# Online Video Game Addiction: A Review and an Information Systems Research Agenda

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**Sepandar Sepehr**
McMaster University
sepehrs@mcmaster.ca

**Milena Head**
McMaster University
headm@mcmaster.ca

## ABSTRACT

Using IT systems for extensive amounts of time can have negative affects on one's life. In particular, online video games have received recent attention for their potential addictive nature. While most scholarly works in this domain have been performed by psychologists and psychiatrists, this manuscript posits that there is a great opportunity for information systems researchers to provide a unique contribution in understanding this phenomenon. A selective literature review is conducted to develop an information systems-based framework that maps extant video game research and identifies research gaps.

### Keywords

Video Game Addiction, Pathological Gaming, Problematic Internet Use, Behavioural Addiction, Review

## INTRODUCTION

A potential serious negative outcome of using IT systems is developing 'technology addiction', which is starting to be taken more seriously in Information Systems (IS) research (Turel, Serenko, and Giles, 2011b). However, there is no agreement on this term and its definition. As Turel et al. (2011b) identify, various terms can be used for technology addiction: Internet addiction disorder, compulsive Internet use, problematic or pathological Internet use, pathological use of video games, and computer addiction. Current literature tends to support the notion that technology or the Internet is not addictive by itself, but rather, it causes individuals to have problematic Internet/technology use "in relation to specific online activities, such as gambling, email or pornography" (Yellowlees and Marks, 2007). In particular, recent information systems research has studied the concepts of mobile addiction (Turel, Serenko, and Bontis, 2011a), online auction addiction (Turel et al., 2011b), and online game addiction (Xu, Turel, and Yuan, 2012).

Online video gameplay is one of the significant usages of computers and Internet, in particular among adolescents. Massively Multiplayer Online Role-Playing Games (MMORPGs), such *World of Warcraft* (WoW) has thousands of players from around the world spending significant amount of time on these games everyday. This can result in problematic gameplaying similar to substance dependence among different groups of people (Kuss, Louws, and Wiers, 2012). As such, from the potential activities that can lead to technology/Internet addiction, we believe that video gameplaying, due to its significant effect on people's lives, necessitates rigorous research from different disciplines. In this review, the vast majority of articles examined are for online video games and we will use online video game and video game interchangeably.

It is worth mentioning that these terminologies are still controversial among medical communities, where the terminology of technology addiction has not been acknowledged until very recently. The latest version of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR; APA, 2000) does not include such problems as a disorder per se. In the upcoming issue of DSM (DSM-V), APA includes a new category of behavioural addiction to include gambling addiction that is the bases of many video game addiction studies. Internet addiction is not included in the next issue of DSM due to the lack of research in this domain. However, it will be included as an appendix to "encourage additional research that could lead to their inclusion in future editions" (Gever, 2010; and see APA, 2010).

### Prevalence of Video Game Addiction

One of the main concerns when introducing a new concept, such as online video game addiction, is to evaluate whether it exists and whether it can be diagnosed using established criteria. Depending on the scale, population of the sample, or the method of evaluation (to be discussed in the following sections), each of the studies identified have reported different prevalence rates. The numbers vary from 2% to more than 30% in some studies. For example, in one study among more than 300 Dutch adolescent gamers, the addiction rate is between 2% and 9% depending on the method of evaluation (Lemmens et al. 2009). In other studies, 39% or 1.8% of 442 MMOG players (Charlton and Danforth, 2007) and 3.6% or 44.5% of 1420 online gamers from around the world (Hussain, Griffiths, and Bagulay, 2012) depending on the method of evaluation, 9% of 3,034 grade 3 Singaporean students (Gentile, Hyekyung, Liau, Sim, Ma, Fung, and Khoo, 2011), 8% of 1,178 American youth (Gentile, 2009), and 20% of 387 adolescents (Charlton and Danforth, 1998) can be identified as addicted.

