Online Social Games: The Effect of Social Comparison Elements on Continuance Behaviour

Abstract

Online games also called “social games”, played within social networks or games requiring social interaction with peers, are revolutionizing the nature of video-games due to their social aspect and the ability of users to compare their performance with their friends or people in their network. Social comparison features such as leaderboards, individual scores, achievement badges and level maps are commonly used in online games to enforce the social interaction of players. However, one of the biggest challenges that the social game industry is currently facing is the ability to increase user enjoyment, and keep its players engaged in the games. To probe more deeply into whether and how players’ continuance intention is influenced by social comparison processes, we combine two theoretical lenses: social comparison theory and self-efficacy theory. We conduct a real-world data collection to measure the impact of social comparisons in player perceived enjoyment, online social gaming self-efficacy and game continuance. The results indicate that upward identification and downward contrast are the most influential comparison elements in game continuance. The results of these two comparisons have significant implications for both the theoretical application of social comparison in online settings and for the practical implications of future game design.

Keywords: *hedonic environments, IS continuance, social comparison theory, self-efficacy theory, online social games, perceived enjoyment*

1 Introduction

Hedonic information systems (HIS) are defined as the information systems in which the user "experiences fun while using the system" (Van der Heijden 2004). HIS have different instantiations in the form of digital artifacts such as online music platforms (Turel et al. 2010), online video games (Turel et al. 2010; Wang et al. 2012) or online social media platforms (Turel 2015). While the acceptance of HIS and the HIS discontinuance in the form of quitting addition have been thoroughly studied in the IS literature (Van der Heijden 2004; Rosen et al. 2006; Turel et al. 2010; Wang et al. 2012, Turel et al. 2011; Turel 2015), it still remains unexplored how a user's intentions to continue using a HIS can be influenced by different HIS social design features.

For HIS designers, e.g., online social network platform or video game designers, the ability to apply external pressures within the game to incentivize users to continue using the HIS is vital. Investments in designing HIS are substantial and require continuous user engagement in order to break-even and start receiving returns. The inability to maintain a committed customer base can force HIS out of business very quickly. However, for those businesses that capture customer commitment, returns can be substantial. For example, globally, video games are a $137.9 bn industry, bigger than both the film and music industry, with nearly 2.3 bn people playing games on various devices (Newzoo 2018). Online Social games - also known as social network games - a sub-category of video games which are games played through online social networking platforms or games which require social interaction with other players, are enjoying enormous popularity.[1]

[1] In 2017, the popular social games company *King* with game titles such as *Candy Crush Saga*, *FarmVille Saga*, and *Farm Heroes* Saga, generated $1.99 billion in revenue (King 2018a) and it reached 285 million monthly active users (King 2018b).

Literature on HIS has shown that online communities, such as online social games, are still suffering from reduced continuance and low members' motivation to continue being engaged (Kuem et al. 2020; Ma et al. 2018). Social presence by itself has the potential to increase participation and continuance in HIS (Shen 2012; Zhou et al. 2014). Characteristics, such as the size of an online social community and endorsements of specific members and prominence within the community, are known to increase the quality of participation in HIS (Kuem et al. 2020; Qiu et al. 2017), while feelings of trust toward the online community increase engagement in HIS (Hsiao et al. 2012a, b). Furthermore, Shen (2012) emphasises the importance of the internal and external pressures to influence ongoing social continuance.

In online games, more specifically, the social relatedness of a player with the rest of the players has been shown to increase player satisfaction during the game (Sailer et al. 2017), whereas the feeling of belonging to a social community while playing, increases continuance and game retention (Tseng et al. 2015). More importantly, Sweetser, et al. (2005) and Jegers (2007) show that social interactions among players in online games increase their enjoyment and satisfaction, compared to games with no social elements. Strengthening the latter, Shin et al. (2011) find that when an online game is played within a social network, it increases the players' enjoyment and continuance, compared to online games played individually. Hence, any emphasis on social interaction elements during the game has a strong potential to increase continuance and provides a promising pathway toward increasing player satisfaction and retention. Besides economic benefits, social elements in video games can help in situations such as the recent COVID-19 pandemic, during which the campaign #PlayApartTogether was launched by the World Health Organization and was endorsed by 40 video game designers to help people socialize virtually via

online social games.[2] They argue that with these social elements people can cope with stress and social distancing anxiety while playing online games and staying virtually connected.[3]

Despite the pronounced need for concrete mechanisms to incentivize engagement and continuance (Chang et al. 2014; Hsiao et al. 2012a, b), and the proven superior experience of games with social elements (Sailer et al. 2017; Tseng et al. 2015; Shin et al. 2011; Jegers 2007; Sweetser et al. 2005), so far, very few attempts have been made toward clearly articulating how the specific social elements of a HIS can serve as successful incentives for IS continuance. Social hedonic environments, such online social games, are becoming the norm (Sailer et al. 2017; Qiu et al. 2017; Shin et al. 2011), as compared to hedonic environments, where each individual experiences joy isolated from the social environment. Thus, being able to identify successful social elements that incentivize continuance in HIS will enhance our understanding of the social presence construct (Shen 2012; Zhou et al. 2014), and will allow for capitalizing on the community element toward the much needed continued engagement (Kuem et al. 2020; Ma et al. 2018; Sailer et al. 2017; Tseng et al. 2015).

We respond to this call for establishing a clear relationship between social elements and HIS continuance (Chang et al. 2014; Hsiao et al. 2012a, b; Shen 2012; Qiu et al. 2017; Zhou et al. 2014) by proposing a model that combines elements from IS continuance and social comparison theories, applied in hedonic environments. The use of social elements and social information are the primary components associated with game interactions and have the potential to motivate players to satisfy particular psychological needs. The theoretical propositions of social influence theory help to disentangle the social elements in online gaming engagement (Shen, 2012; Lee et al. 2011; Song

[2] https://www.bloomberg.com/press-releases/2020-04-10/games-industry-unites-to-promote-world-health-organization-messages-against-covid-19-launch-playaparttogether-campaign [Accessed: Nov. 25th, 2020]
[3] https://theconversation.com/social-video-games-to-play-during-the-coronavirus-quarantine-134880 [Accessed: Nov. 25th, 2020]

et al. 2006). As Shen (2012) states (pp. 202), “While social influence measures individual’s compliance with social norms under pressure, the tendency to social comparison factor operates through the internalization and identification mechanisms.” In online gaming, the internalization and identification of mechanisms include social comparisons about their game actions, accomplishments and performance.

In order to understand the effects of social comparison elements on HIS continuance the present study seeks to explore two research pathways:

1- What are the relationships between individuals’ social comparison process and intention to continue using a HIS?
2- How do the different social comparison processes influence perceived enjoyment and self-efficacy while using a HIS?

As an instantiation of HIS, we use an online social game, where we conduct a real-world data collection and we measure the players’ intention to continue playing, as well as their actual continuance. The latter helps us validate how self-reported intentions match actual behavioural choices. Our findings contribute to the social HIS continuance literature (Chang et al. 2014; Hsiao et al. 2012a, b; Shen 2012; Qiu et al. 2017; Zhou et al. 2014) by delving deeper into the social presence construct and including the ‘social’ theoretical focus to continuance. Emphasising the ‘social’ enables us to more clearly articulate which social comparison directions can incentivize continuance. Furthermore, our findings are contributing to the social HIS adoption discussion (Chang et al, 2006; Cheung et al. 2015), which shows that engagement and continuance are strongly correlated with adoption. Understanding these ‘social’ elements of continuance enables us to more clearly understand the right incentives for continuance, and how these can influence HIS adoption.

2 Theoretical foundations

We build our study around two theoretical lenses: social comparison theory, and social cognitive theory. We describe each theory in detail in the following sections.

2.1 Social Comparison Theory

Originally formulated by Leon Festinger (1954), Social Comparison Theory (SCT) postulates that "people evaluate their opinions and abilities by comparison respectively with the opinions and abilities of others" (Festinger 1954, p. 118). The direction of such social comparisons has been a central part of the SCT, and Festinger (1954) suggested two directions: upward comparisons and downward comparisons. An upward comparison occurs when an individual compares himself/herself with others who are better off. A downward comparison occurs when an individual compares himself/herself with someone who is doing worse.

Building on Festinger's (1954) seminar work, Buunk et al. (1997) present the social comparison identification-contrast model, which outlines that upward and downward comparisons produce either positive or negative feelings, depending on whether an individual identifies or contrasts themselves against a comparison target. Thus, social comparison provides two effects: identification and contrast (Buunk et al. 1997; Van der Zee et al. 1999; Carmona, et al. 2006). Primarily, identification refers to perceiving oneself similar and feeling connected with a comparison target, whereas contrast effect refers to perceiving oneself as different and more fortunate than the comparison target and distancing them self or even looking down on them. The identification-contrast process may not be mutually exclusive and can occur in parallel (Gibbons et al. 1999; Mussweiller and Strack 2000). Social comparison processes can be classified into four

types, by crossing both direction of comparison (upward and downward) and effect (identification and contrast): upward identification, upward contrast, downward identification, and downward contrast.

Traditionally, upward identification is related with learning and growth, and it can be both inspiring and motivational (Taylor et al. 1989; Collins 1996; Lockwood et al. 1997; Buunk et al. 2007). For instance, a study by Van der Zee et al. (2000) among cancer patients showed that upward identification is positively associated with direct coping strategies. Also, some studies among elderly people found that upward identification is positively associated with life satisfaction (Frieswijk et al. 2004; Beaumont et al. 2004). On the contrary, downward identification can produce negative feelings such as anxiety and self-doubt (Markus et al. 1986), burnout (Buunk et al. 2001) and is often related to low performance among students (Buunk et al. 2005). The reason behind such negative feelings is that individuals perceive themselves as similar to comparison targets who are worse off, they engender thoughts that one could end up like the comparison target (Mussweiler and Strack 2000; Smith 2000; Van der Zee et al. 2000; Kemmelmeier et al. 2001; Buunk et al. 2005).

Regarding contrast comparison effects, the opposite holds. While upward contrast is associated with reduced sense of personal accomplishment and self-efficacy, downward contrast is associated with positive effects on self-esteem, sense of control and capability (Greenberg et al. 2007; Moore 2007; Stewart et al. 2013). For instance, upward contrast has been negatively associated with treatment adherence among people living with HIV infection (Bogart et al. 2002) and linked to feelings of envy in work teams (Lam et al. 2011).

