

Technology-Mediated Self-Regulation: An Implication for Preventing Online Gaming Addiction

Research-in-Progress

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Abstract

Self-regulation has assumed an important role in online gaming addiction. Although the role of self-regulation has received increasing scholarly attention in the past decade, research on self-regulation remains new in the information systems literature. There is also a lack of understanding of how technological design features can enhance one's self-regulation and thus prevent online gaming addiction. Therefore, we attempt to bridge these research gaps by identifying technological design features that can enhance one's self-regulation in online gaming, as well as by developing a research model to explain how technological design features influence one's online gaming addiction through the self-regulatory mechanisms. In this research-in-progress paper, we present our research model and hypotheses and describe our research design. We expect that this study contributes to our understanding of the intervention and prevention in the domain of technology addiction.

Keywords: Self-regulation, online games, technological design feature, technology addiction, addiction prevention, social cognitive theory of self-regulation

Introduction

Online gaming addiction has become an emerging societal challenge in many countries (Gentile et al. 2011). People who are addicted to online gaming suffer from reduced decision-making ability, interpersonal problems, physical health problems, and even death (Billieux et al. 2011; Lee 2013; Lee et al. 2015; Thomas 2014; Ye 2015). In the past decade, there has been an increasing scholarly concern on the development of technology addiction (Turel et al. 2011), and self-regulatory deficiency has been regarded as a crucial antecedent of technology addiction in various contexts, such as mobile phones (Soror et al. 2015), social networking sites (Lee et al. 2012; Thadani and Cheung 2011; Turel and Serenko 2012), and online games (Haagsma et al. 2013; Lee et al. 2014).

However, research on self-regulation is relatively new in the information systems (IS) literature, and a scientific understanding of the issue is still evolving. While most of the IS studies have focused on examining the effects of self-regulation on technology use, such as complying to Internet user policy (Li et al. 2014) and reducing negative consequences of mobile phone use (Soror et al. 2015), the self-regulatory mechanisms, namely self-monitoring, self-judgment, and self-reaction, as well as the role of technological design features on enhancing each of these self-regulatory subfunctions was largely overlooked. Similar research patterns have been observed in past studies on self-regulation and online gaming addiction. More research is thus needed to systematically explain how self-regulatory mechanisms operate and what technological design features enhance a user's self-regulation in order to provide insights into preventing online gaming addiction.

To bridge the research gaps, this paper has two main objectives: (1) to identify technological design features that can enhance one's self-regulation in online gaming, and (2) to develop a research model explaining how technological design features influence one's online gaming addiction through the self-regulation mechanisms. We expect that this study will contribute to our theoretical understanding of the role of self-regulation in technology addiction, as well as to offer a set of actionable design principles for game designers to enhance users' self-regulatory mechanisms.

The remainder of this paper is organized as follows. In the next section, the theoretical foundation of this study is introduced and the research status of self-regulation and technology addiction is reviewed. Thereafter, the research model and hypothesis development are presented. Subsequently, details on research designs, data collection procedures, measures, and data analysis approaches are reported. Last, expected implications for research and practice are highlighted.

Literature Review

Self-Regulation

Self-regulation generally refers to the process by which one initiates, adjusts, interrupts, or alters actions to promote attainments of personal goals, plans, or standards (Heatherton and Baumeister 1996). It is related to a wide spectrum of behaviors, both positive and negative (de Ridder et al. 2012). Conversely, low or deficient self-regulation has been regarded as a common factor associating with many individual and societal problems, including addiction, eating disorder, impulsive buying, procrastination, and criminality (de Ridder et al. 2012; Vohs and Baumeister 2011). In contrary, individuals with high self-regulation are more capable in controlling their thoughts, regulating their emotions, and inhibiting their impulses (Vohs and Baumeister 2011). They generally enjoy better psychological health, interpersonal relationships, and academic successes (de Ridder et al. 2012; Tangney et al. 2004).

According to Bandura (1991) and LaRose et al. (2003), the self-regulatory mechanism operates through three subfunctions, namely self-monitoring, self-judgment, and self-reaction.

- *Self-monitoring* involves observing one's actions to gather diagnostic information about the impact of such behaviors on the self, others, and the environment.
- *Self-judgment* evaluates observations of behavior against personal standards and/or in reference to social standards.

- *Self-reaction* requires exercising one's self-reactive influences over courses of action which is readily achieved by providing tangible rewards for and/or by having anticipative affections of one's own reactions.