Regardless of the variance in prevalence rates, it is reasonable to state that the online video game addicts exist and necessitate research. In particular, the following review of online video game addiction will show that IS scholars have conducted limited research in this important domain and have the potential to provide a rich and complementary perspective. Thus, we will identify the gaps in online video game addiction literature and exhibit the contributions that IS can make.

## METHODOLOGY

A selective literature review was carried out by conducting a search through Google Scholar, Business Source Complete, AIS Electronic Library, and PsycINFO databases, searching for 'game addiction' and related terms. Sorted by relevance, the first 25 articles with empirical studies were chosen in addition to some of the notable articles identified in the literature. It should be mentioned that only one article on this topic has been published in MIS journals (Xu et al., 2011) and the rest of the articles are from psychology and related fields. The purpose of this review is to clarify the concept of online video game addiction and identify research gaps within a proposed holistic framework. This review, however, does not aim to propose propositions or hypotheses as that matter would require further expansion of the theoretical argument, which would be beyond our scope of this manuscript. We also do not explore all the aspects of video gameplay, such as fun and positive effects, but only online video game addiction and its negative aspects.

## ONLINE VIDEO GAME ADDICTION FRAMEWORK

To organize a structured literature review, we propose a macro theoretical framework depicted in Figure 1, which follows Venkatesh and Bala's (2008) framework for analyzing Technology Acceptance Model (TAM) research. Based on this framework we review the current literature on video game addiction with the purpose of clarifying this concept and its extant literature across various disciplines. In the proposed framework, it is important to note that current literature does not clearly articulate the causal relationship between psychosocial problems and video game addiction. As such, psychosocial problems are expressed with a bidirectional relationship with online video game addiction, showing the comorbidity identified in medical literature rather than as outcomes. Figure 2 in the Appendix provides an integrative conceptual model based on this literature review, which aims to visualize how the reviewed articles fit in this framework.

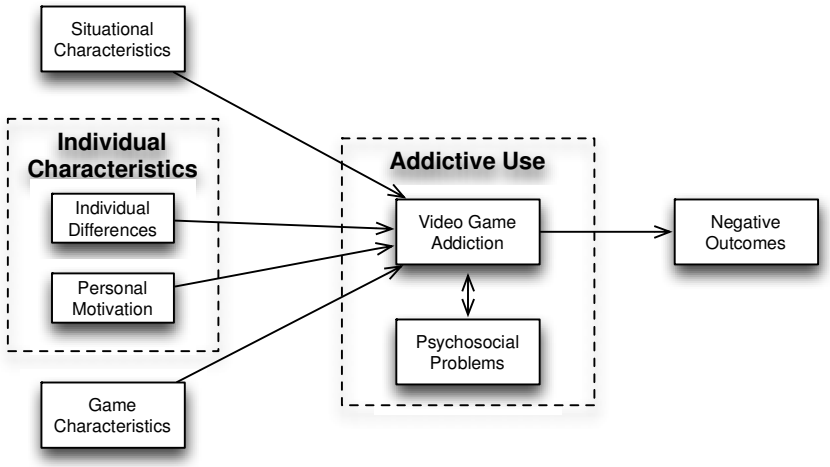


Figure 1 – The Framework used for Reviewing Online Video Game Addiction

The following organizes the literature according to the above framework, starting with clarification of Addictive Use concept, followed by its consequences (Negative Outcomes) and antecedents (Individual Characteristics, Situational Characteristics, and Game Characteristics). It should be noted that the purpose of this review is merely to synthesize the previous works on online video game addiction and not to interpret their conclusions. Therefore, it is possible to notice similarities in different categories as previous research has made different conclusions regarding the direction of causality. Particularly, aggression/aggressive behaviour is discussed to be both a psychosocial problem correlated with video game addiction (with no causality drawn) and a negative outcome of video game addiction.

## ADDICTIVE USE: VIDEO GAME ADDICTION

To review the academic studies of video game addiction, we have identified two aspects that need to be analyzed based on the current literature. First, we explain how different measurements developed for diagnosing video game addiction differ

from each other. As such, we start with categorizing these various measures. The next aspect is the criteria that are used for diagnosing dependant users as discussed below.