Social comparisons may be especially manifested in circumstances that are ambiguous or where success is highly appreciated (Buunk and Mussweiler 2001; Suls et al. 2002). Inducing individuals to rely more on comparisons when processing information allows them to be more efficient in making a critical series of judgments (Keil et al. 2006). Also, learning through social comparison processes is ubiquitous because it allows individuals to process information in a more efficient manner than more absolute modes of information processing (Mussweiler and Epstude 2009; Corcoran et al. 2011). Furthermore, the context determines the ways individuals react to social comparison information (Brewer et al. 1994; Buunk et al. 1997; Schmitt et al. 2000; Arigo et al. 2014).

The social comparison theory has been researched and applied in a variety of domains such as school choice (Hannon 2018), identification of group movement trajectories via video data (Zhang et al. 2018), formality of feedback in MOOCs (Choi et al. 2019), quitting smoking (Maramis et al. 2019), changing one's body image (Fisher et al. 2002), incentivizing energy savings (Petkov et al. 2011), assessing health risk perception (Zell et al 2013). The most substantial body of literature on social comparison focuses on environments coping with disease or pain (Buunk et al. 1997; Myers et al. 2009; Tennen et al. 2000), such as cancer (Van der Zee et al. 1999; Van der Zee et al. 2000), fibromyalgia (Cabrera-Perona et al. 2017), burnout (Buunk et al, 2004; Carmona et al. 2006) or other chronic pain disorders (Affleck et al. 1997; Arigo et al. 2014). However, there is scant knowledge about the effects of social comparison processes in hedonic information systems (Liu 2016), and more specifically in online social games, as shown as well in the 60-year meta-analysis presented by Gerber et al. (2018).

The environment in which social comparison theory is adopted plays a role in the final outcome of the intervention. For example, it has been shown that environments that promote competition

facilitate the occurrence of contrast effects, whereas environments that promote cooperation are more inclined to produce identification effects (Beach et al. 2000; Stapel et al. 2005). Despite the increasing popularity of online social games, relatively little research has examined the behaviour of online game playing (Yee 2006). Recent studies (e.g., Yee 2006; Kawale et al. 2009; Wu et al. 2010; Fuster et al. 2013; Hamari et al. 2014) have identified socialization as one the main motivations for playing online games and retention, but not always socialization has a positive impact in player retention. For example, Shores et al. (2014) showed that game interactions such as interacting with toxic players have negative impacts on retention in *League of Legends* multiplayer video games. In this study, we examine the effects of socialization by delving deeper into the directions of social comparison theory that can induce continuance in social hedonic environments, such as online social games, where joy and fun are the main objectives.

The explosive growth of social media technologies has greatly facilitated the sharing of social information and the user's online social context. A user's social context refers to the network of people who provide him/her with relevant information (Xu et al. 2011). Thus, in order to motivate and engage users, social network platforms (e.g., *Facebook, Foursquare, Instagram, Linkedin or Twitter*), video games, Enterprise Resource Planning (ERP) systems, CRM applications (e.g., social CRM) and mobile apps are starting to draw on and exploit this social information and built in elements of social comparison. Most software applications like mobile apps are implementing social elements to engage users. These elements emphasize the degree to which individuals compare themselves to others, and their perception of somehow faring better or worse (e.g., Festinger 1954; Wood 1989; Shen 2012). By comparing themselves to others, individuals get information that they can use to assess, verify, and motivate efforts to improve themselves (Taylor

et al. 1989; Gibbons and Buunk 1999). Most social comparison processes occur implicitly, without the subjects being consciously aware of them (Gilbert et al. 1995; Mussweiler et al. 2004).

The direction of the social comparison, i.e., whether an individual compares them self to a better-off or worse-off target, is a central element of this work. Typically, cognitive motivations (self-evaluation or self-improvement) drive upward comparisons and in contrast, affective motivations (e.g., in order to feel better about oneself, self-enhancement) drive downward comparisons (Hakmiller 1966; Wheeler 1966; Wills 1981; Lockwood et al. 1997; Buunk et al. 2007; Corcoran et al. 2011).

2.2 Self-efficacy Theory

In his social cognitive theory of personality, Bandura (1977) incorporated the concept of self-efficacy, which is defined as a belief that an individual has in his/her own ability to meet situational demands or perform tasks. Self-efficacy is developed and maintained by four primary sources of influence (Bandura 1986): enactive mastery experiences (personal performance accomplishments), social persuasion (support or not support one receives from significant others for engaging in particular activities), vicarious experiences (observation of other people's performance attainments), and physiological and affective states (emotional and physical reactions to personal experiences). In this study, we focus on social comparison processes as elements of mastery experiences, vicarious experiences and social persuasion (Bandura 1986).

Self-efficacy is domain and task-specific and it should be thought of and evaluated in terms of specific constructs (Bandura 1977; Bandura and Locke 2003). The self-efficacy theory has been applied in contexts such as career assessment (Betz 2000, 2004), leadership within organizations

(McCormick et al. 2002), educational environments (Shea et al. 2010, Schunk et al. 2016, Joo et al. 2000), posttraumatic recovery (Benight et al. 2004), nutrition behaviour (Anderson et al. 2007), performance in online environments (Hsu et al. 2004), entrepreneurial environments (McGee et al. 2009). There is very limited work on applying the self-efficacy theory on online social games, hence, in this study we are filling this void. We are building on literature focusing on video games (Gentile et al. 2007; Mayo 2009; Pavlas et al. 2010), without an online social character, based on which gaming self-efficacy is defined as a belief that one holds in his/her ability to successfully play online games or to complete tasks in an online game context (Pavlas et al. 2010). Bandura (1981), in his theory of self-efficacy, suggested that social comparison information is important in the development of self-efficacy beliefs, therefore, in this work we use social comparison theory as an antecedent of self-efficacy theory. In addition, self-efficacy has been associated with continuance in environments such as online banking (Maduku 2016), social networking sites (Wang et al. (2015), as well as online health communities (Jehad et al. 2020). Hence, we assume that self-efficacy will have a relationship with continuance in online social games, as well.

2.3 Perceived Enjoyment

In IS literature, Perceived Enjoyment (PE) is conceived as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al. 1992, p. 1113). This has led to the notion that PE is an intrinsic motivational driver (Davis et al. 1992; Venkatesh 2000; Lee et al. 2005). In the present study, we define player PE as the extent to which the activity of playing online social games is perceived to be pleasant, enjoyable and fun. Many researchers (e.g., Van der Heijden 2004; Sherlock 2007; Wu and Li 2007; Lee et al. 2013; Alzahrani et al. 2017) already established

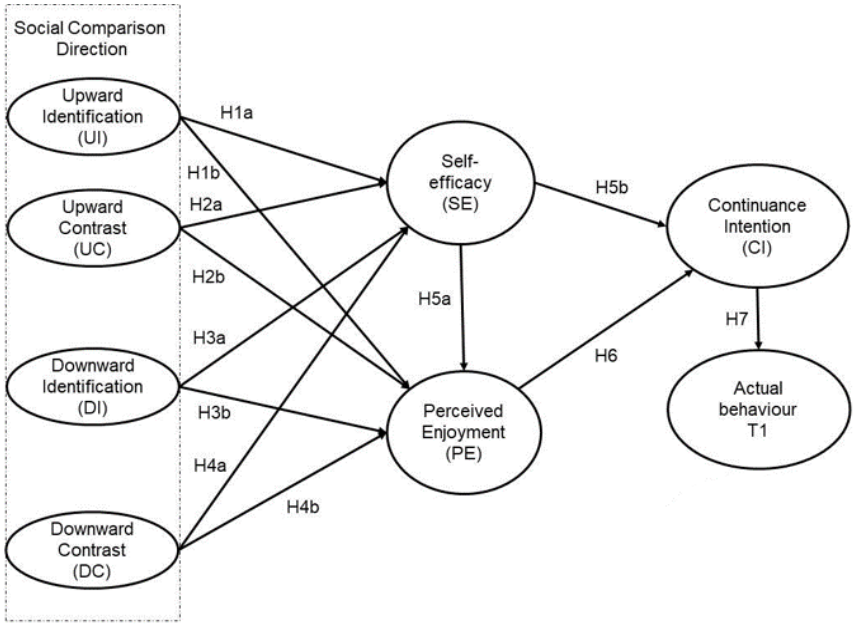
that PE is a crucial intrinsic motivational driver for playing an online game. Online social gaming is a voluntary and hedonic activity, and people play online games by anticipating a pleasant and enjoyable experience (Choi et al. 2004). Similarly, Hsu and Lu (2007) argued that the main motivation for participation in online gaming communities is for entertainment, fun and pleasure, not to achieve specific goals nor enhance performance. Thus, in the Technology Acceptance Model they replaced perceived usefulness with PE, to explain the continuance intention to play online games.

Additionally, because experiences determine expectations (Bandura 1997; Rotter 1954), PE can be conceptualized as a type of outcome expectancy (e.g., Rovniak et al. 2002), thus, providing a theoretical framework for understanding perceived online social gaming activity enjoyment. Social cognitive theory posits that those with initially high outcome expectancies (e.g., expectation to enjoy physical activity) may be more likely to initiate behaviour change (e.g., exercise), whereas those with initially low expected outcomes (e.g., expectation to not enjoy exercise) may be less likely to adopt the behaviour (Schwarzer et al. 2000; Bandura 2004).

3 Hypothesis Development

Under the social comparison prism, our research model proposes that the social comparison direction affects intentions to continue playing online social games as a result of changes in online social gaming self-efficacy and perceived enjoyment, as depicted in Figure 1. We hypothesize that social comparison dimensions can indirectly influence the intention to continue playing online social games through online social gaming self-efficacy and perceived enjoyment.

Figure 1 – Proposed theoretical model.



3.1 Social Comparison and Self-efficacy

Consistent with the identification-contrast social comparison model and self-efficacy conceptualization (Bandura 1982), we examined whether the engagement in social comparison processes affects players' online social gaming self-efficacy, positing that comparing oneself to others' accomplishments influences one's online social gaming self-efficacy. Bandura introduces the social comparison element of vicarious experiences "because most performances are evaluated in terms of social criteria, social comparative figures prominently in self-efficacy appraisals" (Bandura 1986, p. 400).

