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ABSTRACT

The holistic experience of IT artifacts can be seen in the immersive interaction of video game players. This interaction has been attributed to a *State of Flow* with the IT artifact. This state, which often results in users devoting a significant amount of time and effort with the IT, has been captured through the construct of *cognitive absorption*. In this research in progress paper, we describe how interactions with an IT – in particular with video games – can be perceived as being competitive. Moreover, we aim to investigate the process through which emotional responses to a competitive situation emerge and how they influence the experience of cognitive absorption. Further, we aim to examine the role of personality traits on the video game players' emotional experience. The findings of this research in progress can ultimately highlight the role of emotions for immersive game-based learning environments.

Keywords: Cognitive Absorption, Competitiveness, Video Games, Arousal, Learning

INTRODUCTION

As Generation Y, also known as Millennials, enter the workforce, their mindset, their behavior, and how their motivations become an important phenomena to be studied. For this generation, video games are an inseparable communication and learning medium. In recent years, video games have spread greatly, such that the video games industry is one of the fastest growing industries (McGonigal 2011).

As a consequence of this wave of gameplay, schools and workplaces face new challenges to adapt themselves to the new gamers generation. Gee (2003) believes that "schools, workplaces, and families can use games and game technologies to enhance learning" (p. 1). Gameplay is "an important component of attention, involvement, and productivity, and it's capable of energizing behavior of all sorts" (Reeves and Read, 2009, p. 173). Scholars have repeatedly stated and studied the positive effect of learners' engagement, involvement and focus of attention on the outcome of learning (Choi, Kim, and Kim, 2007; Shin, 2006). Clear reward systems, which can create competition by enabling comparison, are instrumental to evoking these feelings of engagement, involvement and focused attention when playing games.

Given the above motivation, this study seeks to understand in detail the concept of competition in video games and how it can be used to engage students, which can then be applied to the learning processes. We propose a research model to achieve the following objectives: (1) to investigate when a competitive game results in players' immersion in the game; (2) to study how different modes of competition affect players' perception of competitiveness in video games; and (3) to explore the moderating effect of personality traits of game players on their focused attention during a competitive gameplay.

The remainder of this work-in-progress paper includes the theoretical background of the study, the proposed model and the hypotheses, and the research methodology for testing the hypotheses. Potential contributions of this proposed study will also be presented.

THEORETICAL BACKGROUND

Cognitive Absorption (CA) (Agarwal and Elena Karahanna, 2000), Social Comparison Theory (SCT) (Festinger, 1954), and Social Facilitation Theory (SFT) (Zajonc, 1965) are the three main theories that are used as a basis for this study and the hypothesized research model. CA, defined as a multi-dimensional concept, captures the optimal experience of users during their interaction with an IT artifact. CA is based on the Theory of Flow (Csikszentmihalyi, 1991) and aims to capture "a state of deep involvement with software" (Agarwal and Karahanna, 2000, p. 665), which predicts the satisfaction of users with the system, and consequently, their continuing usage intension (Agarwal and Karahanna, 2000, p. 665). Different scholars have studied the positive effects of being in the state of CA (flow) on various outcomes such as purchase intention, learning, and achievement (Choi et al., 2007; Shin, 2006). CA encapsulates temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity. (Choi et al., 2007; Novak et al., 2000; Shin, 2006).

In educational environments, learners often require feedback to evaluate their progress. However, educators do not always have objective evaluations of learners available. Thus, based on SCT, "comparing one's performance or abilities against like others might improve intrinsic motivation, even when the comparison shows poor performance" (Mumm and Mutlu, 2011). Indeed, as Garcia and Tor (2009) explain, "social comparison

processes fuel the motivation to compete" (p. 5)). Additionally, SFT indicates that the presence of others directly affects people's competitive behavior (Garcia and Tor, 2009). The competitive behavior, consequently, enhances individuals' motivation to increase their performance (Mumm and Mutlu, 2011).