### Categorizing Video Game Addiction Measures

Evaluating video game addiction measures, also referred to in psychology literature as diagnosis questionnaires, one can identify three different but intertwined approaches of categorization of this construct, as follows:

The first categorization is based on the underlying criteria for measuring video game addiction. Turel et al. (2011b) categorize Behavioural and Technology Addiction, which can be applied to Video Game Addiction, into three groups:

- Unidimensional measures that are Obsessive-Compulsive Disorder based, which is a closely related disorder. For example, van Rooij, Schoenmakers, Vermulst, Van den Eijnden, and Van de Mheen (2011) adopt Compulsive Internet Use Scale (CIUS; Meerkerk, Van Den Eijnden, Vermulst, and Garretsen, 2009) in video gaming context. CIUS results from analysis of "the criteria for Dependence and Obsessive-Compulsive disorder as found in the DSM-IV, the literature on behavioral addictions, and from qualitative research among self-declared Internet addicts" (ibid, p. 5).
- Unidimensional constructs developed to measure the core symptoms, which are generally based on DSM-IV's Pathological Gambling diagnosis questionnaire, categorized as an Impulse Control Disorder. This group constitutes the majority of measurements that have been recently developed and tested for measuring the video game addiction phenomenon (e.g. Charlton and Daforth, 2007; Chou and Ting, 2003; Griffiths and Hunt, 1998).
- Multidimensional or composite constructs that are composed of different scales. For example, the authors measure Online Auction Addiction based on Compulsive Consumption, Internet Addiction, and Compulsive Gambling. Similarly, Haagsma, Caplan, Peters, and Pieterse (2013) develop a new scale based on Caplan's (2010) General Problematic Internet Use Scale (GPIUS), which delves deeper into video game addiction measures by proposing a structural model of the relationship between different dimensions.

Consistent with the first categorization approach, based on underlying addiction criteria, Lemmens, Valkenburg, and Peter (2009) define four groups of video game addiction measures that are used in the current literature: (1) diagnostic criteria based on DMS's pathological gambling to define pathological game use by adapting six or seven DSM criteria; (2) Young's (1998) 8-item questionnaire for diagnosing Internet addiction, which itself is based on DSM-IV's clinical definition of pathological gambling; (3) ICD-10 (World Health Organization, 1993) diagnostic criteria for pathological gambling; and (4) other measures that scholars have developed (such as that of Chiu, Lee, and Huang, 2004 and Wan and Chiou, 2006).

The second categorization is based on the method of measurement, where video game addiction measures have been analyzed using dichotomous items or on a continuum such as 5-point or 7-point Likert scale (as in Haagsma et al. 2013, Lemmens et al., 2009, and van Rooij et al., 2011). Dichotomous items are generally answered to their criteria as Yes or No only. Young's (1998) instrument classifies users as 'dependant' and 'non-dependant' based on how many 'Yes' answers one would give in response to the criteria (questions) for diagnosing pathological gambling.

The third categorization is regarding identification of the game players with pathological behaviour using measurement items that can be scored either Monothetically or Polythetically. Monothetic format of diagnosis requires all the addiction criteria (all the items) to be met. The criteria can be met either as Yes in dichotomous or higher than a certain threshold in continuum items. Polythetic style on the other hand defines an arbitrary number of criteria to be met. To identify someone as an addict based on Polythetic format, one should qualify for half or more of the criteria under study (Lemmens et al., 2009). The Polythetic approach is in alignment with DSM criteria for diagnosing pathological gamblers. The variations of the results reported explained in the introduction are related to this method of evaluation. The main concern with using Polythetic style for video game addiction measurement is the problem of over-estimation (Charlton, 2002; Charlton and Danforth, 2007).

### Video Game Addiction Criteria (Dimensions)

Having defined video game addiction and various approaches for defining the measurements, we need to clarify the dimensions of measurements, or in other words, criteria for diagnosis as referred to in the psychology literature. We reviewed some of the most common criteria used in psychology literature to diagnose video game addicts. A summary of this review can be find in Table 1.