While experienced mastery has been found to be the most powerful source of self-efficacy beliefs, individuals may increase their self-efficacy after the exposure to the successful achievements of others (Bandura et al. 1986; Schunk 1986; Monteil et al. 2000; Johnson et al. 2008). On the other hand, engaging in a downward identification process will lead to lower levels of self-efficacy, because individuals identify themselves with unsuccessful downward targets and assume it will be

likely that they will become like the downward target, and lead to poorer performance (Bandura 1986; Buunk et al. 1990; Buunk et al. 2001; Vrugt et al. 2002). Therefore, we propose two hypotheses:

H1a: Upward identification has a positive effect on online social gaming self-efficacy.
H3a: Downward identification has a negative effect on online social gaming self-efficacy.

As previously discussed, after an exposure to a successful other (upward contrast) an individual may feel shame, frustration and resentment (Smith 2000), leading to lower online social gaming self-efficacy and performance (Van Yperen et al. 2002). When an individual is outperformed by the comparison target, his/her self-perceptions are threatened, and that may influence the individual self-evaluation as unfavourable by perceiving one's own capacities and abilities as inferior (Collins 1996; Muller et al. 2010). Contrarily, when individuals contrast with an unsuccessful comparison target (downward contrast), it may help them improve their performance (Dijkstra et al. 2008; Boissicat et al. 2012; Chung et al. 2016). Thus, we propose two hypotheses:

H2a: Upward contrast has a negative effect on online social gaming self-efficacy.
H4a: Downward contrast has a positive effect on online social gaming self-efficacy.

3.2 Social Comparison and Perceived Enjoyment

When the social comparison turns out successful, individuals may enjoy a positive state of mood and wellbeing. Consequences of upward identification and downward contrast include self-esteem, perceived control, optimism, perceived similarity, and empathy (Smith 2000; Dijkstra et al. 2008; Chung et al. 2016). These comparison processes are considered desirable in nature, and may produce emotions of pride, relief and satisfaction (Smith 2000; Smith et al. 2006). Rahimi et al.

(2017) show that desirable social comparisons lead to increase of enjoyment. Furthermore, Lewis and Weather (2016; 2019) studied the emotional responses to social comparisons in reality TV programs and found that emotional responses associated with desirable social comparisons (upward identification and downward contrast) are positively related to enjoyment of the TV program. In addition, social presence and tendency to social comparison have been found to influence perceived enjoyment in online environments (Shen 2012). Specifically, positive social comparison feedback (such as notifications related to upward identification and downward contrast) is shown to positively influence perceived enjoyment via competence (Velez et al. 2018). Moreover, Graves et al. (2012) have shown that self-esteem positively affects enjoyment; hence, desirable social comparisons, which are known to produce feelings of self-esteem, can lead to higher enjoyment. Similarly, Raghunathan et al. (2006) show that the sense of belonging, or similarity with approved individuals can increase enjoyment; therefore, social comparisons that induce such positive similarity feelings can increase enjoyment. Thus, we can hypothesize that:

H1b: Upward identification has a positive effect on perceived enjoyment.
H4b: Downward contrast has a positive effect on perceived enjoyment.

When the comparison turns out unsuccessful, individuals may experience a negative state of mood and wellbeing. Both upward contrast and downward identification are related to negative feelings such as guilt, blame, regret, and malicious envy, as well as feelings of incompetence and inability to improve one's performance (Smith 2000; White et al. 2006; Chester et al. 2013; Jankowski et al. 2014; Cabrera-Perona et al. 2017). Malicious envy has been shown to negatively affect enjoyment (Wu et al. 2014); hence, upward contrast and downward identification, which are known to produce feelings of malicious envy, can lead to lower enjoyment. Furthermore, feelings of perceived incompetence and fewer opportunities to improve one's performance lead to reduced

enjoyment (Vorderer et al. 2003). Upward contrast and downward identification are associated with feelings of incompetence and inability to improve one's performance: a player who identifies with a poor performer, feels that she will perform as poorly as this performer or that she will not be able to improve, similarly to the poor performer; hence, her enjoyment is reduced. Thus, we can hypothesize that:

H2b: Upward contrast has a negative effect on perceived enjoyment.

H3b: Downward identification has a negative effect on perceived enjoyment.

3.3 Self-efficacy, Enjoyment and Game-Play Continuance

Previous self-efficacy theory research, postulates that judgments of self-efficacy influences behaviour, including outcome expectancies, goals, persistence, and effort (Bandura, 1997). Previous research (Tamborini et al. 2007; Klimm et al. 2009) confirms that gaming self-efficacy experiences influence game enjoyment. This leads us to the next hypotheses:

H5a: Online social gaming self-efficacy has a positive effect on players' perceived enjoyment.

H5b: Online social gaming self-efficacy has a positive effect on intentions to continue playing.

When the users experience fun and pleasure from using a system, they are more likely to be intrinsically motivated to adopt it (Davis et al. 1992; Van der Heijden, 2004; Hong et al. 2017). Extant literature demonstrates that PE is one of the most important drivers of intention to play (Wu et al. 2007; Lin et al. 2010; Chang et al. 2011; Lee et al. 2013) and continuance to play (Lee et al. 2010). Thus, we postulate that:

H6. Perceived enjoyment positively influences the intention to continue playing the online social game.

H7. The intention to continue playing is positively correlated with the actual behaviour of continuing playing in time T1.

4 Research Methodology

We use real-world data collection to gather online social game playing data in a natural, unobtrusive environment. The online social game serving as an instantiation of our hedonic environment was Farm Heroes Saga. Farm Heroes Saga[4] is an online game developed by King.com[5] (the company that developed the social game Candy Crush Saga[6]) and currently is one of the most played games on Facebook. The game is a free-to-play social puzzle game full of in-game goods to acquire with real money such as boosts, virtual currency, extra moves or lives. Farm Heroes Saga employs well-established puzzle mechanics like the ones used by the popular Candy Crush Saga game. The objective of the game, in order to complete each game level, is for players to match fruits of the same type/colour in groups of at least 3 (in a horizontal or vertical row) by swapping a single one with a different one located next to it in the game grid. A successful match causes the fruits used in it to disappear and all the objects above them to fall and new ones to appear at the top of the board.

Structurally, Farm Heroes Saga consists of "Episodes", with each of them consisting of an overhead map (Figure 2) with a different number of game levels to beat (averaging at about 15 per episode), with a boss fight as the final game level of each of them. This game level map also shows an indication of a players' friends current game level (if they are in the same "Episode"/map)

[4] https://king.com/game/farmheroes [Accessed: Nov. 25th, 2020]
[5] https://king.com/ [Accessed: Nov. 25th, 2020]
[6] http://candycrushsaga.com/en/ [Accessed: Nov. 25th, 2020]

allowing to send those same friends some sort of in-game aid, such as extra lives or powerups. There are currently 128 episodes in Farm Heroes Saga, with a total of 1975 divided among them.

Each game level may also require players to complete determined objectives to successfully finish it. Similar to other games produced by the company, most levels expect the player to fill a "growth meter" (wherein other King games you must obtain a "star") by completing matches with specific fruits before the timer expires or the movement limit is reached. Some levels, however, allow the collection of animals by reaching a specific minimum score. Obtaining a full set of animals, rewards players with free power-ups. Occasionally a level consists of a "boss fight" against the game's mascot and antagonist *Rancid the Racoon*, who is trying to destroy the farm where the game takes place, being up to the player to stop him with the help of the animals that reside in the farm. These fights maintain the same basic gameplay mechanics as regular levels but instead of filling a meter, the player must deplete their opponent's life bar. Beating the boss allows the player to move to the next group of levels, provided they get the specific minimum score, which in turn rewards a player with a key to open the path ahead. In case a player is unable to get the minimum score required to proceed, they may ask three friends to help them get past the barrier or instead wait four days for the next segment of the game to unlock automatically.

Other social mechanics used (in addition to the aforementioned help players can provide to their friends) are leaderboards (called "Top Lists" in the game) to continuously expose the player to social information. For example, after each quest, the game shows a leaderboard with the player score and the results of other players in that specific level. As shown in Figure 2, this Top List is a feature in Farm Heroes Saga with which the player can not only see their friends score, but also the current highest worldwide scores. These lists are used to incite some degree of friendly competition among friends and keep players invested in the game for longer.

Figure 2. A snapshot of Farm Heroes Saga game: Top list leaderboard and game level map

4.1 Subjects

We advertised the data collection to 393 participants. They were informed in advance about what information would be recorded and that their personal information would be kept confidential. The participants were asked to voluntarily participate in our data collection, and their incentive to participate was the enjoyment of playing the game, achieving different game levels and competing with friends in their social network. Their ranking in the game would be their reward. Social games like the one in question are called “free to play games”, and serve as a good example of hedonic environments, which is the focus of this work. We conducted the data collection in this way, as our goal was to monitor the online gaming behaviour in a natural environment without extra manipulations. The participants’ task was to play the game as they would normally do. The only requirement to participate in the data collection was that the subjects had not played the game before, to ensure that they were all at the same level of experience as well as at zero engagement saturation in this particular game. Our intention was not to record or control their experience with other games, mimicking the process during which a game designer launches a new game. In such

a process, the game designer advertises the game and the players who choose to play it might have experience with other games or not, but they certainly do not have experience with the game in question.

Out of these 393 subjects 212 accepted to participate (36.3% female, 63.7% male, age [23-30]).[7] The subjects were graduate students enrolled in a full-time one-year master's program. This sample is suitable for our data collection, because the chosen cohort were young (age [23-30]) and tech-savvy individuals who were aware of social elements such as game leaderboards and tend to play social online games. Furthermore, using graduate students in this data collection can be considered similar to other contemporary population samples because graduate student learned behaviours were not used in the data collection, incentives were not provided for participation nor were they used to evaluate the collected data in any way (Exadaktylos 2013; Valogianni et al. 2020). In order to monitor their progress, we immersed ourselves in the subjects' network and we supervised the whole process throughout the course of the data collection. In addition, no participant drop-outs were observed during the data collection.

In order to administer the presented data collection, we followed an approach similar to the one followed by online game designers. We advertised the game to 393 potential users, and 212 accepted to play. It might have been that some of the 212 players were already friends before the game or not, but for each of these 212 players, the social comparison took place only with their friends in their social network that play the game. Similarly to online social game designers, we were agnostic to their prior underlying social relationships. As the objective of our study is to show

[7] The only evidence we have about the subjects who did not accept to participate in the data collection was that either they did not want to play the game, they did not want their information recorded or they had previous experience with the game; hence, they were not eligible to participate.

that social comparison among one person's real or virtual friends can create incentives for game continuance, this ex-ante relationship agnosticism was desirable.