RESEARCH MODEL AND HYPOTHESES

The proposed research model is presented in Figure 1**Error! Reference source not found.**. Since the reflective indicators of the CA have been thoroughly investigated and validated, they are not hypothesized here, but, will be collected and analyzed for the empirical study.

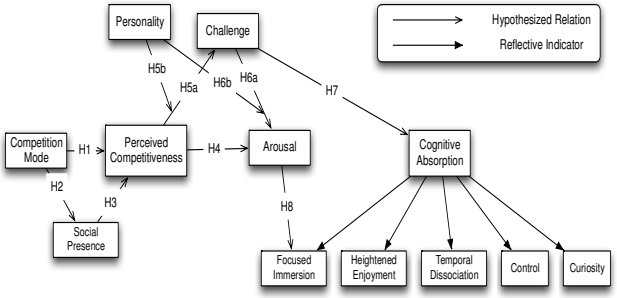

Figure 1 - Research Model of the Study

'Competition' can be conceptualized as an individual personality trait or as a characteristic of the environment that an individual perceives. The former form of competition is known by the term "*dispositionally competitive*" (Graziano, Feldsman, and Rahe, 1997), indicating individuals who posses a competitive personality trait or attitude. The latter concept is more complex and known as '*Situational Competitiveness',* which explains the behavior of people in a competitive context (Graziano et al., 1997). The same people can react to different contexts differently – being cooperative in one context and being competitive in another.

Extant literature demonstrates the significance of the situational competitiveness phenomenon, which is affected by various contextual criteria. Based on SCT, an important contextual criterion is comparison with other people. It is expected that the closer the relationship among participants in a competitive task is, the greater the comparison and perceptions of competition. Thus,

> **Hypothesis 1:** Different Competition Modes (no competition; competing against computer; competing against human strangers; competing against human acquaintances/friends) will have different effects on the Perceived Competitiveness of the video game.

In computer gaming environments, in situations where gamers are aware of playing against a real person, it has been shown that they report higher levels of presence, flow, and enjoyment (Weibel, Wissmath, Habegger, Steiner, and Groner, 2008). Similarly, Ravaja, Saari, Turpeinen, Laarni, Salminen, and Kivikangas (2006) have shown that playing video games with human opponents, compared to computer opponents, causes higher levels of emotional involvement, measured by spatial presence, engagement, and arousal (physiological and self-reported). They also found that playing against friends has a deeper level of emotional involvement compared to playing against strangers. Social presence[1], rather than special presence, is the focus of this current investigation.

Social presence has been studied in various contexts, in particular in website use, where scholars have explained the effect of different human-centric features such as human image (Cyr, Head, Larois, and Pan, 2009). Straub and Karahanna (1998) propose that the richer the communication medium between people is, the higher the perception of social presence will be. Even though competitive video games do not typically have face-to-face interactions (which is the richest medium), many video games provide a medium to communicate and interact with other gamers. This mode of communication and interaction offers a richness that may instill perceptions of social presence. Thus, we hypothesize:

> **Hypothesis 2:** Different Competition Modes (no competition; competing against computer; competing against human strangers; competing against human acquaintances/friends) will have different effects on the Perceived Social Presence of the video game.

SFT posits that the presence of others triggers the motivation to compete, consequently, how people evaluate competitiveness of the environment. Moreover, the number of players to whom people compare their own scores, can also influence the degree of perceived competition (Garcia and Tor, 2009), which indicates a salient effect of social presence on the perception of competitiveness. Thus, we hypothesize that:

> **Hypothesis 3:** Higher perceptions of Social Presence will positively affect Perceived Competitiveness of the video game.

There is little known about the mechanism in which competitiveness of a video game effects one's motivation to play, and potentially addiction. Scholars studying addiction have indicated that gamblers experience feelings similar to being "hyped up", which they refer to as arousal (Titz, Andrus, and Miller, 2001). Arousal, according to (Holsapple and Wu, 2007) is "the state of emotional and mental activation or alertness elicited by external sensory stimulation," (p. 87) which is an emotional response during the use of a hedonic IT product. Similar to gambling (Titz et al., 2001), we expect to observe excitement among players of competitive video games due to the reward (often intrinsic) they receive after wining the game. Ravaja et al. (2006) support this claim by expressing that "social-competitive situation" increases arousal. Thus, we hypothesize:

[1] Social presence is the human contact feeling and perceiving others as present during the use of a medium, while spatial presence is the experience of being physically present in the environment of the interacting media.