Table 1 - Diagnosis Criteria for Video Game Addiction

| Criteria: | Salience | Mood Modification / Euphoria | Tolerance | Relapse (and Reinstatement) | Withdrawal | Conflict | Negative Outcomes/ Problems | Other Criteria |
|---|---|---|---|---|---|---|---|---|
| Brown (1991, 1993) | X | X | X | X | X | X | | |
| Griffiths & Hunt (1998) | X | X | X | X | X | X | | Chasing[1] |
| Young (1998) | X | X | X | X | X | X | | |
| Chou & Ting (2003)[2] | X | | X | X | X | X | | |
| Charlton & Danforth (2007)'s Addiction | Behavioural Salience[3] | | | X | X | X | | |
| Charlton & Danforth (2007)'s Engagement | Cognitive Salience | X | X | | | | | |
| Lemmens et al. (2009) | X | X | X | X | X | X | X | |
| Meerkerk et al. (2009) | Preoccupation | Coping | | Loss of Control | X | X | | |
| Haagsma et al. (2013) | Cognitive Preoccupation | X | | X | | | X | POSI[4] |

**Definitions of the main criteria:** *Salience*: is the extent to which the activity dominates one's life. *Euphoria*: feeling a 'buzz' or a 'high' from doing the activity. *Tolerance*: having to engage in the activity progressively longer to gain the same 'buzz'. *Relapse and reinstatement*: despite trying to quit, continuing the activity the same as before. *Withdrawal symptoms*: having negative emotions and physical effects while not doing the activity. *Conflict*: the extent to which the activity results in conflict with the person's normal life including social relationships and his/her other activities.

[1] A sample question for this new criterion is "Do you play to beat your personal high score?" (Griffiths and Hunt, 1998, p. 476).

[2] In their structural equation modeling, mood modification criteria overlaps with Flow experience (for measuring high engagement) and therefore is not included as a criterion for video game addiction.

[3] Behavioural salience refers to the situation where the activity dominates one's behaviour, while cognitive salience only dominates his/her mental life (the person keeps thinking about the activity).

[4] Preference for Online Social Interaction (POSI)

Brown (1991, 1993) is perhaps the first scholar whose work is being widely adopted by researchers of Internet, technology, and video game addiction. For example, Charlton (2002) is among the first who adopt Brown's criteria to Internet addiction, and subsequently to video game addiction (Charlton and Danforth, 2007). Brown defines six criteria for behavioural addiction based on pathological gambling diagnosis outlined in DSM (APA, 1987, 1994). One of the first adaptation of DSM's criteria to computer game addiction was performed by Griffiths (1998) and Griffiths and Hunt (1998). Similarly, in the same year, Young (1998) published his Diagnostic Questionnaire (DQ), an 8-item instrument for diagnosing Internet Addiction, which has also been used in video game addiction studies.

Using Brown's (1991, 1993) behavioural addiction questionnaire, and factor-analysis techniques, Charlton and Danforth (2007) test whether behavioural addiction to online video games represents a single factor. The results show that the six criteria for behavioural addiction, in the context of video games similar to Internet addiction (Charlton, 2002), do not represent video game addiction. In fact, this new Engagement-Addiction scale (ibid.) differentiates high engagement from addiction in video games. The 'core criteria' that can identify video game addiction versus 'peripheral criteria' that refer to non-pathological aspects of high engagement as shown in Table 1.

Other notable measurements are introduced by Lemmens et al. (2009), Meerkerk et al. (2009), and Haagsma et al. (2013). In addition to the main six criteria, Lemmens et al. (2009) believe that having 'problems' is explicitly part of addiction. Originally developed for Internet addiction, Meerkerk et al.'s (2009) Compulsive Internet Use Scale (CIUS) has been used for diagnosing video game addiction (van Rooij et al., 2011). Since the Meerkerk et al.'s scale is based on Obsessive-Compulsive Disorder rather than pathological gambling, there are some differences in the criteria. The mapping of their scale to the closely related previously mentioned criteria is shown in Table 1. Lastly, Haagsma et al. (2013) propose the Problematic Online Game Use Scale (POGUS), which was mentioned earlier.