4.2 Design and procedure

Our study adopted a prospective design over the course of two weeks. First, the respondents completed a pre-test online questionnaire with demographic information. Two weeks after (i.e., in time T1), the respondents filled an online questionnaire with questions related to social comparison directions, online social gaming self-efficacy, enjoyment and behavioural intentions (as shown in Appendix A), which are the main constructs of our model presented below. In time T1, in addition to the questionnaire responses, we measured the actual game level that each participant achieved.[8] The respondents did not know when T1 would take place, resembling a natural environment where they just have to play the game. They only knew that T1 would be the same for all participants. Their task was to start playing the game, and we informed them that at some unknown point in time we would request them to fill in an online questionnaire and we would measure their level in the game. Once we sent out the online questionnaire, they knew that at the same time their game level would be measured (actual behaviour), but they were not aware of the exact timing that the questionnaire would be sent out.

Furthermore, all participants belong to the same graduate program cohort, therefore, they all have the same study schedule, class attendance obligations (9:00 to 15:00 mandatory daily class attendance), study trips, and very similar free time. In addition, when the data collection took place, there were no exogenous events (such as exams, etc.) that could distort the time available for

[8] We also collected the game levels in two additional moments, one month after moment T1 which we called T2 and a third time period (T3) three months after moment T2. In both T2 and T3, we observe positive correlation between behaviour (game level) and continuance intention (CI) as indicated in T1.

playing the game. Thus, because of this schedule homogeneity in our population, their time availability to play the game is very comparable, considering also that many of their free-time activities are common for all of them (cohort-organized free time activities, celebrations, trips, etc.).

4.3 Measurement Variables

Except for demographic variables, all study variables were assessed using established scales. All self-reported items were measured using a seven-point Likert scale, and are listed in Appendix A. The four social comparison constructs were measured using sixteen items adapted from Van der Zee et al. (1999; 2000). The online social gaming self-efficacy was measured using four items adapted from Venkatesh (2000). The construct of Perceived Enjoyment (PE) was measured using four items following Ryan et al. (2006). The continuance intention to play was assessed with four items adapted from Hsiao et al. (2012a). In our data collection, besides measuring the players' intention to continue playing via the online questionnaire, we recorded their actual behaviour. This was measured by their progress (game level achieved) in the game in time period T1. In order to have access to this information, we asked the participants to add us as friends in the game in the beginning of the data collection, so we could observe their progress. The participants were informed that we would be monitoring their game levels once they filled the online survey. However, this information did not influence their continuance behaviour, as they did not receive any incentive for continuing to play or not, therefore, they could freely decide one or the other.

5 Data Analysis and Findings

The model summarized in Figure 1 was tested using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) method. PLS-SEM was chosen for its capability to accommodate complex models (Chin 2010) and small-sized samples. Our sample size of 212 subjects is suitable for our PLS-SEM model, since our largest construct includes 4 variables and according to the empirical rule we should have a sample 10 times bigger that the number of variables included in the largest construct (Marcoulides et al. 2006). Additionally, we opted for PLS-SEM because the objective of this study is the explanation of variance (Hair et al. 2017; Ringle et al. 2012; Sarstedt et al. 2017). We assessed the measurement and structural models using SmartPLS version 3.0 (Ringle et al. 2015). The bootstrapping method (5000 resample) was used to test the path coefficients significance (Hair et al. 2017).

5.1 The Measurement Model

The measurement model was evaluated using reliability, convergent and discriminant validity tests. The reliability test showed that all Cronbach's alphas and composite reliabilities are higher than 0.7 (Chin 1998), as presented in Table 1. Convergent validity was evaluated using Average Variance Extracted (AVE) scores and factor loadings. The results reported in Table 1 show that all AVE scores are above the recommended threshold of 0.5 (Fornell-Larcker, 1981). Factor loadings and cross loadings (as reported in Appendix B) show that all factor loadings are all above the recommended threshold of 0.70 (Chin 1998) and all the items showed higher factor loadings with their respective construct than the loadings on other constructs.

Table 1 – The measurement model: reliability results.

						Correlation Matrix							
	Mean	STD	CA	CR	AVE	UI	UC	DI	DC	SE	PE	CI	T1
UI	4.42	1.12	0.88	0.93	0.81	**0.90**							
UC	3.72	1.49	0.82	0.89	0.73	-0.35	**0.86**						
DI	3.62	1.43	0.87	0.92	0.80	-0.48	0.37	**0.89**					
DC	4.45	1.03	0.79	0.88	0.71	0.62	-0.43	-0.41	**0.84**				
SE	4.64	1.04	0.88	0.92	0.73	0.59	-0.54	-0.41	0.65	**0.86**			
PE	4.42	1.10	0.90	0.93	0.76	0.79	-0.44	-0.61	0.72	0.70	**0.87**		
CI	4.30	1.37	0.84	0.90	0.76	0.52	-0.33	-0.45	0.59	0.65	0.71	**0.87**	
T1	14.46	5.40	1.00	1.00	1.00	0.58	-0.42	-0.49	0.63	0.67	0.77	0.77	**1.00**

Notes. STD, standard deviation; CA, Cronbach alpha, CR, composite reliability; AVE, average variance extracted; correlation matrix, the diagonal elements are the square roots of AVE.

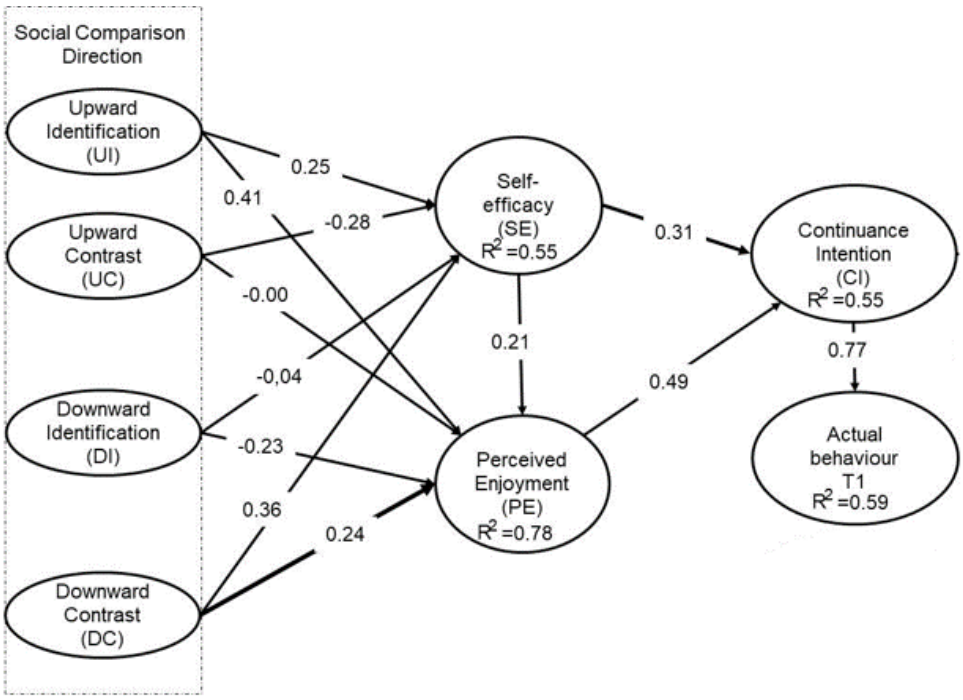
The discriminant validity was tested using the Fornell–Lacker Criterion, i.e., the square root of AVE for each construct to be greater than its correlation with any other construct. Additionally, we evaluated the Heterotrait-monotrait ratio of correlations (HTMT) as suggested by Henseler et al. (2015). Based on the results of Table 1, and the square root of AVE criterion, discriminant validity was established. Also, as shown in Appendix C, the HTMT criterion shows that only one factor is slightly above the conservative threshold of 0.85. Thus, the discriminant validity is demonstrated by the HTMT method. The descriptive analysis (Appendix C) reveals that UI (mean=4.42) and DC (mean=4.45) are reported as the highest comparison responses and players have a high online social gaming self-efficacy belief (mean= 4.64).

5.2 Structural Model

The results of the structural model are reported in Figure 3 and Table 2. The estimated model explains 55% of the variance in players' intention to continue playing online social games, and 59% in actual playing behaviour (time T1). Furthermore, besides just examining the intention to continue playing a social game, we tested if the players' intention to continue was actually realized in time T1. From what we observe in Figure 3, the continuance intention (CI) to play the online social game is positively related ($p<0.001$) with the actual continuance of playing T1. Specifically,

we observe that more than 77% of the users who indicated intention to continue playing, did continue playing the game in T1.

Figure 3: Research model results



The results show that both online social gaming self-efficacy (β=0.31, p<0.001) and perceived enjoyment (β=0.49, p<0.001) have a positive impact on continuance intention (CI), supporting H5b and H6, respectively. Together, these constructs can explain 55% of variance for players' continuance intention. Also, the online social gaming self-efficacy (β=0.21, p<0.001) has a positive impact on perceived enjoyment, supporting the H5a hypothesis.

Table 2: Structural model: path coefficients, p-values

	Path	Path coefficient	p-value	VIF	
H1a	UI→SE	0.25***	0.00	1.81	Supported
H1b	UI→PE	0.41***	0.00	1.95	Supported
H2a	UC→SE	-0.28***	0.00	1.29	Supported
H2b	UC→PE	-0.00	0.97	1.47	Not supported

H3a	DI→SE	-0.04	0.49	1.39	Not supported
H3b	DI→PE	-0.23***	0.00	1.40	Supported
H4a	DC→SE	0.36***	0.00	1.79	Supported
H4b	DC→PE	0.24***	0.00	2.08	Supported
H5a	SE→PE	0.21***	0.00	2.24	Supported
H5b	SE→CI	0.31***	0.00	1.97	Supported
H6	PE→CI	0.49***	0.00	1.97	Supported
H7	CI→T1	0.77***	0.00	1.00	Supported

Notes: ***The corresponding p-values suggest significance of the coefficients.

Furthermore, H7, which hypothesizes the players' intention positively affects their actual continuation of playing the game in time T1 is supported, strengthening the aforementioned results. Indeed, players who indicated that they would continue playing the game, in fact they did at a more than 77% rate. We should note that when comparing H1a, H1b, H4a and H4b, UI has a stronger effect on PE ($\beta = 0.41$, $p<0.001$) rather than on SE ($\beta = 0.25$, $p<0.001$). This means that when individuals feel similar and identify themselves with the top performers, they feel that they enjoy the game more, possibly as a result of their anticipation to perform as well as the top performers in the game. On the other hand, DC has a stronger effect on SE ($\beta = 0.36$, $p<0.001$) rather than on PE ($\beta = 0.24$, $p<0.001$). This implies that when players are distancing themselves from the poor performers of the game and they see that they have distinct differences, they feel that their skills in the game are high and their online social gaming self-efficacy is increasing. In summary, UI makes players enjoy the game more because they anticipate being at the top of the leaderboard or the level map because they see similarities with the top performance. On the contrary, DC makes players feel distant from the bad performers, because they feel dissimilar from the players at the bottom of the leaderboard or level map.

