Transactions on Replication Research

Conceptual Replication

Integrating Technology Addiction and Use: An Empirical Investigation of Facebook Users

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Abstract:

The purpose of this study was to conceptually replicate the model proposed by Turel, Serenko, and Giles (2011) in the new context of social networking websites. For this, the original instrument was adapted, data from 186 social networking website users were collected, and the model was analyzed by means of Partial Least Squares (PLS). The results supported the ideas advanced in the original study and show that addiction distorts user perceptions of usefulness and enjoyment attributed to the system, which in turn, influence behavioral usage intentions. In contrast to study 2 in the original paper, and in line with study 1 in the original paper, no relationship between addiction and perceived ease of use was observed. Comparing central tendencies across studies, it seems that users of social networking websites are more likely to exhibit technology addiction symptoms than users of online auction websites. The results ultimately imply that context matters in technology addiction research since it can alter some aspects of the measurement model, nomological network, and construct means.

Keywords: IT diffusion and adoption, Psychological, User acceptance of IT

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1 Introduction

Technology addiction is a new phenomenon that has already attracted the attention of the mainstream MIS research community (D'Arcy, Gupta, Tarafdar, & Turel, 2014; Tarafdar, D'Arcy, Turel, & Gupta, 2015). It is defined as dependence on the use of an information technology to such an extent that common behavioral addiction symptoms appear: (1) salience (the technology dominates a user's thoughts and actions); (2) withdrawal (negative emotions and feelings appear if a person cannot access the technology); (3) conflict (the use of the technology interferes with other tasks and affects normal functioning); (4) relapse and reinstatement (a user is incapable of voluntarily reducing technology use); (5) tolerance (a person has to employ the technology to a larger degree to produce thrill); and (6) mood modification (using the technology offers thrill, generates relief, and changes mood) (Turel, Serenko, & Giles, 2011). It is an important unexpected outcome of using certain technologies (e.g., social networking websites, video games, online auctions, mobile phones) that provide user brains with strong rewards and can deteriorate the wellbeing, job and school performance, normal functioning, and health of technology users (Turel & Serenko, 2012). Hence, scholars should examine this phenomenon and better understand its antecedents and outcomes (Tarafdar, Gupta, & Turel, 2013).

One of the seminal and influential MIS works on technology addiction was done by Turel et al. (2011) who proposed and empirically validated that technology addiction distorts user perceptions of usefulness, enjoyment, and ease of use of the system to which users are addicted. Particularly, they theorized that there are two psychological mechanisms that facilitate the augmentation of system-referenced perceptions. These include 1) bias-based cognitive change mechanisms, such as emotional bias, confirmation bias, after-purchase/after-use rationalization, and cognitive dissonance; and 2) learning- and memory-based cognitive change mechanisms, such as sequential updating of perceptions and feedback from past use. They tested their model in the context of an online auction website (eBay) and confirmed their propositions.

Their study has inspired a number of researchers who tried to further understand the technology addiction phenomenon (Sepehr & Head, 2013; Zwanenburg, 2013). However, only one study has empirically confirmed the proposition that addiction distorts perceptions of the IT artifact (Carillo, Scornavacca, & Za, 2014), but it did not employ all of the constructs of the original model proposed by Turel et al. (2011). Several researchers also extended the initial study by focusing on other IT artifacts the use of which can be addictive, especially, social networking websites (SNW) (e.g., Maier, Laumer, & Weitzel, 2013; Parlak & Eckhardt, 2014; Thadani & Cheung, 2011; Turel, He, Xue, Xiao, & Bechara, 2014).Yet none of them empirically tested the original model. Thus, the present investigation attempts to replicate the original model with respect to addiction to social networking websites. This addiction is defined as a user's psychological state of dependence on the use of a social networking website which is manifested through an obsessive pattern of seeking and using this website; and these behaviors take place at the expense of other important activities, ultimately infringe normal functioning, and result in a range of negative consequences (Turel, 2014; Turel & Serenko, 2012). SNW use can be addictive because it can fill social voids in people's lives and produce ongoing thrills, which may be very appealing for vulnerable brains (Echeburua & de Corral, 2010; Pempek, Yermolayeva, & Calvert, 2009). Hence, SNW addiction may be quite prevalent (Karaiskos, Tzavellas, Balta, & Paparrigopoulos, 2010).

Consequently, we aim at extending the external validity of the original model of Turel et al. (2011) by testing it in a new context which is presumably and potentially addictive – social networking websites. Figure 1 and Table 1 present the model and list of hypotheses, respectively.