While self-regulation is crucial in determining a wide range of human behaviors, the self-regulation literature suggests that one's capacity for self-regulation is a limited resource. The capacity of self-regulation decreases upon uses or increases through gradual development or practice, but is renewable over time (Baumeister and Heatherton 1996; Usta and Haubl 2011). For example, performing effortful tasks depletes one's self-regulatory resources and impairs their ability to exercise self-control (Usta and Haubl 2011). On the other hand, repeated physical and cognitive self-control exercise (Sultan et al. 2012) or attention training (Vohs and Baumeister 2011) are effective in enhancing one's self-regulatory ability. Furthermore, researchers have suggested that technologies assume an important role in enhancing one's self-regulation in technology use across contexts (Nussbaumer et al. 2011).

Research Status of Self-Regulation in the Information Systems (IS) Literature

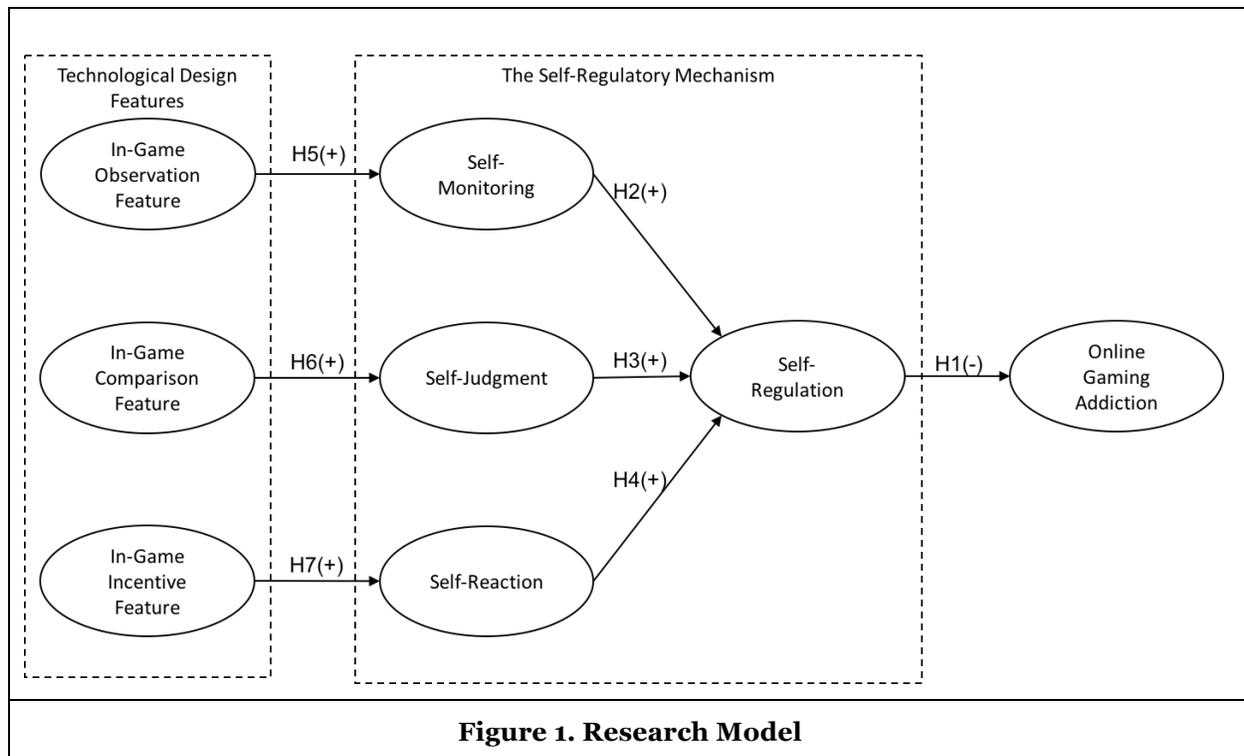
Although research on self-regulation in the IS literature is in its infancy, certain research patterns have been observed. First, a majority of the studies have examined the role of self-regulation in promoting desirable behaviors or inhibiting deviant ones, such as complying to Internet user policy (e.g., Li et al. 2014), enhancing online learning outcomes (e.g., Wan et al. 2012), and reducing negative consequences of mobile phone use (e.g., Soror et al. 2015). Few researchers have investigated the relationships between self-regulation and general IS usages, including IS adoption (e.g., Hwang 2005) and IS continuance (e.g., Lin et al. 2014). Second, most of the researchers have focused on a particular subfunction of the self-regulatory mechanism, rarely have they systematically examined the three self-regulatory subfunctions (i.e., self-monitoring, self-judgment, and self-reaction). For example, some researchers have focused on the importance of being attentive to performing behaviors (e.g., Hu et al. 2015; Lin et al. 2014; Sutanto et al. 2011); some have concentrated on the need of evaluating behaviors against personal ethics (e.g., Li et al. 2014) or group norms (e.g., Wan et al. 2012). Finally, most studies have focused on the outcomes of self-regulation (e.g., Gravill and Compeau 2008; Hu et al. 2015; Wan et al. 2012). However, the effects of technological design features on self-regulation have been largely overlooked.