Finally, we tested for the presence of reverse causality between all examined constructs, and we found that reverse causality is not present in our model. Specifically, following the Simpson's

paradox analysis, we assessed the presence of this paradox. A potential presence of the Simpson's paradox would mean presence of reverse causality in our results (Kock et al, 2016). According to Simpson's paradox, the sign of the causality assessment path coefficients indicates its presence or not. We found all causality assessment path-correlation signs have values of 1, indicating absence the Simpson's paradox and, consequently, absence of reverse causality (Kock et al, 2016). Furthermore, we tested for the presence of statistical suppression, or omitted variable bias, which could be another indication for reverse causality. To test for statistical suppression, we calculated all path-correlation ratios. If any of these ratios had values greater than 1, we would have indications for reverse causality (Kock et al, 2016). All absolute path-correlation ratios in our analysis have values lower than 1, signalling absence of statistical suppression. In addition, to delve deeper into this relationship, all path-correlation differences should have values greater than 1.3, if the p values are lower than 0.05. In our case, all path-correlation differences have values well below the threshold of 1.3, not creating any concerns for reverse causality among any of the examined relationships. (Kock et al, 2016). Finally, we directly calculated the bivariate causal direction ratios (Kock et al, 2016), which would reveal the presence of reversed relationships in our model. Specifically, these ratios are calculated by dividing the coefficient of the reversed link by the path coefficient of the link toward the hypothesized direction. These ratios should be lower or equal to 1 to indicate absence of reverse causality. In our case, all these ratios have values below 1, only with the ratio between CI and T1 being 1.039, which is very close to 1 and does not create concerns about reverse causality. However, to examine the presence of reversed effects deeper, we calculated the bivariate causal direction differences that show if, in the presence of reversed causality, any reversed relationships are significant or not. If any of these values are greater than 1.3 when the p values are lower than 0.05, then in combination with the previous path coefficient

ratios can be used to identify significant reversed relationships. In our case, all values of these differences are well below 1.3 (maximum value 0.498), indicating that there is no significant reversed relationship in our model. Especially, in the relationship between CI and T1, which is the only ratio that was marginally above 1, the bivariate causal direction difference has a value of 0.032, which is very well below 1.3, therefore, creating no concerns for presence of reverse causality.

5.3 Assessment of model fit

We evaluated the research model fit through three fit indices: Path Coefficient (APC), Average R-Squared (ARS), and Average variance inflation factor (AVIF). Both, the APC = 0.344 ($p < 0.001$), ARS = 0.647 ($p < 0.001$) are significant below 0.05 (Kock 2015). The results show a value of AVIF = 1.764, which is below the recommended threshold of 3.3 (Knock 2015), indicating our model does not have vertical/lateral collinearity issues.

Furthermore, we used Normed-fit index (NFI), Chi-square, Stone-Geisser's Q^2 values, and Standardized Root Mean Square Residual (SRMR) to assess the goodness of fit of our model. Fit measures values of NFI=0.83, Chi-square (760.13), indicate that our model is an acceptable fit to the data. The Stone-Geisser Q^2 values (Stone, 1974; Geisser, 1974) were calculated using the blindfolding procedure. The results show that the Q^2 values are greater than zero (Hair et al. 2017) for all predictor constructs of our model: CI (0.41), PE (0.58), SE (0.39), T1 (0.59). In addition, the SRMR quality criterion (Henseler et al. 2014) has a value of 0.05, which is below the acceptable limit of 0.08; hence, the fit of our model is confirmed (Hair et al. 2017; Hu and Bentler, 1999).

5.4 Statistical Power Analysis

We conducted statistical power analysis for each statistically significant path coefficient in our model (Table 3) to assess the possibility of type II errors. We observe that overall, our model has a very good power, with the relationship between UI and SE being the only one that has power of 0.77, slightly lower than the recommended 0.8 threshold (Kock et al. 2018). Therefore, we can conclude that our model can prevent type II errors with a very high probability.

Table 3: Statistical power of the presented model

	Path	Path coefficient	Statistical Power	
H1a	UI→SE	0.25***	0.77	Supported
H1b	UI→PE	0.41***	1.00	Supported
H2a	UC→SE	-0.28***	0.98	Supported
H2b	UC→PE	-0.00	-	Not supported
H3a	DI→SE	-0.04	-	Not supported
H3b	DI→PE	-0.23***	0.99	Supported
H4a	DC→SE	0.36***	0.99	Supported
H4b	DC→PE	0.24***	0.97	Supported
H5a	SE→PE	0.21***	0.83	Supported
H5b	SE→CI	0.31***	0.92	Supported
H6	PE→CI	0.49***	1.00	Supported
H7	CI→T1	0.77***	1.00	Supported

Notes: ***The corresponding p-values suggest significance of the coefficients.

6 Discussion of Findings

Through the presented model, we empirically investigated the impact of social comparison experiences on HIS self-efficacy, perceived enjoyment and continuance intention to use the HIS (online social game). First, similarly to other domains (Sherlock 2007; Wu et al. 2007; Lee et al. 2013; Alzahrani et al. 2017), our study confirms that perceived enjoyment is the most influential

predictor of player continuance intentions. However, online gaming self-efficacy is still relevant because it not only has a moderate effect on continuance intentions, but also it affects perceived enjoyment. Humans tend to enjoy more tasks that they know how to complete, and they are good at. Therefore, it is expected that when players have high self-efficacy beliefs, their perceived enjoyment will also increase. In contrast, when people feel that they are not performing well in a task, their enjoyment is quite likely to decrease. This finding contributes to the ongoing discussion about identifying elements in HIS (such as online social games) that are successful in establishing continuance (Hsiao et al. 2012b). While previous work (Hsiao et al. 2012a, b) has identified that a player's trust in the online community and the perception of social value derived from this community positively affect continuance in online games, no attempt to connect the continuance intentions with self-efficacy and perceived enjoyment has been made. The latter two constructs lead us to a concrete operationalization of instruments that incentivize players to continue being engaged in the HIS.

To this end, we show that players' perceived enjoyment and self-efficacy are influenced by the process of social comparison with other players. Our results demonstrate that out of four dimensions of social comparison, three of them (upward identification, upward and downward contrast) influence perceived enjoyment. Literature has shown that social presence and tendency to social comparison influence perceived enjoyment (Shen 2012), but there was limited evidence about the relationship between the social comparison elements and perceived enjoyment. Furthermore, previous work (Chang, et al. 2014) has shown that continuance in HIS can be incentivized via utilitarian incentives to players, as well as peer influence from their community. We advance this conversation by showing that in addition to peer influence, direct social

comparisons (upward identification, downward identification and downward contrast) among the correctly chosen individuals can affect enjoyment and enhance continuance in online social games.

Specifically, upward identification seems to be the most influential comparison mechanism that leads to an increased online social game perceived enjoyment, which, in turn, is positively related with the intention to continue playing the game. This result means that players, when they identify with the players performing better than them, they feel they enjoy the game more and, therefore, they continue playing. That could be interpreted as a feeling that their chances of performing equally well are higher, continuing to be engaged in the game. When players feel that they are performing as bad as players below them in the leaderboard (downward identification), the opposite happens. Their perceived enjoyment decreases, indicating that emphasizing the inferior performance of players below the user in the leaderboard might lead to downward identification feelings, making the user feel that in the future s/he might perform as badly as people with lower leaderboard rankings. Thus, establishing upward identifications can contribute not only to the online social game continuance literature (Chang et al. 2014; Hsiao et al. 2012a, b), but also to the online social games adoption literature (Chang et al, 2006; Zhu et al. 2012; Cheung et al. 2015), as it is shown that customer engagement (Chang et al, 2006; Cheung et al. 2015) is one of the determining factors when it comes to online game adoption.

In addition, we do not find support that upward contrast influences player perceived enjoyment. This result may be partially explained by the fact that when players contrast themselves with other players within the game, they are directly comparing their gaming performance. Therefore, although we expect them to be discouraged and feel that their online social gaming enjoyment has decreased as a result of this upward contrast, some players may also implicitly enjoy this competing aspect of the game. These players may interpret this competition as a quest to seek

revenge and may see this competition as a challenge that keeps them motivated. Therefore, we cannot arrive at a clear conclusion related to upward contrast and perceived enjoyment. Similar findings are also presented by Velez et al. (2018), Rahimi et al. (2017) and Lewis (2020), where such negative feedback and upward contrast did not seem to affect perceived enjoyment negatively.

Moreover, we did not find support of our hypothesis connecting downward identification with decrease in self-efficacy. Self-efficacy is defined as "people's judgment of their own capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, A. 1986). Therefore, despite that some individuals might be discouraged by identifying with players performing worse than them (downward identification), others might not perceive this downward identification as a reflection to their own capabilities and skills. Instead, they might see this identification as a circumstantial event that might be overcome using their own capabilities. Based on Lindsley et al. (1995), self-efficacy has a spiral relationship with performance in the sense that self-efficacy affects performance and performance affects self-efficacy. Therefore, despite that downward identification is expected to decrease self-efficacy, the interpretation of a player's performance might increase the feelings of self-efficacy, leading to an uncertain direction of the outcome. Similar results are being presented by Carmona et al. (2008) who conducted a study with 120 university students to examine whether social comparison responses mediated the relationship between goal orientation, self-efficacy and academic success. They also found that downward identification does not influence academic self-efficacy. Thus, the relationship between downward identification and self-efficacy deserves future investigation.

Finally, taken together, our findings indicate that upward identification and downward contrast comparisons are the most influential comparison elements in game continuance intentions, with

both comparisons influencing self-efficacy and enjoyment, but in different ways. Upward identification had a stronger relationship with game enjoyment, whereas downward contrast had a stronger relationship with online social gaming self-efficacy. Therefore, a combination of those could lead to more effective online social game continuance incentives, responding to the literature call for disentangling the social elements that increase online gaming engagement (Shen, 2012; Lee et al. 2011; Song et al. 2006).

