{(m+n-2)} \times \text{SE}^2_{\text{Group1}} + \frac{(n-1)^2}{(m+n-2)} \times \text{SE}^2_{\text{Group2}}}\right] \times \left[\sqrt{\frac{1}{m} + \frac{1}{n}}\right]}$$

Our results demonstrate that national culture moderates the effects of social media addiction and internet addiction on social media-related technostress. In particular, the path coefficients of the relationship between social media addiction on social media-related technostress structurally differ between the U.S. and Chinese participants (with the path being nonsignificant for the U.S., and significant for China)[2]; further, the path coefficients of the relationship between internet addiction on social media-related technostress significantly differ between the U.S. and Chinese participants ($p < .001$). These findings are summarized in Table 4.

Finally, we assessed the model's predictive quality using the Stone-Geisser (Q^2) test (Geisser, 1975; Stone, 1974). The model has estimation relevance when Q^2 is above 0; otherwise, the model lacks estimation relevance, leading to a doubtful determination of the latent variable. All constructs have a Q^2 value greater than 0; therefore, our model has good predictive relevance (see Table 5).

6. DISCUSSION

This study examines how internet and social media addiction influence social media-related technostress. Based on data collected from U.S. and China, we find that internet addiction is positively related to technostress; further, it reduces the relationship between social media addiction

Table 2. Items and descriptive statistics

Construct	Items	United States				China			
		Mean	Loading	CR	AVE	Mean	Loading	CR	AVE
Social Media Addiction	SMA1	3.45	.77	.85	.58	4.16	.71	.80	.50
	SMA2	3.22	.78			3.89	.75		
	SMA3	3.95	.63			4.17	.61		
	SMA4	3.12	.85			3.87	.76		
Social Media Related-Technostress	TSTR1	2.01	.73	.90	.68	2.49	.61	.82	.53
	TSTR2	2.40	.81			2.82	.72		
	TSTR3	2.25	.87			2.39	.80		
	TSTR4	2.16	.89			2.43	.77		
Perceived Ease of Use	PEOU1	5.33	.71	.88	.66	5.06	.87	.86	.61
	PEOU2	5.27	.83			4.70	.65		
	PEOU3	5.73	.90			5.39	.90		
	PEOU4	5.46	.79			5.08	.66		
Perceived Enjoyment	PENJ1	4.77	.96	.88	.71	5.18	.89	.94	.84
	PENJ2	5.09	.70			5.50	.90		
	PENJ3	5.42	.85			5.58	.95		
Perceived Usefulness	PUSE1	4.25	.90	.90	.75	4.76	.70	.90	.74
	PUSE2	4.85	.81			5.38	.91		
	PUSE3	4.97	.88			5.41	.95		
Hedonic Utility	HU1	4.85	.92	.94	.83	5.30	.92	.88	.72
	HU2	4.61	.94			5.17	.93		
	HU3	5.15	.87			5.51	.68		
Internet Addiction	IAT	49.51	-	-	-	63.31	-	-	-
Loneliness	LONE1	3.40	.81	.91	.66	3.18	.79	.86	.55
	LONE2	3.13	.83			3.10	.71		
	LONE3	3.38	.81			3.24	.82		
	LONE4	3.30	.83			3.12	.74		
	LONE5	3.15	.79			2.98	.64		

and technostress to non-significance for the U.S. and lowers the relationship's weight for China. The path coefficients of internet and social media addiction were also significantly different between the U.S. and China. Next, we will discuss the theoretical and practical implications of our study.

6.1. Implications for Theory

Our study makes two primary theoretical contributions. First, we extend the Cognitive-Behavioural 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

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

United States	1	2	3	4	5	6	7	8
1 Hedonic Utility	**.91**							
2 Internet Addiction	.24	**-**						
3 Loneliness	.03	-.49	**.81**					
4 Perceived Enjoyment	.25	.26	-.03	**.84**				
5 Perceived Ease of Use	.13	-.13	.19	.03	**.81**			
6 Perceived Usefulness	.37	.16	.03	.28	.11	**.86**		
7 SM Addiction	.23	.73	-.37	.33	-.08	.18	**.76**	
8 Technostress	.11	.60	-.46	.10	-.27	.22	.47	**.83**
China	1	2	3	4	5	6	7	8
1 Hedonic Utility	**.85**							
2 Internet Addiction	.01	**-**						
3 Loneliness	.14	-.10	**.74**					
4 Perceived Enjoyment	.40	-.02	.02	**.92**				
5 Perceived Ease of Use	.13	.01	.34	.25	**.78**			
6 Perceived Usefulness	.24	-.03	.22	.27	.46	**.86**		
7 SM Addiction	-.07	.48	-.10	.07	-.03	-.15	**.71**	
8 Technostress	-.20	.43	-.17	-.25	-.33	-.26	.44	**.73**