## ADDICTIVE USE: PSYCHOSOCIAL PROBLEMS

It is widely believed that game players who spend playing too many hours (above 10 hours a day) are at high risk of being addicted to video games (Anand, 2007). Previous studies have shown that video game addiction among adolescents gamers is highly correlated with psychosocial problems such as time spent on games (i.e., usage), life satisfaction, loneliness, social competence[5], and aggression (Lemmens et al., 2009). For example, Peters and Malesky (2008) further support the relationship between addiction of World of Warcraft[6] players to the game and the time they spend playing online, the relationship that is also supported among adolescents who are addicted to online games in general (Gentile, 2009; Xu et al., 2012). However, due to the lack of research on the causal relationship among game addiction and these psychosocial variables, the authors avoid making conclusions regarding the direction of the relationships.

Gentile (2009) compare pathological gamers versus non-pathological gamers among 1,178 American adolescents (aged between 8 and 18) regarding their psychosocial behaviour. The results show that pathological gamers are twice as likely as non-pathological gamers to have attention problems such as attention deficit disorder. However, the author avoids making conclusion regarding the direction of causality between pathological gameplay and attention problems.

In a study on a large sample of adolescents (13-16 years olds) in the Netherlands, van Rooij et al. (2011) show that compared to non-addicts, video game addicts have significantly higher levels of depressive moods, loneliness and significantly lower levels of self-esteem. In this study, the results of this comparison for social anxiety level is not significant. The same results have been replicated in a subsequent study (van Rooij, Schoenmakers, van den Eijnden, Vermulst, and van de Mheen, 2012). Gentile et al. (2011) further clarify by showing in a longitudinal study that depression can be an outcome of video game addiction.

In a longitudinal study, Lemmens et al. (2011) further analyze the causal relationships of psychosocial problems with video game addiction. This study shows that social competence and self-esteem (as indicators of psychosocial well-being) can predict pathological video gameplay. But loneliness can be both an antecedent and consequent of addictive gameplay. In fact, some game players start playing video games excessively due to lack of social interaction, but some first develop pathological tendency to video games and as a result, they lose their real-world social interaction. Kim, Namkoong, Ku, and Kim (2008) also find the high correlation between poor interpersonal relationship (similar to loneliness) and online game addiction among adolescents, but avoid making any conclusion about the direction of causality.

Similar to loneliness, not having an occupation is correlated with higher video game addiction, but the causal inference cannot be made easily (Kim et al. 2008). Based on the current literature, it cannot be concluded that one becomes addicted to video games because of no occupation, or one would lose their job as a consequence of becoming addicted to video games.

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[5] As expected, the correlation between addiction and life satisfaction as well as with social competence is negative.

[6] World of Warcraft is the biggest and most famous MMORPG

### NEGATIVE OUTCOMES

There are many outcomes, mostly negative, as a result of being addicted to something. In a study of online game players behaviour, it has been shown that the difference of the effect size of video game addiction on aggressive behaviour compared to non-pathological gamers is weak (Grüsser, Thalemann, and Griffiths, 2007). However, other researchers claim that addiction to video games is highly related with the level of animosity/strong hostility among teenagers (Chiu et al., 2004).

One of the key concerns regarding playing too many hours of video games, and in particular addiction to video games among mainly adolescents is the effect on their performance in school (Anand, 2007). This negative effect is supported among Taiwanese teenagers (Chiu et al., 2004). Skoric, Teo, and Neo's (2009) study of 333 elementary school video gamers show that the students with addiction symptoms have significantly poorer scholastic performance. This study compares addiction versus high engagement based on Charlton's (2002) concept of differentiation of high engagement symptoms from behavioural addiction. The results show that no significant negative relationship between high engagement and scholastic performance can be found. Moreover, despite collecting scholastic achievement scores in two separate time periods, coming up with certain conclusions regarding the causal relationship between addiction and school performance still requires rigorous longitudinal study to confirm these findings. To clarify this causal relationship, Gentile et al. (2011) have conducted a longitudinal study among 3043 adolescents from Singapore, which confirms that video game addiction can result in lower school performance in addition to depression, anxiety, and social phobia.