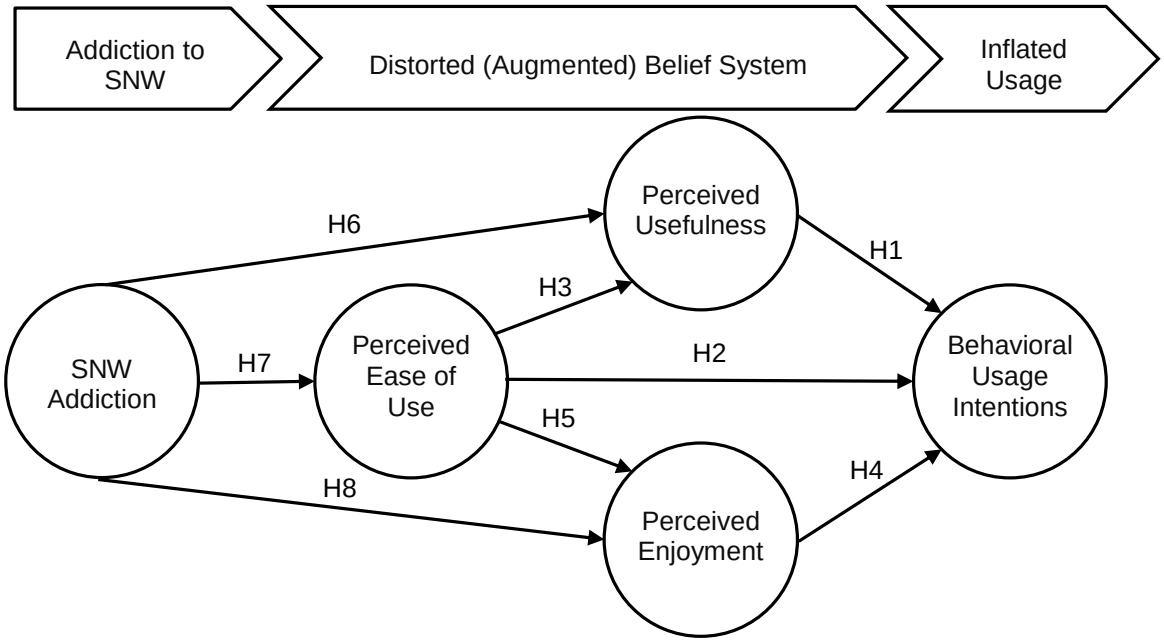

Figure 1. The Structural Model

Table 1. Hypotheses

N	Hypothesis
H1	Perceived usefulness has a positive direct effect on behavioral usage intentions towards a social networking website.
H2	Perceived ease of use has a positive direct effect on behavioral usage intentions towards a social networking website.
H3	Perceived ease of use has a positive direct effect on perceived usefulness of a social networking website.
H4	Perceived enjoyment has a positive direct effect on behavioral usage intentions towards a social networking website.
H5	Perceived ease of use has a positive direct effect on perceived enjoyment with a social networking website.
H6	The level of online auction addiction has a positive direct effect on perceived usefulness of a social networking website.
H7	The level of online auction addiction has a positive direct effect on perceived ease of use of a social networking website.
H8	The level of online auction addiction has a positive direct effect on perceived enjoyment with a social networking website.

2 Methodology

All measures were adapted from Turel et al. (2011). The perceived usefulness (PU) scale was adapted by changing item wording to focus on the context of SNW and removing one item that was not applicable. The perceived ease of use (PEOU) scale was shortened by removing two questions “EBay.com is flexible to interact with” and “It is easy to interact with eBay.com” in order to reduce cognitive load on respondents. Minor adjustments to behavioral intentions (BI) items were also made to fit the SNW context.

Addiction was measured with three different constructs: 1) as a compulsive tendency to use SNW based on the Faber and O’Guinn (1992) scale (FOGS); 2) as behavioral technology addiction to SNW based on Charlton (2002) scale (CTAS); and 3) as a second-order construct comprised of the obsessive-compulsive use of SNW (CUW) and obsessive-compulsive participation in SNW (CPAU) dimensions (Pallanti,

DeCaria, Grant, Urpe, & Hollander, 2005). Perceived usefulness, perceived ease of use, perceived enjoyment, and behavioral usage intentions were also adapted to the SNW context (Davis, Bagozzi, & Warshaw, 1992; Gefen, Karahanna, & Straub, 2003). Social desirability bias was measured by administering a 13-item short form of the Marlowe-Crowne scale (Reynolds, 1982). The survey was presented to three researchers in the area of Internet addiction, and they reaffirmed the content validity of all items, and particularly those items capturing addiction to social networking site use, which were adapted from the items focusing on eBay use in Turel et al. (2011). Basic demographic data were also collected. Appendix 1 presents the instrument.

Note that Turel et al. reported two studies (Study 1 that included only FOGS to measure addiction and Study 2 that included FOGS, CTAS, CUW, and CPAU to measure addiction). The present investigation includes the FOGS, CTAS, CUW, and CPAU constructs thereby replicating their Study 2. However, the present findings may be also compared with those in Study 1 because each employed the FOGS construct. The Compulsive Buying Scale was not used in this study. First, compulsive buying is not fully applicable to the context of social networking websites. Second, if this scale was adapted, its items would dramatically overlap with those used in FOGS.

The questionnaire was administered to 225 students of an American university enrolled in a marketing class. Participation was voluntarily, and it was rewarded with course bonus points. Because individuals frequently use more than one SNW, they were instructed to complete the survey with respect to the SNW they use most frequently.

After eliminating several incomplete or partially completed surveys, 186 valid responses (83% response rate) were retained for analysis. Forty-eight percent of the respondents were female. Respondents were 23 years old on average, ranging from 19 to 40 years old. Fifty-six percent used more than one SNW. The vast majority, 92%, used Facebook, 56% - Myspace, 16% - Twitter, and 9% - LinkedIn. A few used Tagged.com, Hi5.com, Xing.com, and Cyworld. Eighty-seven percent selected Facebook as their most frequently employed SNW. Most respondents seemed to be moderate or heavy SNW users. On average, they joined their SNW three years ago and had 227 contacts (or friends). Per day, on average, they checked their SNW six times, made two posts (updates), and used it for 44 minutes.

3 Results

3.1 Preliminary Assessment

A multivariate analysis of variance (MANOVA) test revealed that gender as a fixed factor has no significant omnibus effect on the model's constructs (Pillai's Trace of 0.03, $p = 0.78$) after controlling for age as a covariate (Pillai's Trace of 0.11, $p < 0.01$). Further analysis of age showed that age was correlated with PEOU ($r = -0.16$, $p < 0.05$), which means that older individuals find SNW more difficult to use. In addition, age was negatively correlated with all technology addiction constructs: FOGS ($r = -0.17$, $p < 0.05$); CTAS ($r = -0.18$, $p < 0.05$); CUW ($r = -0.20$, $p < 0.01$); and CPAU ($r = -0.16$, $p < 0.05$). Therefore, younger individuals are more prone to technology addiction.