We should highlight that the presented study is advancing our understanding about HIS continuance by measuring the actual continuance behaviour in an online social game, besides measuring the self-reported intention that has so far been used in the literature as a metric for continuance (Chang et al. 2014; Hsiao et al. 2012a, b). Therefore, our results can help strengthen the theory of HIS continuance by providing objectively measured evidence in combination with self-reported measures.

7 Conclusions and Implications

This study shows that hedonic information systems continuance intentions can be incentivized using social comparison along different directions. We find that upward identification and downward contrast have a significant positive effect on users' online social gaming self-efficacy and perceived enjoyment, revealing strong intentions to continue being engaged with the HIS. We also find a negative influence of upward contrast to self-efficacy, and a negative influence of downward identification to perceived enjoyment, both leading to a negative impact on continuance. Next, we discuss the theoretical and practical implications of these findings.

7.1 Theoretical Implications

This work has some important contributions to IS research. The major contribution of this study lies on building a novel and multifaceted theoretical account of how players react to different social comparison design elements of a hedonic information system, with respect to continuance. While previous work (Chang et al. 2014; Hsiao et al. 2012a, b) has highlighted the need for concrete mechanisms to incentivize continuance in HIS, we know very little about connecting the social comparison dimension to continuance intentions in HIS such as online social games. This study examined how the specific social elements of a HIS can serve as successful incentives for IS continuance, advancing the discussion about social relatedness and satisfaction (Sailer et al. 2017). Specifically, the findings of this work explicitly articulate which social elements can increase satisfaction in online social games, as opposed to previous general claims about social relatedness. More importantly, our findings can address the reduced continuance and low members' motivation issues in online social games (Kuem et al. 2020; Ma et al. 2018), capitalizing on the presented explicit social mechanisms.

In addition, the findings of this study contribute to a deeper understanding of the social component of the online social game literature and, more specifically, the literature on social interactions among players and how it increases their satisfaction and enjoyment (Sailer et al. 2017, Tseng et al. 2015, Shin et al. 2011, Sweetser et al. 2005, Jegers 2007). Existing literature has not made an attempt to operationalize these social interactions to comprehensive directives for game designs. Hence, our findings can help offering anxiety-relieving benefits to players (e.g., #PlayApartTogether campaign launched by the World Health Organization).

By combining the theories of social comparison with social comparison design, we are able to more thoroughly explore group socialising behaviour in an online social community setting. The theoretical combination enables us to consider more thoroughly individual hedonistic behaviour

as it manifests within a self-identifying group - an online social community. We argue that since the feeling of trust in the online community is known to increase engagement in online games (Hsiao et al. 2012a, b), correctly designed comparisons with the right individuals within this community are going to strengthen the effect on continuance. This argument is supported by our results.

Furthermore, while social comparison theory has been developed and tested in user groups coping with numerous health-related issues (Buunk et al. 1997; Tennen et al. 2000; Myers et al. 2009) such as cancer (Van der Zee et al. 1999; Van der Zee et al. 2000), fibromyalgia (Cabrera-Perona et al. 2017), burnout (Buunk et al, 2004; Carmona et al. 2006) or other chronic pain disorders (Affleck et al. 1997), it has not been analysed in environments where joy and entertainment are the main objectives. As our results demonstrate, the combination of social comparison theory with IS continuance can open new pathways in IS research and HIS enjoyment, since it can lead to very concrete incentive designs that can be easily interpreted by players (level maps, notifications about comparison with individuals that players identify with, etc.).

Moreover, our results have the potential to contribute to the growing online social games adoption literature (Chang et al, 2006; Cheung et al. 2015), as the proposed incentives can influence engagement in social games, and it is shown (Chang et al, 2006, Cheung et al. 2015) that customer engagement is one of the determining factors when it comes to online game adoption.

In addition, this work builds on the seminal technology acceptance (Davis 1989) and IS success (DeLone et al. 1992) models by accounting for social characteristics rather than focusing on only individually assessed ones, such as Perceived Usefulness and Perceived Ease of Use (Davis 1989), or the User Satisfaction (DeLone et al. 1992). The technology acceptance and IS success models

have extensively served IS research to uncover human intentions toward technology adoption and acceptance (King et al. 2006; Petter et al. 2009). Specifically, in the fields of online (Zhu et al. 2012) and simulation games (Pando-Garcia et al. 2016), as well as hedonic information systems as a whole (Wang et al. 2012), these models have been used to reveal the individual characteristics that can increase the adoption of the system, focusing on the user-system relationship. However, with the rise of online communities, research has found that besides individually assessed characteristics, users are affected by community characteristics when it comes to their intention to adopt technology (Chang et al, 2006; Cheung et al. 2015; Hsiao et al. 2012a, b). Therefore, in this paper, we advance this discussion by showing that besides individually measured signals related to technology, community induced signals have the potential to strengthen adoption and engagement in hedonic information systems.

Finally, this paper contributes to social theory in IS research. Social mechanisms abound in IS theory but, like causal claims more generally, they are rarely explicitly identified and mentioned as such (Avgerou 2013). Thus, this work attempts to contribute to the explicit identification of such mechanisms that shape behaviour – continuance in this case – toward a desired outcome.

7.2 Practical Implications

From a managerial point of view, this paper creates insights about the users' intentions to continue being engaged in an online social game. This can be of paramount importance for the online social game designers who strive to understand players' driving factors to continue being engaged. It is also a significant determinant for the online social game industry in its strategy to attract loyal players (Choi et al. 2004; Hsu et al. 2007; Wu et al. 2007; Huang et al. 2011; Su et al. 2016). Therefore, the current study, besides exploring new properties of social comparison and IS

continuance theory in the use of HIS, can create concrete insights for online social game stakeholders that are coping with gamers' engagement and retention toward profit maximization.

HIS designers can induce upward identification and downward contrast, when presenting leaderboards and level maps, or via notifications sent to players. For example, they can create leaderboards or notifications to the players, emphasizing the good performance of their friends with whom they identify with, e.g., they have similar characteristics, they are one of the nodes in the social network they interact frequently with, etc. Furthermore, game designers can stress (via notifications, posts, summary results or messages) the similarities of a user to a top performer, making the user feel that it is possible to achieve a similarly good performance. Establishing the notion of similarity of a player with the top performers in the game, can, indeed, create incentives for the player to continue being engaged and minimize the chances of quitting.

In addition, we observed that upward contrast can create feelings of negativity to users that feel they are distant from the top players and they are underperforming significantly compared to them, with no hope to reach their performance. These feelings of negativity reduce their desire to continue being engaged. On the contrary, downward contrast creates feelings of superiority to the users, and increases their self-perceptions of high performance. Therefore, in our particular context of online social games, game designers need to set their gaming incentives (e.g., point systems, leaderboards, badges, levels, notifications, etc.) in a way that establishes identification feelings with the top performers and contrast feelings with the underperforming players. For example, game designers can change the visual representation of leaderboards and level maps so that players can easily visualize the ones which they identify with and the ones they contrast. Such an incentive game design can increase users' intentions to remain engaged as they feel that they can perform as well as the top players, and they feel that they are clearly better than the underperforming players.

Besides online social games, our findings can be applied to other IS platforms with potentially similar promise. For example, Qiu et al. (2017) emphasize the need for high quality contribution in prediction markets in order to ensure accurate and reliable results. They find that increasing the audience which the market is targeting and that endorsing in different ways individuals of different capability levels can lead to a more reliable outcome. The findings of this paper could be useful in prediction markets or serious games (Ketter et al. 2016), as these environments can benefit from their social dynamics to strengthen continuance intentions. To operationalize this, prediction market designers could set up upward identification or downward contrast structures, such as leaderboards, notifications about comparisons with high performing individuals, etc., to "make trading more social", as Qiu et al. (2017) point out.

Another important IS domain where the presented results can help incentivize continuance is the open source communities. Wu et al. (2007) show that software developers can be motivated to continue being engaged with the open source community via emphasizing certain individual traits and characteristics. We argue that adding on these traits social comparison elements that induce upward identification or downward contrast within the online community has the potential to increase continuance behaviours. For example, the open source community manager could design personalized leaderboards where the similarities of a user with the top performers, or the dissimilarities with poor performers are emphasized. In addition, Boons et al. (2015) show that feelings of pride can act as drivers in crowdsourcing platforms. Thus, using the presented social comparison elements, a crowdsourcing platform manager can establish a clear feeling of pride for users that need further incentives to remain engaged.

Our findings can be also capitalized by charity organizations to incentivize fundraising and philanthropy in general. As Castilo et al. (2014) state, "Charities can increase donations by simply

asking donors to share that they have donated." Thus, using our social comparison findings, charity foundations can increase donation targets even more by establishing upward identifications of donors with high reputable individuals within their social network that have contributed significant donations. In this way, in addition to utilizing the social presence to achieve higher donation targets, charity organizations can benefit from the underlying dynamics within this social environment.

Moreover, social networking sites (SNS) (Lin et al. 2017) could potentially benefit from our findings. Lin et al. (2017) use the technology acceptance model (TAM) to show which individual factors affect continuance in social networking sites and show that their results differ across gender. Possibly, continuance in SNS could become stronger by showing to users the activities of other users they identify with, such as attendance of events, etc. Similarly, the presented results could be used in social virtual worlds (Zhou et al. 2014). Zhou et al. (2014) show that social benefits are expected to affect continuance in social virtual worlds, but they do not delve deeper into this dimension. One potential extension would be to implement the presented social comparison characteristics in order to make these social benefits more prominent for the users and induce a stronger continuance behaviour.

In addition, Silic et al. (2020) show that gamified environments can significantly improve effectiveness of cybersecurity training within organizations. Specifically, they show that different gamification elements during corporate cybersecurity training can increase the intention to follow security policies. Consequently, our findings can be applied in such a system, as employees within the company can compare with one another. Inducing the right comparisons among them can establish feelings of joy or hope that they can perform well, as opposed to threats or other penalties that are shown not to work well (Silic et al. 2020).

Finally, social shopping websites can make use of our results to increase continuance of use of their platform. Shen (2012) shows that social presence is associated with higher probabilities of continuance in a social commerce platform. We argue that creating concrete social comparisons (such as notifications about friends who are frequent shoppers, or about specific products that friends purchased from the platform) to benefit from this social presence will indeed contribute to the users' continuance behaviour.

8 Limitations and Future Research

In this analysis, there are certain limitations that open pathways for future research. The first variable was the self-reported social comparison perception reported by participants. That could have potentially included some self-reporting bias. In the future, it would be interesting to investigate the presence of such a bias and limit it by using the right instruments. Moreover, since the data from the present study are cross-sectional in nature, in the future we plan to conduct longitudinal analysis to elucidate the temporal precedence of the variables.