Research Status of Self-Regulation and Online Gaming Addiction

Self-regulation has been examined in past studies of online gaming addiction. Through a comprehensive literature review, several patterns of research on self-regulation and online gaming addiction have been observed. First, in a majority of studies, researchers have measured self-regulation as a stable personality trait and examined its effects on online gaming addiction (e.g., Collins et al. 2012; Khang et al. 2013; Mehroof and Griffiths 2010) with a notable exception of Haagsma et al. (2013) who measured deficient self-regulation as a state of diminished self-control. While self-regulation, as a personality trait, has been consistently found to be negatively related to online gaming addiction (e.g., Kim et al. 2008; Son et al. 2013), the state of self-regulation (i.e., the temporary and malleable form of self-regulation) and its related subfunctions (i.e., self-monitoring, self-judgment, and self-reaction) have not received commensurate scholarly attention. Furthermore, while most of the studies were from the psychology and psychiatry literature, holding a clinical perspective and focusing on the direct effects of self-regulation on outcome variables (e.g., Haghbin et al. 2013; Mehroof and Griffiths 2010), antecedent variables of self-regulation remained underexplored. Specifically, there is a paucity of research on the role of technological design features on enhancing a user's self-regulation.

Research Model and Hypothesis Development

In response to the research gaps identified in the previous sections, this study builds on social cognitive theory of self-regulation (Bandura 1991) and focuses on how self-regulation is associated with the prevention of online gaming addiction. Specifically, this study systematically examines the three self-regulatory subfunctions (i.e., self-observation, self-judgment, and self-reaction), and identifies technological design features that enhance each subfunction. Figure 1 depicts the research model.



Self-Regulation and Online Gaming Addiction

Online gaming addiction refers to a psychological state of maladaptive dependency on playing online games to such a degree that the following typical behavioral addiction symptoms arise: *salience, withdrawal, conflict, relapse and reinstatement, tolerance, and mood modification* (Turel et al. 2011).

Self-regulation has been extensively researched in past studies on behavioral addictions. Specifically, self-regulatory deficiency has been found to be an important antecedent to online gaming addiction. Lee and LaRose (2007) found that self-regulatory deficiency led to patterns of mounting usage of online games. Furthermore, Liu and Peng (2009) added that a user with deficient self-regulation would encounter difficulty in reducing the online game usage despite acknowledging the potential negative consequences that might be resulted from such gameplays. In other words, successful prevention of online gaming addiction hinges on enhancing a user's self-regulation toward his/her gameplays. For instance, Soror et al. (2015) found that a user with high self-regulation significantly reduced his/her mobile phone usage and the associated negative consequences. In the same vein, a user with high self-regulation should be less likely to develop online gaming addiction. Therefore, it is hypothesized that:

H1: A user's self-regulation is negatively related to online gaming addiction.

Social Cognitive Theory of Self-Regulation

Social cognitive theory of self-regulation suggests that human behavior is not only influenced by external variables but also extensively regulated by the ongoing exercise of self-influences (Bandura 1991). Compared with other living creatures, human beings have higher ability to regulate their inner states, processes, and responses (Baumeister et al. 1994). According to Bandura (1991) and LaRose et al. (2003), one's self-regulatory mechanism operates through three principal subfunctions, namely self-monitoring, self-judgment, and self-reaction. Deficiency in the three subfunctions would result in deteriorated self-regulation and lead to different deviant and maladaptive behaviors. In other words, to successfully exercise self-regulation over online gameplays, a user needs to observe and gather information about his/her performing behaviors (i.e., self-monitoring), evaluates it against personal and/or social standards (i.e., self-

judgment), and exercises self-reactive influences for changing his/her behaviors through incentives (i.e., self-reaction). Thus, it is hypothesized that:

H2: A user's self-monitoring is positively related to self-regulation while playing online games.