The following Spearman's correlations were obtained between social desirability bias and the addiction constructs: rho CUW-SDB = -0.05, ns; rho CPAU-SDB = -0.08, ns; rho FOGS-SDB =-0.18, $p < 0.05$; and rho CTAS-SDB = -0.17, $p < 0.05$). This result is generally expected and consistent with prior research. Table 2 shows that the addiction constructs were strongly correlated, yet they were not fully interchangeable. Harman's single factor test, which is frequently used to measure common method variance, produced nine factors, with the first one accounting for only 34.8% of variance. This ruled out systematic bias in the dataset. Table 3 presents construct means and shows that means for PU and BI are the same as those reported by Turel et al. However, means for PEOU and PE are higher in the present study. Most importantly, all addiction constructs means are systematically higher in the context of SNW.

Table 2. Pearson Correlations among Addiction Constructs

	FOGS	CTAS	CUW
CTAS	0.80		
CUW	0.73	0.83	
CPAU	0.77	0.82	0.93

Table 3. Construct Means								
	FOGS	CTAS	CUW	CPAU	PU	PEOU	PE	BI
Present study	1.89	2.28	2.61	2.56	5.07	5.68	5.03	4.93
Turel et al. (2011), study 2	1.35	1.53	1.71	1.72	5.10	5.37	4.73	4.94

Appendix 2 presents reliability and validity assessment of the measurement model. As expected, PU, PEOU, PE, and BI constructs exhibited good psychometric properties. The addiction to SNW scale adapted from Charlton (2002) was also very reliable and valid. However, the reliability of a compulsive tendency to use SNW scale, based on the Faber and O'Guinn (1992), was somewhat lower (yet acceptable). Particularly, the loadings of four out of eight items were below the commonly used in confirmatory research threshold of 0.7. The average variance extracted was 0.5, which is acceptable. As the reliability of indicators varies, the reliability of each indicator should be assessed. Researchers postulate that an indicator should explain a substantial part of its construct's variance (usually at least 50%). Accordingly, the absolute correlations between a construct and each of its manifest variables (i.e., the absolute standardized outer loadings) should be higher than 0.7. Taking into account PLS' characteristic of consistency at large, one should be careful when eliminating indicators, especially when the loadings are not too far from the recommended 0.7 value. Only if an indicator's reliability is low and eliminating this indicator goes along with a substantial increase of composite reliability, it makes sense to discard this indicator. If this is not the case, preserving content validity is a more reasonable objective, and retaining the low-loading items is reasonable. This is the approach that was applied in the present study, and hence the items with loadings slightly below 0.7 were retained.

Obsessive-compulsive use of SNW (CUW) and obsessive-compulsive participation in SNW (CPAU) that were used to create a second-order addiction construct also had loadings and average variance extracted measures lower than those reported by Turel et al. (2011). CUW and CPAU were also very strongly correlated (0.93 in the present study vs. 0.70 reported by Turel et al. (2011)). Because of this, the square root of the average variance extracted of CUW and CPAU was lower than their cross-loading.

3.2 Model Estimation

The model was estimated by using SmartPLS v.2.0. Bootstrapping with 250 re-samples was performed to extract t-values. When the addiction construct was presented as a second-order factor, betas between the first- and second-order factors were: CPAU 0.52 ($p < 0.001$) and CUW 0.51 ($p < 0.001$). Table 4 presents the structural model. This analysis demonstrated that all links, except for the addiction – perceived ease of use relationship, were significant and in the expected direction.

Four important differences were discovered. First, in the present study, PEOU had an effect on BI ($\beta = 0.19$, $p < 0.01$) whereas no such relationship was observed by Turel and colleagues in their study 2 (though a weak effect was observed in their Study 1). It is for this reason in part, presumably, the R-squared for BI was higher in the present study. Second, Turel et al. reported a statistically significant relationship between addiction and perceived ease of use, using three different measures of addiction, in their study 2. In contrast, this relationship was not observed for all three different addiction constructs in the present study, which is consistent with the study 1 Turel et al. report. Third, the present study also identified a seemingly stronger effect of addiction on perceived usefulness and perceived enjoyment (0.32-0.34 and 0.31-0.37, correspondingly) than those identified by Turel et al. (2011) (0.15-0.23 and 0.19-0.28, correspondingly). Fourth, all three addiction constructs, despite some reliability issues with the FOGS and the second-order addiction factor, had consistent impact on PU, PEOU, and PE, with the FOGS exhibiting slightly higher structural relationships. In contrast, in Turel et al.'s study, the second-order addiction construct had the highest impact on technology perceptions.

Table 4. The Structural Model								
* - p < 0.05 ** - p < 0.01 *** - p < 0.001		Present Study			Turel et al. (2011)			
					Study 1	Study 2		
Hypothesis / Addiction Scale		FOGS	CTAS	Second-Order	FOGS	FOGS	CTAS	Second-Order
H1	PU → BI	0.34***	0.34***	0.34***	0.20**	0.24**	0.24**	0.24**
H2	PEOU → BI	0.19**	0.19**	0.19**	0.17*	0.02	0.02	0.03
H3	PEOU → PU	0.45***	0.48***	0.48***	0.67***	0.51***	0.54***	0.51***
H4	PE → BI	0.35***	0.35***	0.35***	0.57***	0.46***	0.46***	0.46***
H5	PEOU → PE	0.51***	0.54***	0.54***	0.74***	0.54***	0.58***	0.55***
H6	ADD → PU	0.34***	0.32***	0.32***	0.15*	0.18***	0.15***	0.23***
H7	ADD → PEOU	0.04	-0.05	-0.06	0.08	0.21***	0.10*	0.18**
H8	ADD → PE	0.37***	0.31***	0.34***	0.21**	0.27***	0.19***	0.28***
R^2	PU	33.0%	31.4%	31.4%	48.2%	33.6%	32.7%	35.5%
	PE	41.4%	36.9%	38.9%	61.2%	42.6%	39.4%	43.4%
	PEOU	0.2%	0.2%	0.3%	0.06%	4.2%	1.1%	3.3%
	BI	59.1%	59.1%	59.1%	74.4%	43.3%	43.4%	43.3%

4 Discussion

The purpose of this study was to conceptually replicate the model proposed by Turel et al. (2011) according to which technology addiction distorts user perceptions of an IT artifact. The model was tested in a new context of social networking websites. Based on the findings, the notion advanced by Turel et al. (2011) was supported, and several implications emerged that warrant further elaboration.