Through the present analysis we provide academic evidence of how social comparison experiences in online social games can increase gaming continuance, offering useful insights to the game industry stakeholders. Future researchers can build on this evidence and extend the research model by including more variables related to players' behaviour and intentions to remain engaged. That can have a significant impact on the online social game industry, since maintaining a customer base instead of approaching new customers is far more cost effective for online social game designers.

In addition, in this paper, we aim to demonstrate that social comparison has an effect on continuance in online social games. In this respect, many social comparison features (such as

leaderboards, level maps, etc.) may influence continuance. However, we have not disentangled the effect of each individual feature, as this would require a different research design. Future work could further pursue the direction of disentangling the effects of different game features and implement them along the social comparison directions that we have highlighted as impactful.

Furthermore, inducing the right interpretation of a leaderboard or a level map, for example identification rather than contrast response, the concepts of 'priming' or 'social priming' can be leveraged (Bhagwatwar et al. 2017). Priming refers to the nonconscious activation of a mental representation by external stimuli before carrying out a task, affecting information processing style and behaviour (Bargh et al. 2000). Previous studies (e.g., Buunk et al. 2011) have suggested that priming effects may affect social comparison orientation. Further research will also be needed to understand the social comparison phenomenon by, for example, exploring social identity theory which relates to the desire to belong to a group (Taifel and Turner ,1979). Social identity theory states that individuals identify themselves by the groups to which they belong and perceive and judge others by their group memberships. Thus, the phenomenon of group-based comparison is central to social identity theory.

Finally, in this study we chose to be agnostic to the underlying social relationships of the players. It would be interesting for future work to investigate how different social relationships affect continuance. For example, co-workers might compete, whereas friends outside of work might have different comparison dynamics. In a similar vein, this work was agnostic to the information of subjects that refused to play the game. Hence, future research can attempt to request information from subjects that refuse to participate, yet they are willing to share their information and reasons for not participating. Such an analysis can also shed light on the characteristics of players that do not adopt such online social games.

References

Affleck, G., & Tennen, H. (1997). Social comparison as a coping process: A critical review and application to chronic pain disorders. *Health, coping, and well-being: Perspectives from social comparison theory*, 263-298.

Alzahrani, A. I., Mahmud, I., Ramayah, T., Alfarraj, O., & Alalwan, N. (2017) Extending the Theory of Planned Behaviour (TPB) to Explain Online Game Playing among Malaysian Undergraduate Students. *Telematics and Informatics*, 34(4):239-251.

Anderson, E. S., Winett, R. A., & Wojcik, J. R. (2007). Self-regulation, self-efficacy, outcome expectations, and social support: social cognitive theory and nutrition behaviour. *Annals of behavioural medicine*, *34*(3): 304-312.

Arigo, D., Suls, J., &Smyth, J. (2012) Social comparisons and chronic illness: research synthesis and clinical implications. *Health Psychology Review*, 8(2):154-214.

Avgerou, C. (2013) Social mechanisms for causal explanation in social theory based IS research. *Journal of the Association for Information Systems*, 14(8):399-419.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84(2):191-215.

Bandura, A. (1981). Self-referent thought: A developmental analysis of self-efficacy. In J. H. Flavell & L. Ross (Eds.), *Social cognitive development: Frontiers and possible futures* (pp. 200-239). Cambridge: Cambridge University Press.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A., & Locke, E. A. (2003). Negative self-efficacy and goal effects revisited. *Journal of Applied Psychology*, 88(1):87-99.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behaviour*, 31:143-164.

Bargh J. A., & Chartrand T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In: Reis H. T., editor. Handbook of research methods in social and personality psychology. New York, NY: Cambridge University Press; 2000. pp. 253–285.

Beach, S. R., & Tesser, A. (2000). Self-evaluation maintenance and evolution: Some speculative notes. In J. Suls & L. Wheeler (Eds.), *Handbook of social comparison: Theory and research* (pp. 123–140). New York: Kluwer Academic/Plenum Publishers.

Beaumont, J. G., & Kenealy, P. M. (2004). Quality of Life Perceptions and Social Comparisons in Healthy Old Age. *Aging & Society*, 24:755-769.

Benight, C. C., & Bandura, A. (2004). Social cognitive theory of posttraumatic recovery: The role of perceived self-efficacy. *Behaviour Research and Therapy*, *42*(10): 1129-1148.

Betz, N. E. (2000). Self-efficacy theory as a basis for career assessment. *Journal of Career Assessment*, *8*(3): 205-222.

Betz, N. E. (2004). Contributions of self-efficacy theory to career counseling: A personal perspective. *The Career Development Quarterly*, *52*(4): 340-353.

Bhagwatwar, A., Massey, A., & Dennis, A. (2017). Contextual Priming and the Design of 3D Virtual Environments to Improve Group Ideation. *Information Systems Research*. 29(1): 169-185.

Boissicat, N., Pansu, P., Bouffard, T., & Cojn, F. (2012) Relation between perceived scholastic competence and social comparison mechanisms among elementary school children. *Social Psychology of Education*, 15(4):603-614.

Boons, M., Stam, D., & Barkema, H. G. (2015). Feelings of pride and respect as drivers of ongoing member activity on crowdsourcing platforms. *Journal of Management Studies*, *52*(6): 717-741.

Brewer, M. B., & Weber, J. G. (1994) Self-evaluation effects of interpersonal versus intergroup social comparison. *Journal of Personality and Social Psychology*, 66:268–275.

Buunk, A.P., & Dijkstra, P. (2011). Does Attractiveness Sell? Women's Attitude Toward a Product as a Function of Model Attractiveness, Gender Priming, and Social Comparison Orientation. *Psychology & Marketing*, 28(9):958-973.

Buunk, A.P., & Gibbons, F.X. (2006) Social comparison orientation: a new perspective on those who do and those who don't compare with others. In Guimond, S. (Ed.) *Social Comparison and Social Psychology: Understanding cognition, intergroup relations and culture* (pp. 15-33) Cambridge: Cambridge University Press.

Buunk, A. P., & Gibbons, F. X. (2007) Social comparison: The end of a theory and the emergence of a field. *Organizational Behaviour and Human Decision Processes*, 102(1): 3-21.

Buunk, B. P., & Mussweiler, T. (2001) New directions in social comparison research. *European Journal of Social Psychology*, 31(5): 467-475.

Buunk, B. P., Schaufeli, W. B., & Ybema, J. F. (1994). Burnout, uncertainty, and the desire for social comparison among nurses. *Journal of Applied Social Psychology*, *24*(19): 1701-1718.

Buunk, B. P., & Ybema, J. F. (1997) Social comparisons and occupational stress: The identification-contrast model. In B. P. Buunk & F. X Gibbons (Eds.), *Health, coping and well-being: Perspectives from social comparison theory* (pp. 359–388) Mahwah, NJ: Erlbaum.

Cabrera-Perona, V., Buunk, A., Terol-Cantero, M., Quiles-Marcos, Y., & Martín-Aragón, M. (2017) Social comparison processes and catastrophising in fibromyalgia: A path analysis, *Psychology & Health*, 32(6):745-764

Carmona, C., Buunk, A. P., Peiro, J. M., Rodriguez, I., & Bravo, M. J. (2006) Do social comparison and coping styles play a role in the development of burnout? Cross-sectional and longitudinal findings. *Journal of Occupational and Organizational Psychology*, 79:85-99.

Carmona, C., Buunk, A. P., Dijkstra, A., & Peiro, J. M. (2008). The relationship between goal orientation, social comparison responses, self-efficacy, and performance. *European Psychologist*, 13 (3): 188-196.

Castillo, M., Petrie, R., & Wardell, C. (2014). Fundraising through online social networks: A field experiment on peer-to-peer solicitation. *Journal of Public Economics*, *114*: 29-35

Chang, B. H., Lee, S. E., & Kim, B. S. (2006). Exploring factors affecting the adoption and continuance of online games among college students in South Korea: Integrating uses and gratification and diffusion of innovation approaches. *New Media & Society*, *8*(2): 295-319.

Chang, C., & Chin, Y. (2011) Predicting the usage intention of social network games: an intrinsic: extrinsic motivation theory perspective. *International Journal of Online Marketing (*IJOM) 1(3): 29-37.

Chang, I. C., Liu, C. C., & Chen, K. (2014). The effects of hedonic/utilitarian expectations and social influence on continuance intention to play online games. *Internet Research 24(1): 21-45*.

Chester, D., Powell C., Smith R., Joseph J., Kedia G., Combs D., & DeWall C. (2013) Justice for the average Joe: The role of envy and the mentalizing network in the deservingness of others' misfortunes. *Social Neuroscience*, 8:640–649.

Cheung, C. M., Shen, X. L., Lee, Z. W., & Chan, T. K. (2015). Promoting sales of online games through customer engagement. *Electronic Commerce Research and Applications*, *14*(4):241-250.

Choi, D., Kim, J. (2004) Why people continue to play online games: in search of critical design factors to increase customer loyalty to online contents. *Cyber-Psychology & Behaviour*, 7(1):11-24.

Choi, H., Dowell, N., Brooks, C., & Teasley, S. (2019, March). Social Comparison in MOOCs: Perceived SES, Opinion, and Message Formality. In *Proceedings of the 9th International Conference on Learning Analytics & Knowledge* (pp. 160-169).

Chung, J.M., Robins, R.W., & Schriber, R.A. (2016) Positive illusions in the academic context: A longitudinal study of academic self-enhancement in college. *Personality and Social Psychology Bulletin*, 42(10):1384-1401

Collins, R. L. (1996). For better or worse: The impact of upward social comparison on self-evaluations. *Psychological Bulletin*, 119:51-69.

Corcoran, K., Crusius, J., & Mussweiler, T. (2011) Social comparison: Motives, standards, and mechanisms, *Theories in social psychology*, 119-139.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3):319-340.

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

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60-95.

Dijkstra, P., Kuyper, H., Buunk, A., Van der Werf, M., & Van der Zee, Y. (2008) Social Comparison in the Classroom: A Review. *Review of Educational Research*, 78:828-879.

Exadaktylos, F., Espín, A. M., & Branas-Garza, P. (2013) Experimental subjects are not different. *Nature: Scientific Reports*, *3*, 1213.

Festinger, L. (1954) A Theory of Social Comparison Processes. *Human Relations*, 7:117-140.