H3: A user's self-judgment is positively related to self-regulation while playing online games.

H4: A user's self-reaction is positively related to self-regulation while playing online games.

Self-Monitoring

Self-monitoring involves observing one's behaviors and gathering diagnostic information about the impact of such behaviors on the self, as well as on others and the environment (Bandura 1991; LaRose et al. 2003). If one does not pay adequate attention to his/her behaviors and the corresponding consequences, it is unlikely that he/she will propose any changes to the performing behaviors.

Success in self-regulation largely hinges on the accuracy, consistency, and temporal proximity of self-observation (Bandura 1991). First, to be effective in self-monitoring, one needs to obtain accurate information about his/her behaviors in relation to the situations in which it is performed. Second, consistent self-monitoring, compared with intermittent self-monitoring, is a more effective self-regulation approach as it can draw one's regular attention to his/her behaviors. Furthermore, temporal proximity of observation increases the likelihood of enlisting subsequent self-reaction because it brings consequences to bear on present behaviors than their distal effects. Applying such notions to the prevention of online gaming addiction, if online games can provide technological features that allow users to observe and obtain accurate, consistent, and timely information about their gameplays, a user will be more likely to monitor his/her gaming behaviors. Therefore, it is hypothesized that:

H5: In-game observation feature is positively related to a user's self-monitoring while playing online games.

Self-Judgment

Self-judgment involves evaluating one's observations of behavior against personal standards and/or in reference to social standards (Bandura 1991; LaRose et al. 2003). Observation in itself provides little insights into plausible reactions. Specifically, self-monitoring gives rise to self-reaction through a judgmental function that involves comparisons (Bandura 1991).

Comparisons can be made against personal standards and/or social standards (LaRose et al. 2003). Whether a given behavior is considered desirable or undesirable depends heavily on the personal as well as social standards against which it is evaluated (Bandura 1991). One develops personal standards through intuition (Bandura 1991). Therefore, for preventing excessive online gaming, online games should have technological features that allow a user to compare between his/her usage level across time.

Since most activities have no absolute measures of adequacy, a user also compares against independent and relatively objective indicators of adequacy of behaviors (i.e., social standards). For instance, playing online games for three hours a day is deemed excessive for user A but not for user B. Therefore, it would be useful if online games can provide technological features that give an overview of the time users have spent in the games. As a result of this, one, who aims to play less than the average of other users, can refer to an objective social standard and perform such a comparison effectively and efficiently. Taken together, it is hypothesized that:

H6: In-game comparison feature is positively related to a user's self-judgment while playing online games.

Self-Reaction

Self-reaction refers to the exercise of self-reactive influences over courses of action which is readily achieved by creating tangible incentives for and/or by having anticipative affections of one's own reactions (Bandura 1991; LaRose et al. 2003). While self-judgment sets the occasion for self-reactive influences, self-reaction subfunction delineates how standards regulate courses of behavior through incentives or a motivational mechanism (Bandura 1991).

Incentives have been proven effective in enhancing self-reactive ability and inducing behavioral changes (Zimmerman 1989). Incentives in the self-reaction subfunction can be loosely classified into two types, tangible incentives and evaluative incentives. Tangible incentives and evaluative incentives are analogous to extrinsic benefits and intrinsic benefits respectively, and affect one's exercise of self-influences through the motivational mechanism. For instance, monetary incentives (anticipated job satisfaction) encourage an employee to have his/her job done well through an extrinsic motivational (intrinsic motivational) mechanism (Bandura 1991). Applying such a notion to the online gaming addiction prevention, online games can help a user to exercise self-reactive influences over his/her gameplays by providing system-administered in-game money and experience point (i.e., tangible incentives) and/or compliment (i.e., evaluative incentives) for logging off after prolonged use. Therefore, it is hypothesized that:

H7: In-game incentive feature is positively related to a user's self-reaction while playing online games.

Controlled Effects

Demographic variables and experiences have been shown to be important factors affecting IS usage (Venkatesh et al. 2003). Therefore, a number of control variables will be included into the current investigation, including a respondent's demographics (e.g., age and gender), Internet experiences, gaming experiences, and psychological well-beings.