First, the study by Turel et al. (2011) focused on technology addiction in the context of online auctions (eBay). Therefore, they adapted measurement items from the Faber and O'Guinn's (1992) compulsive consumption scale. In the present study, we did our best to adapt this scale to the context of social networking websites. For example, we replaced the original question "If I have any money left at the end of the pay period, I just have to spend it on eBay" with "If I have a few minutes between engagements (e.g., between classes), I just have to spend them on my social network website." Nevertheless, the reliability of the adapted scale was within the lowest acceptable threshold. Therefore, we recommend that the addiction measurement items based on the Faber and O'Guinn (1992) instrument be applied in the context that focuses on compulsive actions which involve monetary transactions (e.g., auction and gambling websites) rather than on compulsive use which involves consumption and monetary transactions to a lesser extent (e.g., video gaming or Facebook use).

Second, the obsessive-compulsive use of SNW and obsessive-compulsive participation in SNW constructs that originated from Pallanti et al. (2005) exhibited somewhat lower psychometric properties. They were, however, very strongly correlated (0.93 in the present study vs. 0.70 in Turel et al.'s study). It is for this reason, these constructs did not meet the necessary discriminant validity requirements (see Table A9 in the Appendix). Turel et al. used a second-order construct because the employment of online auction websites consists of two different (and not necessarily correlated) behaviors: the use of the website (e.g., browsing product info, reviewing the seller's ranking) and the participation in the auction process (e.g., placing bids, increasing bids, winning items). Theoretically, at least some users may heavily engage in the former behavior (e.g., browse online offerings out of curiosity) and minimize the latter (e.g., if they have no money to actually purchase the products). In contrast, using social networking websites and participating in social networking activities reflect almost the same latent concept. Thus, whereas the need for second-order constructs was theoretically and empirically justified in Turel et al.'s study, this conceptualization was not necessary in the present context. This produced a very high inter-construct correlation that exceeded the square root of average variance extracted of both constructs.

The purpose of eBay is to allow users to locate products they need, facilitate transactions, and provide additional support infrastructure, for example, if a dispute arises. In other words, it is function- and transaction-oriented. In contrast, the goal of Facebook is provide a platform for mostly hedonic activities, which is fundamentally different from that of eBay. This shows that the type of a system may substantially affect the reliability and validity of research instruments. Ideally, a research instrument should be employed within the context in which it was originally developed, and any adaptation should be accompanied by a rigorous validation process. In some situations, however, totally new instruments should be developed. Overall, this finding contributes to a discussion on the structural and contextual stability of MIS research instruments (Marakas, Johnson, & Clay, 2007; Serenko & Turel, 2007) and calls for future research in this area.

Out of three measures of addiction we used here, technology addiction to SNW based on Charlton (2002) exhibited the best psychometric properties. This further manifests the robustness of the general behavioral addiction approach to measure various types of technology addiction.

Third, the present study confirmed the viability of the model proposed and initially validated by Turel et al. Despite differences in the levels of reliability and validity of the measurement model, all three addiction measures produced generally consistent results. Therefore, there is additional evidence that the level of addiction distorts user perceptions of usefulness of and enjoyment with technology which, in turn, affects its use. Because the means of the addiction constructs observed in the present study were higher than those reported by Turel et al., we conclude that users of social networking websites may be more likely to exhibit technology addiction symptoms than users of online auction websites. Such symptoms may be easier to exhibit with regards to SNW since the use of such sites requires minimal resources (no need for financial investment) and maybe consequently, people feel a lower need to inhibit their SNW use, which results in stronger SNW addiction symptoms. In the context of social networking websites, addiction also distorts technology perceptions to a greater degree than in the context of online auctions. Thus, the level and impact of technology addiction depends on the nature of an IT artifact. One key difference between the Turel et al. (2011) context and this one is the need to use financial resources in the former. Future research may use this factor as a moderator when comparing different types of addictions and their impacts.

Fourth, the present study did not observe a link between addiction and ease of use. Recall that the respondents were fairly experienced with their favorite social networking website. Given a relative simplicity of contemporary websites, including Facebook, it is likely that most individuals had mastered the use of the system which reduced the variance of the PEOU construct. In fact, average standard deviation of PEOU was lower than those of PU and PEOU (PEOU st. dev. = 1.33, PU st. dev. = 1.47 and PE st. dev. = 1.40). In the present study, the PEOU construct mean was 5.68 vs. 5.37 reported by Turel et al. (study 2). Thus, it seems that most respondents found SNW very easy to use, and there was low variation in this construct. This, presumably, reduced the explanatory power of PEOU in the context of social networking websites. At the same time, PEOU had an effect on BI which was not observed in study 2 by Turel et al. (but did exist in study 1). Altogether, it implies the PEOU may be marginally important for experienced users, and that it is possibly, and not always, an important predictor of usage intentions for experienced users.

Fifth, in the present study, age was negatively correlated with all technology addiction constructs (r ranging from -0.16 to -0.20). Therefore, younger computer users are more prone to exhibit technology addiction symptoms in the contexts of SNW. This phenomenon has been also observed in other contexts, including mobile email (Turel, Serenko, & Bontis, 2011), general Internet use (Ferraro, Caci, D'Amico, & Di Blasi, 2007), and social networking websites (Turel & Serenko, 2012).