Hypothesis 4: Higher levels of Perceived Competitiveness will increase the Arousal of video game players.

Competitive situations are one of the easiest ways to create challenge (Csikszentmihalyi, 1991). A video game can be perceived as challenging when the player perceives the game to be highly competitive. Webster and Ho (1997) have used comparison techniques that motivate competitiveness to distill the level of challenge among students. This effect would be higher for more personally competitive individuals, as they place a higher value on competition. Therefore, we would expect competitive players to be more challenged during competitive video gameplays. Thus, we hypothesize:

Hypothesis 5a: Higher Perceived Competitiveness will lead to higher perceived Challenge.

Hypothesis 5b: The influence of Perceived Competitiveness on perceived Challenge will be moderated by players' personality, such that the effect will be higher for individuals with higher scores in Interpersonal Competitiveness.

Arousal, being a "reported subjective feeling", is the opposite of sleepiness (Russell, Weiss, and Mendelsohn, 1989). When players are playing a video game, they face various challenges (Jennett, Cox, Cairns, Dhoparee, Epps, Tijs, and Walton, 2008), which result in emotional involvement potentially causing physiological alteration (Eysenck, 1976; Graziano et al., 1985). According to the eight-channel model of flow (Csikszentmihalyi, 1997), which is the theoretical base of CA, when challenge and skill are well balanced, individuals experience arousal. However, higher levels of challenge that are not balanced with the skill level of the person might cause that person to become anxious and frustrated.

Additionally, how people react to the challenge of an IT task is dependent on their personal characteristics and their condition while performing the computer task (Ghani and Deshpande, 1994). Among gamblers, personality trait has an important effect in the level of arousal they seek and enjoy (Coventry and Brown, 1993), which we are expecting to be similar among video game players. Thus, we hypothesize:

Hypothesis 6a: Higher levels of perceived video game Challenge will increase feelings of Arousal.

Hypothesis 6b: The influence of perceived video game Challenge on Arousal will be moderated by players' personality, such that the effect will be higher for individuals with higher scores in Interpersonal Competitiveness.

Shin (2006) defines challenge as "the degree to which individuals find it difficult to cope with specific task involved" (p. 706). If the level of perceived challenge in computer task is too low, the users will lose interest in performing that task because it becomes boring for them (Ghani and Deshpande, 1994). In order to reach the state of flow, or CA, a video game player should perform a task that requires a balance of challenge and skills (Csikszentmihalyi, 1991, 1997; Jennett et al., 2008). Thus, perceived challenge, which encapsulates this balance, should influence CA. Generally, "along with individual skills, the challenges presented by an activity are the most important predictors of flow" (Koufaris, 2002, p.212). Thus, we hypothesize:

Hypothesis 7: High levels of perceived Challenge reported by the video game players will lead to a higher level of Cognitive Absorption.

Pace's (2004) grounded theory of flow of web users shows the effect of challenge in information seeking tasks on the focused attention on that activity. In the video game context, we expect to find the mediating effect of arousal on the relationship between challenge and attention. However, the arousal in the video game can attract the focus of the game player, but it does not mean that it will necessarily influence all the dimensions of the state of flow. In fact, Csikszentmihalyi (1997) explains: "In arousal a person feels mentally focused, active, and involved – but not very strong, cheerful, or in control". Thus, we hypothesize:

Hypothesis 8: Increased Arousal level of the players will positively effect the Focused Immersion dimension of Cognitive Absorption in the video game environment.