Table 4. Path coefficient differences between the U.S. and China

	Path Coefficient			
	U.S.	China	Sig diff?	Supported?
Control variables				
PEOU → SMRT	-.19**	-.26**	***	
PENJ → SMRT	-.08	-.16*	sd	
PUSE → SMRT	.21***	-.02	sd	
HU → SMRT	-.04	-.08	ns	
LONE → SMRT	-.20***	.00	sd	
Age → SMRT	.08	.03	ns	
Gender → SMRT	-.02	-.03	ns	
Hypotheses				
H3a: SMA → SMRT	.07	.30***	sd	Yes
H3b: ITA → SMRT	.44***	.29**	***	Yes
R^2	.47	.40		

PEOU = Perceived ease of use; PENJ = Perceived enjoyment; PUSE = Perceived usefulness; HU = Hedonic utility; LONE = Loneliness; SMA = Social media addiction; ITA = Internet addiction; SMRT = Social media related technostress

$* p < .05$, $** p < .01$, $*** p < .001$, ns = not significant, sd = structurally different (one path is significant and the other insignificant)

Table 5. Stone-Geisser (Q^2) values

Construct	U.S.	China
Social Media Addiction	.58	.50
Technostress	.68	.53
Hedonic Utility	.83	.72
Loneliness	.66	.55
Perceived Enjoyment	.71	.84
Perceived Ease of Use	.66	.61
Perceived Usefulness	.75	.74

specific aspects that contribute both positively and negatively towards a user's well-being beyond that of the generalized internet. Our results show that an addiction to social media is associated with increased technostress that is apart from internet addiction.

Second, our cross-cultural comparison shows significant cultural differences in the effects of internet and social media addictions. We argued that individualism / collectivism, one of Hofstede's culture dimensions, could be relevant to understanding the effects of internet and social media addiction on technostress. As people with a higher level of individualism tend to focus more on their personal productivity and achievement, we argued that the effect of internet addiction on technostress should be stronger for users from the U.S. The result is also consistent with our hypothesis. As people with a higher level of collectivism tend to be more interdependent, we argued that the effect of social media addiction on technostress should be stronger for users from China. Our results confirm this hypothesis, showing differences in the relationships between the addictions and technostress for the two cultures in this study. Additionally, finding the significant relationship between social media addiction and technostress even when internet addiction is in the model shows that social media addiction is not simply a part of internet addiction for a highly collectivistic culture.

We also observed significant differences for control variables. Loneliness has a negative effect for the U.S. but not for China. One possibility is that people from China are more interconnected and use social media to maintain their relationships. Therefore, the effect of loneliness in China is superseded by that of social media addiction. Perceived usefulness has a positive effect for the U.S. but not for China. As people from the U.S. (an individualistic culture) focus on more productivity, perceived usefulness is important to influence their usage of social media, and it is possible that overemphasizing perceived usefulness lead to a higher level of technostress. Perceived ease of use can reduce technostress for both the U.S. and China. However, the effect of perceived ease of use is stronger for China, which is not consistent with the individualistic orientation focusing on productivity. One possibility is that since China is a collectivistic culture and people from a collectivistic culture are more likely to take advantage of social media to maintain their social relationships, the greater the perceived ease of use of social media is, the less technostress will arise as the users maintain these relationships.

6.2. 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 the U.S. or China. When designing social media sites, socially responsible developers may want to add reminders for users to take breaks periodically. For example, if users stay for a long time on a site for one day, the site can pop up a

reminder message for users. Users could also take the responsibility into their own hands. Browser extensions such as WasteNoTime (http://www.bumblebeesystems.com/wastenotime) allow users to see how much time they have spent on websites and provide blocking from websites for periods of time or after using it for a specified period of time. If users are made aware of these simple tools, they can have the power to break the addiction and/or the negative effects of social media usage.

Second, our results show that the effect of internet and social media addiction may be different 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.