5 Conclusion

This study sought to extend the external validity of the findings by Turel et al. (2011), which were based on eBay users, to a new context – SNW use. This was done successfully, and the ideas advanced by Turel et al. (2011) seem to generalize across contexts. At the same time, some differences between the measurement and structural models in the two contexts point to contextual dependencies and possible moderators, which may be employed in future research. We hope that such endeavors will be taken by the MIS research community, since understanding addiction, its antecedents and its consequences can have major theoretical, health and wellbeing implications.

References

Carillo, K. D. A., Scornavacca, E., & Za, S. (2014). An investigation of the role of dependency in predicting continuance intention to use ubiquitous media systems: Combining a media system perspective with expectation confirmation theories. Proceedings of the Twenty Second European Conference on Information Systems, Tel Aviv.

Charlton, J. P. (2002). A factor-analytic investigation of computer 'addiction' and engagement. British Psychological Society, 93(3), 329-344.

D'Arcy, J., Gupta, A., Tarafdar, M., & Turel, O. (2014). Reflecting on the "Dark Side" of information technology use. Communications of the Association for Information Systems, 35(1), 109-118.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in workplace. Journal of Applied Social Psychology, 22(14), 1111-1132.

Echeburua, E., & de Corral, P. (2010). Addiction to new technologies and to online social networking in young people: A new challenge. Adicciones, 22(21), 91-95.

Faber, R. J., & O'Guinn, T. C. (1992). Clinical screener for compulsive buying. Journal of Consumer Research, 19(3), 459-469.

Ferraro, G., Caci, B., D'Amico, A., & Di Blasi, M. (2007). Internet addiction disorder: An Italian study. Cyberpsychology & Behavior, 10(2), 170-175.

Gefen, D., Karahanna, E., & Straub, D. (2003). Inexperience and experience with online stores: The importance of TAM and trust. IEEE Transactions on Engineering Management, 50(3), 307-321.

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. Psychophysiology, 39(3), 281-291.

Karaiskos, D., Tzavellas, E., Balta, G., & Paparrigopoulos, T. (2010). P02-232 - Social network addiction: A new clinical disorder? European Psychiatry, 25(Supplement 1), 855-855.

Maier, C., Laumer, S., & Weitzel, T. (2013). Although I am stressed, I still use IT! Theorizing the decisive impact of strain and addiction of social network site users in postacceptance theory. Proceedings of the Thirty Fourth International Conference on Information Systems, Milan.

Marakas, G. M., Johnson, R. D., & Clay, P. F. (2007). The evolving nature of the Computer Self-Efficacy construct: An empirical investigation of measurement construction, validity, reliability and stability over time. Journal of the Association for Information Systems, 8(1), 16-46.

Pallanti, S., DeCaria, C. M., Grant, J. E., Urpe, M., & Hollander, E. (2005). Reliability and validity of the pathological gambling adaptation of the Yale-Brown Obsessive-Compulsive Scale (PG-YBOCS). Journal of Gambling Studies, 21(4), 431-443.

Parlak, S., & Eckhardt, A. (2014). Developing a Facebook withdrawal scale: Results of a controlled field experiment. Proceedings of the European Conference on Information Systems, Tel Aviv.

Pempek, T. A., Yermolayeva, Y. A., & Calvert, S. L. (2009). College students' social networking experiences on Facebook. Journal of Applied Developmental Psychology, 30(3), 227-238.

Reynolds, W. M. (1982). Development of reliable and valid short forms of the Marlowe-Crowne social desirability scale. Journal of Clinical Psychology, 38(1), 119-125.

Sepehr, S., & Head, M. (2013). Online video game addiction: A review and an information systems research agenda. Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago, Illinois.

Serenko, A., & Turel, O. (2007). Are MIS research instruments stable? An exploratory reconsideration of the Computer Playfulness Scale. Information & Management, 44(8), 657-665.

Tarafdar, M., D'Arcy, J., Turel, O., & Gupta, A. (2015). The dark side of information technology. MIT Sloan Management Review, 56(2), 600-623.

Tarafdar, M., Gupta, A., & Turel, O. (2013). The dark side of information technology use. Information Systems Journal, 23(3), 269-275.

Thadani, D. R., & Cheung, C. M. K. (2011). Exploring the role of online social network dependency in habit formation. Proceedings of the Thirty Second International Conference on Information Systems, Shanghai.

Turel, O. (2014). Quitting the use of a habituated hedonic information system: A theoretical model and empirical examination of Facebook users. European Journal of Information Systems, in-press.

Turel, O., He, Q., Xue, G., Xiao, L., & Bechara, A. (2014). Examination of neural systems sub-serving Facebook "addiction." Psychological Reports, 115(3), 675-695.

Turel, O., & Serenko, A. (2012). The benefits and dangers of enjoyment with social networking websites. European Journal of Information Systems, 21(5), 512-528.

Turel, O., Serenko, A., & Bontis, N. (2011). Family and work-related consequences of addiction to organizational pervasive technologies. Information & Management, 48(2-3), 88-95.

Turel, O., Serenko, A., & Giles, P. (2011). Integrating technology addiction and use: An empirical investigation of online auction users. MIS Quarterly, 35(4), 1043-1106.

Zwanenburg, S. P. (2013). Information technology addiction: Construct development and measurement. Proceedings of the Thirty Fourth International Conference on Information Systems, Milan.

Appendix A: Questionnaire

Technology Addiction.
Faber and O'Guinn (1992) scale (FOGS).
FOGS1: If I have a few minutes between engagements (e.g., between classes), I just have to spend them on my social network website.
FOGS2: I felt others would be horrified if they knew of the time I spend on my social network website.
FOGS3: I felt others would be horrified if they knew the amount of information I post on my social network website.
FOGS4: I used my social networking website even though I had to do other things.
FOGS5: I used my social networking website when I knew I didn't have enough time for other important things.
FOGS6: I used my social networking website in order to make myself feel better.
FOGS7: I felt anxious or nervous on days I didn't use my social networking website.
FOGS8: I spent minimal time on important tasks as a result of my usage of the social networking website.