Research Methodology

Massively multiplayer online games (MMOGs) will be used in this study to investigate the effects of technology-mediated self-regulation on preventing online gaming addiction. MMOGs is an appropriate and representative subject because it is one of the most popular online game genres worldwide. An experimental research design will be used to advance and test the research model of self-regulation and online gaming addiction prevention. The experimental study consists of two major stages.

Stage 1: Instrument Development and Validation

As discussed above, the research on self-regulation is still evolving and the measures of some key constructs in the proposed research model are still in the development stage. Most of the key constructs of the research model have not been investigated in the context of online games or information technologies in general. Therefore, measures specific to the current context will be developed following the instrument development approach suggested by Moore and Benbasat (1991).

Stage 2: Experiment

A laboratory experiment with a 2 (in-game observation function, present versus absent) x 2 (in-game comparison function, present versus absent) x 2 (in-game incentive function, present versus absent) will be conducted to test the proposed hypotheses. A pilot test with 50 subjects will be conducted prior to the main experiment to assess the appropriateness of the experimental design, the clarity and length of the questionnaire, and the realism of the manipulations.

Sample and Experimental Procedures

Subjects in this experiment will be students at a large public university in Hong Kong. Prior to the experiment, subjects will be asked to provide information about his/her demographics, Internet experiences, online gaming experiences, and psychological well-beings. Subjects will be then randomly assigned to one of the eight experimental conditions in a mock-up online game environment that simulated an actual virtual world of online game with specific layout and features.

Measures

Measures of self-regulation and online gaming addiction are adapted from validated scales (see Appendix A). Measures for self-monitoring, self-judgment, and self-reaction will be developed following established procedures of instrument development (Moore and Benbasat 1991). In addition, past studies showed that

respondents tend to under-report negative characteristics and behaviors (e.g., stealing or addiction) as they want to portray themselves in a way viewed favorably by others (Turel et al. 2011; Williams and Podsakoff 1992). This phenomenon is referred to social desirability bias. Thus, a social desirability bias scale (Reynolds 1982) will be also included.

Data Analysis

After manipulation checks, ANOVA tests will be conducted to examine the effects of technological design features on self-monitoring, self-judgment, and self-reaction respectively. The remainder of the research model will be estimated using structural equation modeling (SEM) approach which is one of the most widely used analysis techniques in IS research. According to (Chin 1998), SEM provides flexibility in estimating relationships among multiple indicators and criterion variables, allows modeling with latent variables, and estimates a model uncontaminated with measurement errors.

Conclusion and Expected Contributions

Self-regulation has assumed an important role in online gaming addiction. However, research on self-regulation remains new in the IS literature and there is a lack of studies examining the self-regulatory mechanism and the role of technological design features in enhancing one's self-regulation in online gaming. This study, therefore, aims to systematically examine the three self-regulatory subfunctions (i.e., self-monitoring, self-judgment, and self-reaction) and identify corresponding technological design features that enhance one's self-regulatory functions in online gameplays. In this research-in-progress paper, we built on social cognitive theory of self-regulation and developed a research model explicating the relationships among online gaming addiction, the self-regulatory mechanism, and technological design features.

This study presents significant implications to both research and practice. First, this study addresses the research gaps in the research of self-regulation and online gaming addiction as well as is a response to the calls for more IS studies on the role of technological design features in the self-regulation mechanism. Second, this study adds to the growing body of knowledge on online gaming addiction, with a specific focus on the prevention and intervention. The research model can serve as a foundation for future investigations into technology addiction prevention in which self-regulation has a critical role to play. Finally, this study provides online game developers with actionable design principles for enhancing user self-regulation during his/her gameplays and preventing online gaming addiction.

Appendix A - Measures

Table A1. Constructs, Measure Sources, and Items		
Constructs	Measure Sources	Items
Online Gaming Addiction	Xu et al. (2012)	My social life has sometimes suffered because of my online gameplays. Playing online games has sometimes interfered with my work or study. When I am not playing online games I often feel restless. I have made unsuccessful attempts to reduce the time spent on online games. Arguments have sometimes arisen at home because of the time I spend on playing online games. I often fail to get enough sleep because of playing online games. I often miss meals because of playing online games.
Self-Regulation	Haagsma et al. (2013)	When I have not been playing online games for some time, I am not preoccupied with the thought of gaming. I would not feel bad if I was unable to play online games.

		<p>I do not think obsessively about playing online games when I am not playing.</p> <p>I do not have difficulty controlling the amount of time spent on online games.</p> <p>I find it easy to control my online game use.</p> <p>I can resist the urge to play online games.</p>
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