### INDIVIDUAL CHARACTERISTICS: INDIVIDUAL DIFFERENCES

As mentioned above (under psychosocial problems) psychosocial well-being indicators such as social competence, self-esteem, and life satisfaction are shown to be antecedents of video game addiction (Lemmens et al. 2011). With the exception of life satisfaction, the other variables have significant predicting power in relation to video game addiction. Gentile et al. (2011) also support the effect of low levels of social competence on video game addiction. Similarly, real world self-efficacy is negatively related to video game addiction, while virtual world self-efficacy has a positive relationship (Jeong and Kim, 2011). In another study (Kim et al., 2008), other psychological characteristics such as aggression, narcissistic personality traits, and self-control predict video game addiction. Self-control, however, has a negative significant relationship with video game addiction.

The relationship between video game addiction and the Big Five personality traits (McCrae and John, 1992) has also been shown to be significant (Peters and Malesky, 2008). In particular, video game addiction has a moderate positive correlation with neuroticism, a moderate negative correlation with agreeableness, and low negative correlation with extraversion and conscientiousness. The relationship between addiction and extraversion, neuroticism[7], and agreeableness has been supported with the study of Charlton and Danforth (2010) on MMORPG players. The magnitude of the relationships are also the same as Peters and Malesky's (2008) results. The authors also test the relationship between two less famous personality factors, namely Attractiveness and Negative Valence, due to their relationship with self-esteem. Attractiveness measures the extent to which one thinks he/she is important. Also, people high in negative valence are "demanding, needy, and eager to impress" (Charlton and Danforth, 2010 p. 604). The results show that attractiveness has a medium negative correlation and negative valence has a medium positive correlation with video game addiction. The authors further show that no such relationships can be found with high engagement factors (as categorized by Charlton and Danforth, 2007).

In the search for finding the root of the video game addiction scholars probe into problematic traits that can predict one's tendency to addiction. One of these traits that have been repeatedly studied is the level of impulsivity. Recent research shows that the severity of Internet addiction in general (including addiction to online video games) is significantly correlated with the level of trait impulsivity, which is shared among pathological gamblers as well (Lee, Choi, and Shin, 2012). These results show that trait impulsivity can be a sign of vulnerability to Internet and video game addiction. Gentile et al. (2011) further confirm this relationship with their longitudinal study. Similarly, higher levels of sensation seeking (Zuckerman, 1979) has high correlation with addiction to video games. High sensation seeking attributes to individuals who tend to seek excitement, new experiences, and adventures. The fact that people high in sensation seeking are expected to have impulsive characters (ibid.) can explain the relationship between sensation seeking and video game addiction.

### INDIVIDUAL CHARACTERISTICS: PERSONAL MOTIVATION

Chou and Ting (2003) study addiction to cyber-games among 395 game players recruited from virtual game clubs, and find that Flow experience –the state of deep involvement in a task– has a stronger effect on addiction compared to repetition. However, Seah and Cairns (2008) claim that the state of immersion is different from, albeit related to Flow, in the sense that Flow is a harmonious psychological state but immersion does not include the harmoniousness and merely measures the

[7] Charlton and Danforth (2010) measure neuroticism with the reverse measure of emotional stability.

absorption in the game. The authors further show that immersion can significantly influence addiction to video games. Moreover, Wan and Chiou (2006) find that video game addicts experience lower levels of Flow compared to non-addicts. This is because pursuing video gameplay for addicts arises from dissatisfaction of not playing, while for non-addicts the driving factor for playing video games is the sense of satisfaction during gameplay. In contrast to Flow, boredom of teenagers has a positive relationship with addiction to video games (Chiu et al., 2004).