Charlton (2002) Behavioral Technology Addiction Scale (CTAS).
CTAS1: I sometimes neglect important things because of my interest in this social networking website.
CTAS2: My social life has sometimes suffered because of me interacting with this social networking website.
CTAS3: Using this social networking website sometimes interfered with other activities.
CTAS4: When I am not using this social networking website I often feel agitated.
CTAS5: I have made UNsuccessful attempts to reduce the time I interact with this social networking website.
CTAS6: I am sometimes late for engagements because I interact with this social networking website.
CTAS7: Arguments have sometimes arisen because of the time I spend on this social networking website.
CTAS8: I think that I am addicted to this social networking website.
CTAS9: I often fail to get enough rest because I interact with this social networking website.

Obsessive-compulsive use of SNW by Pallanti et al. (2005) (CUW).
CUW1: Much of my time is occupied by thoughts about this social networking website.
CUW2: My thoughts about this social networking website interfere with my social, school, work, and/or role functioning.
CUW3: My thoughts about this social networking website cause me anxiety and/or distress.
CUW4: I often try to turn my attention away from the thoughts about this social networking website.
CUW5: I have much control over my thoughts about this social networking website (R).
CUW6: I spend much of my time using this social networking website.
CUW7: My use of this social networking website interferes with my social, school, work, and/or role functioning.
CUW8: I become anxious and/or distressed when I am prevented from using the social networking website.
CUW9: I often try to resist my social networking website usage compulsion.
CUW10: I have much control over my use of this social networking website (R).

Obsessive-compulsive participation in SNW by Pallanti et al. (2005) (CPAU).
CPAU1: Much of my time is occupied by thoughts about using this social networking website.
CPAU2: My thoughts about using this social networking website interfere with my social, school, work, and/or role functioning.
CPAU3: My thoughts about using this social networking website cause me anxiety and/or distress.
CPAU4: I often try to turn my attention away from the thoughts about using this social networking website.
CPAU5: I have much control over my thoughts about using this social networking website (R).
CPAU6: I spend much of my time using this social networking website.
CPAU7: My usage of this social networking website interferes with my social, school, work, and/or role functioning.

CPAU8: I become anxious and/or distressed when I am prevented from using this social networking website.
CPAU9: I often try to resist my compulsion to use this social networking website.
CPAU10: I have much control over my usage of this social networking website (R).
R – Negatively worded items.

Perceived usefulness (PU).
PU1: This social networking website is useful for staying in touch with people.
PU2: I find this social networking website useful in my social life.
PU3: Using this social networking website enables me to maintain social ties more effectively.
PU4: Using this social networking website improves my social connectedness.
PU5: If I use this social networking website, I will increase my chances of strengthening my social life.

Perceived ease of use (PEOU).
PEOU1: I find this social networking website easy to use.
PEOU2: Learning to operate this social networking website is easy for me.
PEOU3: My interaction with this social networking website is clear and understandable.
PEOU4: It is easy for me to become skillful at using this social networking website.

Perceived enjoyment (PE).
PE1: Using this social networking website is enjoyable.
PE2: Using this social networking website is pleasurable.
PE3: Using this social networking website is fun.
PE4: Using this social networking website is exciting.
PE5: Using this social networking website is interesting.

Behavioral usage intentions (BI).
BI1: Assuming I have access to this social networking website, I intend to use it in future.
BI2: Given that I have access to this social networking website, I predict that I would use it in future.
BI3: Given that I have access to this social networking website, I predict that I would use it more frequently in future.

Appendix B: Reliability and Validity Assessments

Table B1. Item and Construct Statistics					
Item	**Item mean**	**Scale std. dev.**	**Item-total correlation**	**Cronbach's Alpha**	**Scale mean**
FOGS1	2.44	1.31	0.51	0.87	1.89
FOGS2	1.60	0.92	0.67		
FOGS3	1.53	0.83	0.57		
FOGS4	2.50	1.11	0.66		
FOGS5	2.24	1.03	0.69		
FOGS6	2.00	1.02	0.52		
FOGS7	1.50	0.80	0.64		
FOGS8	1.88	1.04	0.73		
CTAS1	2.63	1.72	0.66	0.93	2.28
CTAS2	2.08	1.35	0.76		
CTAS3	2.62	1.63	0.71		
CTAS4	1.94	1.32	0.77		
CTAS5	2.34	1.56	0.70		
CTAS6	2.08	1.47	0.77		
CTAS7	2.07	1.50	0.75		
CTAS8	2.46	1.75	0.76		
CTAS9	2.34	1.73	0.78		
CUW1	2.59	1.53	0.62	0.90	2.61
CUW2	2.61	1.63	0.73		
CUW3	2.12	1.42	0.66		
CUW4	3.17	1.60	0.52		
CUW5	2.41	1.40	0.64		
CUW6	3.24	1.73	0.60		
CUW7	2.62	1.72	0.74		
CUW8	2.12	1.34	0.63		
CUW9	3.03	1.65	0.61		
CUW10	2.18	1.23	0.66		
CPAU1	2.47	1.52	0.68	0.91	2.56
CPAU2	2.51	1.67	0.79		
CPAU3	2.05	1.32	0.72		
CPAU4	3.00	1.59	0.54		
CPAU5	2.43	1.37	0.62		
CPAU6	3.13	1.77	0.60		
CPAU7	2.49	1.58	0.76		
CPAU8	2.21	1.46	0.68		
CPAU9	3.07	1.65	0.60		
CPAU10	2.20	1.25	0.69		
PU1	5.98	1.31	0.59	0.86	5.07
PU2	5.12	1.49	0.80		
PU3	5.22	1.45	0.79		
PU4	4.78	1.54	0.80		
PU5	4.24	1.58	0.65		
PEOU1	5.69	1.35	0.76	0.93	5.68