RESEARCH METHODOLOGY

North American university students will be recruited to participate in this study. Students are a suitable sample for this study, as they have significant interest and experience in gaming (Beck and Wade, 2006), and they represent Gen Y. The number of participants that we seek to recruit is 200, which is more than the required sample size for PLS analysis, given the number of constructs and construct items in the model (Gefen, Straub, and Boudreau, 2000) and provides adequate power for an acceptable effect size (Faul, Erdfelder, Lang, and Buchner, 2007). The participants will be asked to play a modified version of a simple game that teaches power typing (QWERTY Warriors). Participants will be screened to ensure they are confident in playing the game, thus minimizing potential learning biases.

The gameplay will be manipulated for four modes: (1) no competition; (2) competition with the computer; (3) competition with a human stranger opponent; and (4) competition with a human friend. Each participant will be randomly assigned to one of the four treatment modes. After completing the experimental task, the participants will be asked to complete a survey based on the measurement items. A personality and general demographics questionnaire will be distributed before playing the video game.

Pilot Study

Prior to the main study's data collection, a pilot study will be conducted with 30 students. The purpose of the pilot

study is to test and refine the measurements that are going to be adapted from extant literature and to help develop the perceived competitiveness construct. Additionally, the pilot study will help to resolve any potential technical or procedural issues.

Survey Measurements

All the constructs that are being used in this study, except for perceived competitiveness, have already been used in the literature and their measurements have been found to be reliable and valid. Social Presence is a 5-item scale (Gefen and Straub, 2003); Arousal is a 5-item scale (Koo and Lee, 2011); Challenge is a 6-item scale (Novak et al., 2000); and Interpersonal Competitiveness is an 8-item scale (Griffin-Pierson, 1990). The multidimensional items for the second-order CA construct will be drawn from Agarwal and Karahanna (2000).

Perceived Competitiveness is a new construct that will be developed for this study. The three-stage methodology of Lewis, Templeton, and Byrd (2005) will be used in order to develop a reliable and valid construct. This methodology requires consultation with experts in the relevant domain to define the appropriate statements that cover all the dimensions of this construct based on its conceptual definition. Next, the proposed instrument will go through a pre-test with a focus group of approximately eight students. The refined instrument from the pre-test will be used in the pilot study for further validation.

Instrument and Model Validation

All the constructs that are used in the model are reflective constructs. CA is a second-order reflective construct, as shown by Shin (2006). Standard tests will be employed to assess construct reliability and convergent and discriminant validity. To validate the proposed model, Structural Equation Modeling (SEM) will be used. Since the model includes a second-order construct (CA), Partial Least Squares (PLS) using SmartPLS will be used, which allows for exploratory and confirmatory assessments.

Manipulation Check: The treatment that is manipulated in this study is the competition mode of the gameplay. Pilot and main study participants will answer a series of questions at the end of the gameplay in order to assess their awareness of the competition mode for validation of the treatments (Boudreau, Gefen, and Straub, 2001). The questions will assess the participants' perception of competing against friends/strangers /computer /no one.

Post-hoc Analysis: As part of the post-hoc analysis, demographic and personality factors will be assessed for their possible moderating influence. Additionally, other possible relationships that are not hypothesized will be analyzed through examining the saturated model.

POTENTIAL CONTRIBUTIONS AND LIMITATIONS

There are several potential contributions to both theory and practice from the proposed study outlined in this research-in-progress paper. This research will contribute to the IS body of literature by incorporating various theoretical works from different disciplines such as psychology, marketing, and educational studies. By employing the emotional construct of arousal, and by investigating the connection between perceived competitiveness and CA, the proposed research illustrates some factors that impact the continuing use of hedonic IS.

From a practitioner's perspective, designers who work on educational video games can benefit from this study by obtaining a richer understanding of the factors that can lead to deep involvement of learners. These findings may also be of relevance to developers of other hedonic systems where various forms of competition may enhance the experience with the system.

As with most empirical studies, we anticipate there will be some limitations of the proposed study. First, the study is proposed to be conducted among North American students, which limits the generalizability of the results to other countries. Second, direct measurement of learning outcomes in the video game context that is proposed in this study will be difficult. As such, inferences from the video game context to the learning context will have to be based on the outcomes of engagement, involvement and focused attention, rather than more direct learning outcomes such as performance.

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