In an exploratory study, Xu et al. (2012) analyze the motivational elements besides the prevention/prohibiting elements in a single comprehensive model. The authors evaluate if some of the main elements that motivate people to play video games (taken from Yee, 2006) would affect video game addiction. The results show that from the motivating factors tested, the need for escapism and the need for relationship have significant positive effects on video game addiction. One of the preventing factors that is shown to be significant in this study is Attention Switching, which measures how much other activities can distract the player from the addictive gameplay[8].

### SITUATIONAL CHARACTERISTICS

In Xu et al.'s (2012) exploratory study, three of the preventing factors have significant effect on video game addiction: Parental Monitoring (i.e. one's perception about how much his/her parents monitor his/her activities), Resource Restriction (i.e. perception of having constraints including money and regulation for playing), and Dissuasion (i.e. how much one perceives that the others try to prevent him/her from playing). However, the results show that only parental monitoring has a negative effect on video game addiction. Contrary to expectations, dissuasion and resource restrictions have a positive relationship with video game addiction. Moreover, in another study, among 600 South Korean adolescents, social activities with parents and parental attitude toward gamin is negatively associated with developing video game addiction behaviour (Jeong and Kim, 2011).

It is also expected that the family environment would have an influence on developing addiction to video games. For example, "family function" that entails harmony and healthy relationship between family members can determine the level of addiction to video games among teenagers (Chiu et al., 2004). As such, children who live in healthier family environments, perhaps due to an emphasis on children's education and leisure and having a more enjoyable family life, are less likely to become addicted to video games.

### GAME CHARACTERISTICS (TECHNOLOGY/TASK)

Among the studies reviewed, only two have studied the effects of concepts that could be categorized as game characteristics. Most studies in this domain examine video game addiction among online game players, but, Van Rooij et al. (2012) control for the type of video games in their study. They categorize video games as three types: multi-player online games, casual browser games, and offline games. Casual browser games are simple games that people can play on their browsers without having to install or have the game on their device. The results show that online multi-player games are significantly more correlated with video game addiction, while casual browser games are the least addictive games. Furthermore, in a study of the comparison between 175 MMORPG players and 90 non-MMORPG players, it has been shown that MMORPG players are significantly more like to become addicted (Kuss et al., 2012).

### CONCLUSION

Reviewed literature shows the significance of video games, in particular in the lives of adolescents and how they can have negative effects in their lives when the gameplay becomes pathological. However, the research in this area is still in its early stages. IS scholars specifically have just started conducting research on Internet addiction and video game addiction in particular (e.g. Xu et al., 2012). Our literature review clarifies the need for IS research on these negative behaviours that are the result of IT interaction from IS perspective.

Through our literature review, we have identified two major gaps in the current literature: (1) understanding addiction antecedents that are not related to individual differences; and (2) clarifying the causal relationships between the previously discussed constructs and video game addiction. Psychology literature has significantly paid attention between psychological problems and individual differences in regards to video game addiction. However, two of the main addiction antecedents that IS scholars can contribute to are the characteristics of the game design (related to the role of the IT artefact) that affect video game addiction and various situational and environment characteristics, both of which are the least focused categories in video game addiction context to date. These antecedents can have either preventative or stimulating effect on video game addiction. Similar to previous research on preventative effects of situational characteristics (Jeong and Kim, 2011; Xu et al. 2012), researchers can investigate how certain gaming mechanisms and elements can inhibit players from having pathological behaviour in their gameplay while keeping them engaged. To the best of our knowledge, no empirical study has

[8] Prevention elements of Xu et al. (2012) are discussed further in the next section (situational characteristics).

analyzed the effect of different video game elements such as competition, rewards, feedback, etc.. Thus, this review calls for further research on the effect of situation characteristics and game design elements on video gaming addiction, as well as clarification of video game addiction's causal relationship with negative outcomes and psychosocial problems.