Table B1. Item and Construct Statistics					
Item	**Item mean**	**Scale std. dev.**	**Item-total correlation**	**Cronbach's Alpha**	**Scale mean**
PEOU2	5.80	1.31	0.91		
PEOU3	5.70	1.30	0.85		
PEOU4	5.53	1.37	0.79		
PE1	5.23	1.40	0.88	0.95	5.03
PE2	4.93	1.46	0.87		
PE3	5.17	1.37	0.91		
PE4	4.67	1.37	0.82		
PE5	5.16	1.42	0.84		
BI1	5.28	1.35	0.80	0.84	4.93
BI2	5.32	1.32	0.76		
BI3	4.20	1.49	0.52		

Table B2. Measurement Model Reliability Assessment – FOGS			
Item	**Loading**	**Composite Reliability**	**AVE**
FOGS1	0.68	0.89	0.50
FOGS2	0.69		
FOGS3	0.56		
FOGS4	0.82		
FOGS5	0.81		
FOGS6	0.68		
FOGS7	0.61		
FOGS8	0.76		
PU1	0.74	0.92	0.69
PU2	0.89		
PU3	0.88		
PU4	0.87		
PU5	0.76		
PEOU1	0.87	0.95	0.82
PEOU2	0.95		
PEOU3	0.92		
PEOU4	0.88		
PE1	0.88	0.96	0.81
PE2	0.92		
PE3	0.93		
PE4	0.88		
PE5	0.89		
BI1	0.89	0.89	0.72
BI2	0.91		
BI3	0.74		

Table B3. Correlations Matrix and Discriminant Validity Assessment – FOGS (items on the diagonal represent the square root of AVE)					
Construct	**FOGS**	**PU**	**PEOU**	**PE**	**BI**
FOGS	**0.71**				
PU	0.36	**0.83**			
PEOU	0.04	0.46	**0.91**		
PE	0.40	0.80	0.52	**0.90**	
BI	0.27	0.71	0.53	0.72	**0.85**

Table B4. Cross-loadings Matrix - FOGS					
	FOGS	**PU**	**PEOU**	**PE**	**BI**
FOGS1	**0.68**	0.30	0.00	0.35	0.19
FOGS2	**0.69**	0.15	-0.11	0.15	0.07
FOGS3	**0.56**	0.09	-0.23	0.06	0.01
FOGS4	**0.82**	0.35	0.16	0.34	0.28
FOGS5	**0.81**	0.26	0.07	0.28	0.21
FOGS6	**0.68**	0.31	0.06	0.36	0.26
FOGS7	**0.61**	0.06	-0.19	0.11	-0.04
FOGS8	**0.76**	0.17	0.00	0.23	0.15
PU1	0.08	**0.74**	0.56	0.58	0.52
PU2	0.31	**0.89**	0.42	0.75	0.66
PU3	0.37	**0.88**	0.40	0.72	0.63
PU4	0.36	**0.87**	0.32	0.68	0.57
PU5	0.36	**0.76**	0.20	0.57	0.52
PEOU1	0.06	0.44	**0.87**	0.53	0.45
PEOU2	0.03	0.43	**0.95**	0.50	0.49
PEOU3	0.04	0.43	**0.92**	0.45	0.49
PEOU4	0.02	0.38	**0.88**	0.41	0.49
PE1	0.29	0.72	0.57	**0.88**	0.69
PE2	0.36	0.72	0.47	**0.92**	0.66
PE3	0.36	0.73	0.49	**0.93**	0.65
PE4	0.40	0.70	0.38	**0.88**	0.60
PE5	0.38	0.74	0.44	**0.89**	0.63
BI1	0.16	0.59	0.45	0.59	**0.89**
BI2	0.17	0.65	0.56	0.64	**0.91**
BI3	0.37	0.55	0.32	0.60	**0.74**

Table B5. Measurement Model Reliability Assessment - CTAS			
Item	**Loading**	**Composite Reliability**	**AVE**
CTAS1	0.77	0.94	0.63
CTAS2	0.81		
CTAS3	0.79		
CTAS4	0.80		
CTAS5	0.76		
CTAS6	0.81		
CTAS7	0.78		
CTAS8	0.82		
CTAS9	0.82		
PU1	0.74	0.92	0.69
PU2	0.89		
PU3	0.88		
PU4	0.87		
PU5	0.76		
PEOU1	0.87	0.95	0.82
PEOU2	0.95		
PEOU3	0.92		
PEOU4	0.88		
PE1	0.89	0.96	0.81
PE2	0.92		
PE3	0.93		
PE4	0.88		
PE5	0.89		
BI1	0.89	0.89	0.72
BI2	0.91		
BI3	0.74		

Table B6. Correlations Matrix and Discriminant Validity Assessment – CTAS (items on the diagonal represent the square root of AVE)					
Construct	**CTAS**	**PU**	**PEOU**	**PE**	**BI**
CTAS	**0.79**				
PU	0.29	**0.83**			
PEOU	-0.05	0.46	**0.91**		
PE	0.28	0.80	0.52	**0.90**	
BI	0.16	0.71	0.53	0.72	**0.85**

