Understanding compulsive smartphone use: An empirical test of a flow-based model

Chongyang Chen[a,b], Kem Z.K. Zhang[a,*], Xiang Gong[a,b], Sesia J. Zhao[c], Matthew K.O. Lee[b], Liang Liang[a]

[a] School of Management, University of Science and Technology of China, Hefei, China
[b] Department of Information Systems, City University of Hong Kong, Hong Kong, China
[c] Management School, Anhui University, Hefei, China

A B S T R A C T

Smartphones have gained significant popularity. With the rising concerns of compulsive smartphone use, understanding how smartphone users develop compulsive behaviors is crucial. In this study, we aim to investigate the role of flow in the formation of compulsive smartphone use. Drawing upon the flow theory, we incorporate the psychological state of flow as a key factor in our research model. We identify its determinants based on the desirability–feasibility perspective and reinforcement sensitivity theory. We empirically test our model by conducting an online survey with 384 valid responses. We expect that our findings can provide noteworthy insights on the formation of compulsive smartphone use.

1. Introduction

Along with the exponential growth of smartphone usage, growing evidence suggests that many users begin to show the symptoms of smartphone addiction and use the devices compulsively (Lapointe, Boudreau-Pinsonneault, & Vaghefi, 2013). The compulsive use of smartphones has been found to result in negative consequences that seriously affect lives and work (Tarafdar, Gupta, & Turel, 2015; Turel et al., 2008 For instance, during socializing with friends, compulsively checking smartphones may negatively influence users' social lives (Park & Lee, 2011). A recent report from Deloitte[1] indicates that compulsive smartphone use becomes prevalent in China with adverse outcomes such as playing smartphones at the cost of study/work performance. To avoid these unpleasant effects, it becomes critical for researchers to understand the formation of compulsive smartphone use.

According to prior research, compulsive information technology (IT) use denotes the extent to which people use ITs repetitively and fail to control the use (Caplan, 2010). It highlights the behavioral aspect of IT addiction (Thadani & Cheung, 2011; Young, 1998), which has been defined as a maladaptive dependency on IT usage (Turel, Serenko, & Giles, 2011). Kim and Davis (2009) posited that there is no doubt that IT usage is problematic if the behavior becomes compulsive. As an emerging research issue, compulsive IT usage has

not been extensively studied in the information systems (IS) literature (Cheung, Lee, & Lee, 2013), and certainly the same for smartphones. According to neuroscience research, the neural mechanism of compulsive substance use is intrinsic reward-related, which enables people to receive positive feelings from midbrain dopamine neurons (Blum et al., 2000; Hyman, Malenka, & Nestler, 2006). Seeking intrinsic rewards may generate cycles of dysregulation and finally lead to compulsive behaviors (e.g., Koob & Le Moal, 2001). In other words, when a behavior is intrinsically rewarding, it may increase the likelihood of behaving compulsively. Following this perspective, this study plans to investigate whether intrinsic-reward factors can influence compulsive IT use. More specifically, we examine the influence of flow on compulsive smartphone use.

Prior research posits that flow is a key intrinsic reward and refers to a positive psychological experience when people use ITs (Weibel, Wissmath, Habegger, Steiner, & Groner, 2008). Flow has also been shown to be an important experience for smartphone users. For instance, playing smartphone games can help users attain the positive flow state, which leads to continued usage (Joo, 2016). Smartphone users are found to experience flow during viewing mobile advertising (Kim & Han, 2014). Meanwhile, the "danger" of flow is demonstrated by recent anecdotal evidence of IT addiction. For instance, Salehan and Negahban (2013) stated that users who try to maintain the positive

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* Corresponding author.
  E-mail addresses: chongy@mail.ustc.edu.cn (C. Chen), zzkkem@ustc.edu.cn (K.Z.K. Zhang), xianggong3-c@my.cityu.edu.hk (X. Gong), sesia@ahu.edu.cn (S.J. Zhao), ismatlee@cityu.edu.hk (M.K.O. Lee), lliang@ustc.edu.cn (L. Liang).
  [1] http://www.chinaaet.com/article/3000011289, accessed on 30 March 2017.

experience of flow while using social networking applications on smartphones tend to develop undesirable addiction behaviors. Sun, Zhao, Jia, and Zheng (2015) showed that flow may facilitate game addiction in mobile platforms. Based on these concerns, it is possible that the "desirable factor" of flow may exert an important effect on compulsive smartphone use. This is also in line with prior research (Park & Lee, 2011), which indicates that positive experiential factors may result in compulsive smartphone use.

In sum, this study considers flow as an important ingredient in the development of compulsive smartphone use. Our *first* objective is thus to test the effect of flow on compulsive smartphone use (the behavioral aspect of smartphone addiction), rather than on smartphone addiction. Prior research has shown that IT addiction consists a number of symptoms (e.g., conflict, withdrawal, and behavioral salience) (Turel et al., 2011), which may have different determinants (Soror, Hammer, Steelman, Davis, & Limayem, 2015). In this study, we assess the importance of flow in compulsive smartphone use. Linking flow with such a behavioral outcome may partially help to explain why recent research finds inconsistent results regarding whether flow can influence IT addiction (e.g., Thatcher, Wretschko, & Fridjhon, 2008; Wan & Chiou, 2006). The *second* research objective is to identify the determinants of flow. This can enrich our understanding of why smartphone uses are more likely to experience flow during using the devices. It further helps to provide a more complete nomological network of how flow is developed, and how it leads to negative behavioral outcomes like compulsive smartphone use. More specifically, we identify the determinants of flow based on the desirability–feasibility perspective (i.e., instant gratification, mood regulation, and convenience). This perspective reflects users' general beliefs toward ITs, which can explain why users develop personal willingness to embrace IT devices (Jia, Wang, Ge, Shi, & Yao, 2012). We further extend this perspective by including personal traits that are stemmed from reinforcement sensitivity theory. Considering personal traits allows us to discern whether users may exhibit predispositions in developing flow experience and finally the compulsive use of smartphones. It can help us develop effective prevention guidelines for different compulsive users.