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**APPENDIX – INTEGRATIVE CONCEPTUAL MODEL OF VIDEO GAME ADDICTION**

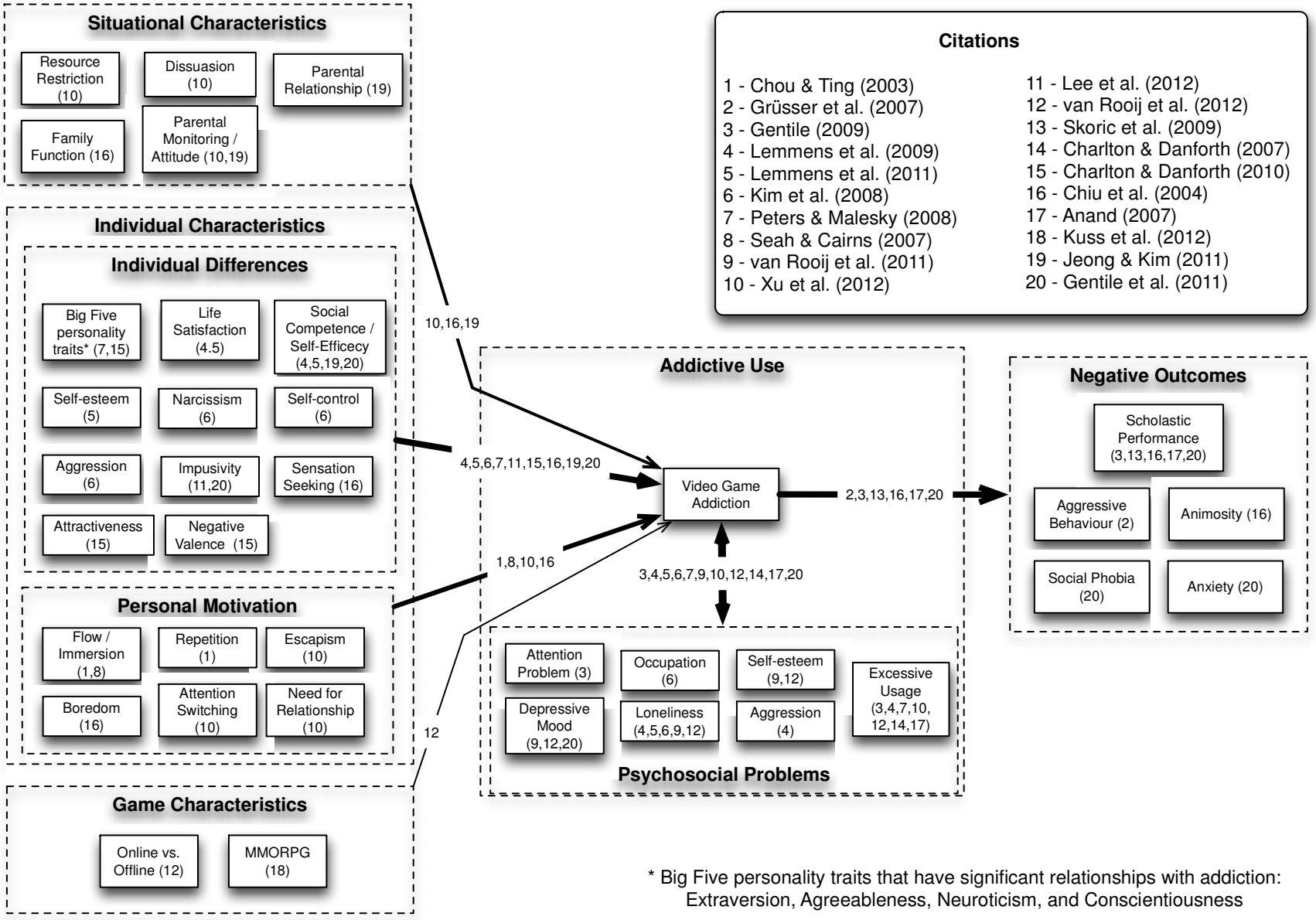


Figure 2 - Integrative conceptual model of Video Game Addiction derived based on empirical studies reviewed