Table B7. Cross-loadings Matrix - CTAS					
	CTAS	**PU**	**PEOU**	**PE**	**BI**
CTAS1	**0.77**	0.33	0.08	0.30	0.25
CTAS2	**0.81**	0.20	-0.08	0.25	0.10
CTAS3	**0.79**	0.28	0.05	0.25	0.18
CTAS4	**0.80**	0.13	-0.16	0.16	0.00
CTAS5	**0.76**	0.18	-0.07	0.22	0.10
CTAS6	**0.81**	0.20	-0.13	0.14	0.07
CTAS7	**0.78**	0.13	-0.16	0.13	-0.02
CTAS8	**0.82**	0.28	0.00	0.28	0.18
CTAS9	**0.82**	0.22	-0.04	0.16	0.14
PU1	0.02	**0.74**	0.56	0.58	0.52
PU2	0.27	**0.89**	0.42	0.75	0.66
PU3	0.25	**0.88**	0.40	0.72	0.63
PU4	0.32	**0.87**	0.32	0.68	0.57
PU5	0.35	**0.76**	0.20	0.57	0.52
PEOU1	-0.01	0.44	**0.87**	0.53	0.45
PEOU2	-0.09	0.43	**0.95**	0.50	0.49
PEOU3	-0.02	0.43	**0.92**	0.45	0.49
PEOU4	-0.06	0.38	**0.88**	0.41	0.49
PE1	0.19	0.72	0.57	**0.89**	0.69
PE2	0.24	0.72	0.47	**0.92**	0.66
PE3	0.24	0.73	0.49	**0.93**	0.65
PE4	0.32	0.70	0.38	**0.88**	0.60
PE5	0.29	0.74	0.44	**0.89**	0.63
BI1	0.04	0.59	0.45	0.59	**0.89**
BI2	0.07	0.65	0.56	0.64	**0.91**
BI3	0.33	0.55	0.32	0.60	**0.74**

Table B8. Measurement Model Reliability Assessment - Second Order			
Item	**Loading**	**Composite Reliability**	**AVE**
CUW1	0.69	0.92	0.52
CUW2	0.78		
CUW3	0.75		
CUW4	0.61		
CUW5	0.73		
CUW6	0.68		
CUW7	0.81		
CUW8	0.72		
CUW9	0.69		
CUW10	0.71		
CPAU1	0.75	0.92	0.55
CPAU2	0.85		
CPAU3	0.76		
CPAU4	0.63		
CPAU5	0.71		
CPAU6	0.70		
CPAU7	0.83		
CPAU8	0.72		
CPAU9	0.65		
CPAU10	0.76		
PU1	0.74	0.92	0.69
PU2	0.89		
PU3	0.88		
PU4	0.87		
PU5	0.76		
PEOU1	0.87	0.95	0.82
PEOU2	0.95		
PEOU3	0.92		
PEOU4	0.88		
PE1	0.88	0.96	0.81
PE2	0.92		
PE3	0.93		
PE4	0.88		
PE5	0.89		
BI1	0.89	0.89	0.73
BI2	0.91		
BI3	0.74		

Table B9. Correlations Matrix and Discriminant Validity Assessment - Second Order (items on the diagonal represent the square root of AVE)						
Construct	**CUW**	**CPAU**	**PU**	**PEOU**	**PE**	**BI**
CUW	**0.72**					
CPAU	0.88	**0.74**				
PU	0.31	0.24	**0.83**			
PEOU	-0.05	-0.08	0.46	**0.91**		
PE	0.32	0.26	0.80	0.52	**0.90**	
BI	0.16	0.11	0.71	0.53	0.72	**0.85**

Table B10. Cross-loadings Matrix - Second Order						
	CUW	**CPAU**	**PU**	**PEOU**	**PE**	**BI**
CUW1	**0.69**	0.59	0.41	0.21	0.43	0.37
CUW2	**0.78**	0.69	0.22	-0.02	0.17	0.10
CUW3	**0.75**	0.63	0.11	-0.10	0.15	0.05
CUW4	**0.61**	0.51	0.15	-0.10	0.12	0.01
CUW5	**0.73**	0.64	0.05	-0.21	0.14	-0.07
CUW6	**0.68**	0.62	0.40	0.08	0.38	0.30
CUW7	**0.81**	0.73	0.31	0.04	0.27	0.15
CUW8	**0.72**	0.68	0.18	-0.14	0.28	0.08
CUW9	**0.69**	0.57	0.22	0.04	0.21	0.15
CUW10	**0.71**	0.67	0.14	-0.15	0.16	0.05
CPAU1	0.66	**0.75**	0.31	0.05	0.31	0.25
CPAU2	0.76	**0.85**	0.21	-0.06	0.18	0.04
CPAU3	0.68	**0.76**	0.07	-0.21	0.09	-0.12
CPAU4	0.57	**0.63**	0.11	-0.04	0.13	0.14
CPAU5	0.58	**0.71**	0.02	-0.19	0.05	-0.13
CPAU6	0.67	**0.70**	0.37	0.13	0.38	0.31
CPAU7	0.74	**0.83**	0.23	-0.01	0.23	0.11
CPAU8	0.62	**0.72**	0.15	-0.10	0.23	0.11
CPAU9	0.62	**0.65**	0.22	0.03	0.22	0.16
CPAU10	0.60	**0.76**	0.04	-0.21	0.07	-0.05
PU1	0.02	-0.06	**0.74**	0.56	0.58	0.52
PU2	0.29	0.18	**0.89**	0.42	0.75	0.66
PU3	0.29	0.26	**0.88**	0.40	0.72	0.63
PU4	0.33	0.31	**0.87**	0.32	0.68	0.57
PU5	0.34	0.29	**0.76**	0.20	0.57	0.52
PEOU1	-0.02	-0.06	0.43	**0.87**	0.53	0.45
PEOU2	-0.07	-0.09	0.43	**0.95**	0.50	0.49
PEOU3	-0.02	-0.06	0.43	**0.92**	0.45	0.49
PEOU4	-0.07	-0.09	0.38	**0.88**	0.41	0.49
PE1	0.22	0.17	0.72	0.57	**0.88**	0.69
PE2	0.27	0.21	0.72	0.47	**0.92**	0.66
PE3	0.27	0.20	0.73	0.49	**0.93**	0.65
PE4	0.37	0.33	0.70	0.38	**0.88**	0.60
PE5	0.33	0.27	0.74	0.44	**0.89**	0.63
BI1	0.04	0.01	0.59	0.45	0.59	**0.89**
BI2	0.05	-0.01	0.65	0.56	0.64	**0.91**
BI3	0.36	0.32	0.55	0.32	0.60	**0.74**

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