Finally, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) has not recognized internet addiction (and consequently, Social Media Addiction) as a mental disorder. These results should add to the growing body of knowledge demonstrating the negative potential effects of these technologies. It is our hope that the DSM will truly consider internet addiction for inclusion so that sufferers may be able to receive the help they need.

6.3. 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. Third, the Chinese government takes initiatives to control internet usage. Although participants have other alternatives to visit (e.g., visit Weibo instead of Twitter), such internet controls may influence their internet and social media usages. 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. Researchers should consider these cultural traits when investigating differences between countries or even regions around the globe. Even as a moderator, Hofstede's cultural dimensions can provide valuable insights into the reasons for differences found.

7. CONCLUSION

With data collected from the U.S. and China, we found that both internet and social media addictions are significantly associated with increases in social media-related technostress. Besides, the strength of these relationships is significantly different for users between the U.S. and China. Our study shows that researchers and practitioners both must remember to consider culture when examining social media and technostress across countries.

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ENDNOTES

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

[2]   The term "structurally different" following the literature (Chen and Zahedi, 2016; Liu and Wang, 2018) is used to differentiate the scenario where one path is significant and the other is not from that where both paths are significant. Our analyses also show that these structurally different comparisons in Table 4 are statistically significant.

APPENDIX A: MEASUREMENT

Internet Addiction (5-point Likert Scale)
ITA1 Do you find that you stay online longer than you intended?
ITA2 Do you neglect household chores to spend more time online?
ITA3 Do you prefer excitement of the Internet to intimacy with your partner?
ITA4 Do you form new relationships with fellow online users?
ITA5 Do others in your life complain to you about the amount of time you spend online?
ITA6 Does your work suffer (e.g., postponing things, not meeting deadlines, etc.) because of the amount of time you spend online?
ITA7 Do you check your E-mail before something else that you need to do?
ITA8 Does your job performance or productivity suffer because of the Internet?
ITA9 Do you become defensive or secretive when anyone asks you what you do online?
ITA10 Do you block disturbing thoughts about your life with soothing thoughts of the Internet?
ITA11 Do you find yourself anticipating when you go online again?
ITA12 Do you fear that life without the Internet would be boring, empty and joyless?
ITA13 Do you snap, yell, or act annoyed if someone bothers you while you are online?
ITA14 Do you lose sleep due to late night log-ins?
ITA15 Do you feel preoccupied with the Internet when off-line or fantasize about being online?
ITA16 Do you find yourself saying 'Just a few more minutes' when online?
ITA17 Do you try to cut down the amount of time you spend online and fail?
ITA18 Do you try to hide how long you've been online?
ITA19 Do you choose to spend more time online over going out with others?
ITA20 Do you feel depressed, moody, or nervous when you are offline, which goes away once you are back online?
Social Media Addiction (7-point Likert Scale)
SMA1 I often think about social media sites when I am not using them.
SMA2 Arguments have arisen with others because of my use of social media sites.
SMA3 I lose track of how much I am using social media sites.
SMA4 I have been unable to reduce my social networking website use.
Technostress (5-point Likert Scale)
SMRT1 I am unable to handle school work due to the time spent using social media.
SMRT2 I need a long time to understand and use new social media.
SMRT3 I find that younger students tend to know more about social media than I do.
SMRT4 I often find it too complex for me to understand and use new social media.
Perceived Ease of Use (7-point Likert Scale)
PEOU1 My interaction with Social Media is clear and understandable.
PEOU2 Interacting with Social Media does not require a lot of my mental effort.
PEOU3 I find Social Media easy to use.
PEOU4 I find it easy to get Social Media to do what I want it to do.
Perceived Enjoyment (7-point Scale)
PENJ1 Exciting: Dull
PENJ2 Pleasant: Unpleasant
PENJ3 Interesting: Boring
Perceived Usefulness (7-point Likert Scale)
PUSE1 Using Social Media enables me to increase my learning and performing.
PUSE2 Using Social Media makes it easier for me to acquire the information/knowledge I need.
PUSE3 Using Social Media helps me get useful information online.
Hedonic Utility (7-point Likert Scale)

Social Media enables me to pursue pleasure, relaxation, and/or enjoyment more...
HU1 quickly
HU2 effectively
HU3 easily
Loneliness (4-point Scale)
LONE1 I am no longer close to anyone
LONE2 I feel completely alone
LONE3 I am unable to reach out and communicate with those around me
LONE4 I feel shut out and excluded by others
LONE5 People are around me but not with me

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