This study is expected to make several contributions. First, given its practical relevance and research significance, this study contributes to the emerging literature of compulsive IT use and pushes forward the development in this area with solid theoretical background. Second, previous research mostly addresses the positive outcomes of flow (e.g., Hsu & Lu, 2004). In contrast, its negative consequences are largely uninvestigated. The very few IS studies that investigate the role of flow in IT addiction contexts only provide limited and incongruent evidence. Extending this line of studies, we investigate the determinants and effect of flow on compulsive smartphone use. Finally, we extend the desirability–feasibility perspective by incorporating reinforcement sensitivity theory. This can add to the IS literature on the dark sides of ITs, and explicate how different users develop their flow state and further compulsive behaviors. The rest of this paper is structured as follows. We review the theoretical background in the next section. Then, we develop our research model, followed by presenting the research method, data analysis, and results. Finally, we summarize this work by discussing the findings, implications, limitations, and opportunities for future research.

2. Theoretical background

To guide the current study, we review the relevant literature, including flow theory, desirability and feasibility perceptions, and reinforcement sensitivity theory.

2.1. Flow theory

Csikszentmihalyi originally proposed the concept of flow, and identified it as the optimal experience in activities and the state of complete absorption (Nah, Eschenbrenner, & DeWester, 2011). People who are in the flow state will perceive pleasure and find an activity worth doing. To develop the concept of flow, prior research has adopted a number of measures and dimensions, including operationalizing it as a first order construct (e.g., Park & Hwang, 2009), or a second order one (e.g., Kwak, Choi, & Lee, 2014). Among these studies, enjoyment and concentration are widely considered to be the two key dimensions (Chou & Ting, 2003; Ghani & Deshpande, 1994).

Flow theory has been employed from physiological settings to broader contexts, such as human–computer interactions (Weibel et al., 2008). In these contexts, flow is often shown to bring positive outcomes. For instance, it is found to positively influence the hedonic use of ITs (e.g., Kwak et al., 2014; Weibel et al., 2008). Hsu and Lu (2004) revealed that flow experience is an indispensable factor contributing to the adoption of online games. Lu, Zhou, and Wang (2009) also demonstrated that flow significantly improves users' attitude toward instant messaging and their behavioral intention. Cowley, Charles, Black, and Hickey (2008) similarly verified the positive association between flow and IT adoption behaviors. In contrast, the danger of flow has not received much attention. A few studies point out that flow may lead to IT addiction. For instance, Wan and Chiou (2006) concluded that flow is *not* important for predicting online game addiction. On the other hand, the psychological study of Chou and Ting (2003) demonstrated the significant effect of flow on cyber-game addiction. It proposed that flow serves as the intermediary connecting the repetition of playing games with addiction. That is, repetition facilitates the enjoyable experience of flow, which increases users' desire to remain positive feelings and eventually results in cyber-game addiction. In the IS literature, Thatcher et al. (2008) also suggested that flow experience may be a reason why Internet users spend longer time than planned in online activities, which results in problematic Internet use. The modest and inconsistent findings regarding the influence of flow on IT addiction calls forth more research in this area. In this study, we will focus on the relationship between flow and compulsive smartphone use. We expect that examining this relationship is theoretically more valid because: (1) smartphone users are easy to experience the flow state given the opportunities to use a variety of mobile applications (e.g., browsing the Internet, playing games, and social networking) (Joo, 2016; Kim & Han, 2014; McCauley, 2014; Zhou, Li, & Liu, 2010); (2) flow has been shown to be a key intrinsic reward that leads to behavioral outcomes (Weibel et al., 2008), and (3) compulsive smartphone use captures the behavioral aspect of smartphone addiction (Thadani & Cheung, 2011; Young, 1998).

In the extant literature, there are concepts similar to flow. A notable one is cognitive absorption proposed by Agarwal and Karahanna (2000). Cognitive absorption is developed from research on flow, the trait dimension of absorption, and the concept of cognitive engagement. It refers to a user's holistic experiences with ITs, a state of deep involvement, and can be measured with five dimensions, namely heightened enjoyment, focused immersion, temporal dissociation, curiosity, and control (Agarwal & Karahanna, 2000). In comparison, flow can be argued with two key characteristics: enjoyment and concentration, by following Ghani and Deshpande's (1994) study. From these perspectives, cognitive absorption is a more comprehensive construct with dimensions (e.g., temporal dissociation) which are beyond the scope of flow and less related to intrinsic rewards (Novak, Hoffman, & Yung, 2000). Therefore, this study chooses flow rather than cognitive absorption as the key determinant of compulsive smartphone use.