Fisher, E., Dunn, M., & Thompson, J. K. (2002). Social comparison and body image: An investigation of body comparison processes using multidimensional scaling. *Journal of Social and Clinical Psychology*, *21*(5), 566-579.

Fornell, C. G., & Larcker, D. F. (1981) Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1):39–50.

Frieswijk, N., Buunk, B. P., Steverink, N., & Slaets, J. P. J. (2004) The effect of social comparison information on the life satisfaction of frail elderly persons. *Psychology and Aging*, 19:183–190.

Fuster, H., Carbonell, X., Chamarro, A., & Oberst, U. (2013) Interaction with the Game and Motivation among Players of Massively Multiplayer Online Role-Playing Games. *The Spanish Journal of Psychology*, 16(43):1-8.

Galinsky A, & Schweitzer M (2015). Friend & foe: When to cooperate, when to compete, and how to succeed at both. New York: Crown Business.

Garcia, S., Tor, A. & Schiff, T. (2013). The Psychology of Competition: A Social Comparison Perspective. In *Perspectives on Psychological Science* 8(6): 634-650. Sage Publications.

Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, 61, 101-107.

Gentile, D.A., & Gentile, J.R. (2007) Video games as exemplary teachers, *Journal of Youth and Adolescence*, 1-38.

Gerber, J. P., Wheeler, L., & Suls, J. (2018). A social comparison theory meta-analysis 60+ years on. *Psychological Bulletin*, *144*(2), 177.

Gibbons, F., & Buunk, B.P. (1999) Individual differences in social comparison: The development of a scale of social comparison orientation. *Journal of Personality and Social Psychology*, 76:129-142.

Gilbert, P., Price, J., & Allan, S. (1995). Social comparison, social attractiveness and evolution: How might they be related? *New Ideas in Psychology*. 13(2):149-165.

Gilbert, D. T., Giesler, R. B., & Morris, K.A. (1995) When comparisons arise. *Journal of Personality and Social Psychology*, 69:227-336.

Graves, L. M., Ruderman, M. N., Ohlott, P. J., & Weber, T. J. (2012). Driven to work and enjoyment of work: Effects on managers' outcomes. *Journal of Management*, *38*(5), 1655-1680

Greenberg, J., Ashton-James, C. E., & Ashkanasy, N. M. (2007) Social comparison processes in organizations. *Organizational Behaviour and Human Decision Processes*, 102:22-41.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017) A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (2nd ed.). Thousand Oakes,CA: Sage.

Hakmiller, K. L. (1966) Threat as a determinant of downward comparison. *Journal of Experimental Social Psychology Suplement* 1:32-39.

Hamari, J., & Tuunanen, J. (2014) Player types: A meta-synthesis. *Transactions of the Digital Games Research Association*, 1(2):29–53.

Hannon, S. M. (2018). Do Factors of Social Comparison Theory Influence School Choice in a Public School Marketplace? (Doctoral dissertation, Indiana State University)

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., ... & Calantone, R. J. (2014). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). *Organizational Research Methods*, *17*(2), 182-209.

Hong, J-C., Lin, P-H., & Hsieh, P-C. (2017). The effect of consumer innovativeness on perceived value and continuance intention to use smartwatch. *Computers in Human Behaviour*, 67:264-272.

Hsiao, C. C & Chou, J.S. (2012a) The effects of a player's network centrality on resource accessibility, game enjoyment, and continuance intention: A study on online gaming communities. *Electronic Commerce Research and Applications*, 11:75–84.

Hsiao, C. C., & Chiou, J. S. (2012b). The impact of online community position on online game continuance intention: Do game knowledge and community size matter? *Information & Management*, *49*(6), 292-300.

Hsu, C. L., & Lu, H. P. (2007) Consumer behaviour in online game communities: a motivational factor perspective. *Computers in Human Behaviour*, 23(3):1642–1659.

Hsu, M. H., & Chiu, C. M. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems*, *38*(3), 369-381.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1-55.

Huang, L.Y., & Hsieh, Y.J. (2011) Predicting online game loyalty based on need gratification and experiential motives. *Internet Research*, 21(5):581-598.

Jankowski KF, & Takahashi H (2014) Cognitive neuroscience of social emotions and implications for psychopathology: Examining embarrassment, guilt, envy, and schadenfreude. *Psychiatry and Clinical Neurosciences*. 68:319–336.

Jegers, K. (2007). Pervasive game flow: understanding player enjoyment in pervasive gaming. *Computers in Entertainment (CIE)*, *5*(1), 9-es.

Jehad Imlawi & Dawn Gregg (2020) Understanding the satisfaction and continuance intention of knowledge contribution by health professionals in online health communities, *Informatics for Health and Social Care*, 45(2): 151-167.

Johnson, E. A., & Stewart, D. W. (2008) Perceived competence in supervisory roles: A social cognitive analysis, *Training and Education in Professional Psychology*, 2:229-236.

Joo, Y. J., Bong, M., & Choi, H. J. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in Web-based instruction. *Educational Technology Research and Development*, *48*(2):5-17.

Kawale, J. Pal, A., &Srivastava, J. (2009) Churn Prediction in MMORPGs: A Social Influence Based Approach. In *Proceedings of the Computational Science and Engineering*. 4:423–428.

Keil, A., Mussweiler, T. and Epstude, K. (2006) Alpha-band activity reflects reduction of mental effort in a comparison task: a source space analysis. *Brain Research*, 1121(1):117-127.

Kemmelmeier, M., & Oyserman, D. (2001) Gendered influence of downward social comparisons on current and possible selves. *Journal of Social Issues*, 57(1):129-148.

Ketter, W., Peters, M., Collins, J., & Gupta, A. 2016. A Multiagent Competitive Gaming Platform to Address Societal Challenges, *Management Information Systems Quarterly* (40:2): 447–460.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management*, *43*(6), 740-755.

King (2018a). Annual revenue of King.com from 2010 to 2017, https://www.statista.com/statistics/288974/king-annual-revenue/

King (2018b). Number of monthly active users (MAU) of King worldwide from 1st quarter 2012 to 1st quarter 2018 (in millions), https://www.statista.com/statistics/281595/king-digital-entertainment-quarterly-mau/

Kock, N. (2015) WarpPLS 5.0 user manual. ScriptWarp System.

Kock, N., & Gaskins, L. (2016). Simpson's paradox, moderation, and the emergence of quadratic relationships in path models: An information systems illustration. *International Journal of Applied Nonlinear Science*, *2*(3): 200-234.

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*: *28*(1), 227-261.

Kuem, J., Khansa, L., & Kim, S. S. (2020). Prominence and Engagement: Different Mechanisms Regulating Continuance and Contribution in Online Communities. *Journal of Management Information Systems*, *37*(1):162-190.

Lam, C. K., Van der Vegt, G. S., Walter, F., & Huang, X. (2011) Harming high performers: A social comparison perspective on interpersonal harming. *Journal of Applied Psychology,* 96:588-601.

Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005) Acceptance of internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information & Management*, 42(8):1095-1104.

Lee, M. C., & Tsai, T. R. (2010). What drives people to continue to play online games? An extension of technology model and theory of planned behaviour. *International Journal of Human-Computer Interaction*, 26(6):601-620.

Lee, M. K., Shi, N., Cheung, C. M., Lim, K. H., & Sia, C. L. (2011). Consumer's decision to shop online: The moderating role of positive informational social influence. *Information & Management*, *48*(6),:185-191.

Lee, S., & Quan, C. (2013) Factors affecting Chinese Ubiquitous Game Service usage intention. *International Journal of Mobile Communications*, 11(2):194-212.

Lewis, N., & Weaver, A. J. (2016). Emotional responses to social comparisons in reality television programming. *Journal of Media Psychology*, 28, 65-77.

Lewis, N., & Weaver, A. J. (2019). Social comparison-related emotional and enjoyment responses to entertainment television characters. *Atlantic Journal of Communication*, 27(5): 339-353.

Lewis, N. (2020). Experiences of upward social comparison in entertainment contexts: Emotions, state self-esteem, and enjoyment. *The Social Science Journal*, 1-16.

Lin, C., & Bhattacherjee, A. (2010) Extending technology usage models to interactive hedonic technologies: a theoretical model and empirical test, *Information Systems Journal*, 20(2):163-181.

Lin, X., Featherman, M., & Sarker, S. (2017). Understanding factors affecting users' social networking site continuance: A gender difference perspective. *Information & Management*, *54*(3): 383-395.

Lindsley, D. H., Brass, D. J., & Thomas, J. B. (1995). Efficacy-performing spirals: A multilevel perspective. *Academy of Management Review*, *20*(3):645-678.

Liu, D., Santhanam, R., Webster, J. (2016) Towards meaningful engagement: A framework for design and research of gamified information systems. *MIS Quarterly*, 41(4):1011-1034.

Lockwood, P., & Kunda, Z. (1997) Superstars and me: Predicting the impact of role models on the self. *Journal of Personality and Social Psychology*, 73(1):91-103.

Ma, X., Khansa, L., & Kim, S. S. (2018). Active community participation and crowdworking turnover: A longitudinal model and empirical test of three mechanisms. *Journal of Management Information Systems*, *35*(4), 1154-1187.

Maduku, D. K. (2016). Fostering m-banking continuance intention: The role of trust in banks, self-efficacy, and mobile network quality. In *10th International Business Conference* (pp. 186-196).

Maramis, C., Mylonopoulou, V., Stibe, A., Isomursu, M., & Chouvarda, I. (2019, July). Developing a Smartphone Application to Support Smoking Behaviour Change through Social Comparison. In *2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (pp. 6922-6925). IEEE.

Marcoulides, G. A., & Saunders, C. (2006) Editor's comments: PLS: a silver bullet?. *MIS quarterly*, 30(2):iii-ix.

Markus, H., & Nurius, P. (1986) Possible selves. *American Psychologist*, 41:954 –969.

Mayo, M.J. (2009) Video games, A route to large scale stem education, *Science*, 323(79): 1-5.

McCormick, M. J., Tanguma, J., & López-Forment, A. S. (2002). Extending self-efficacy theory to leadership: A review and empirical test. *Journal of Leadership Education*, *1*(2):34-49.

McGee, J. E., Peterson, M., Mueller, S. L., & Sequeira, J. M. (2009). Entrepreneurial self-efficacy: refining the measure. *Entrepreneurship Theory and Practice*, *33*(4):965-988.

Monteil, J.-M., & Michinov, N. (2000) Effects of context and performance feedback on social comparison strategies among low-achievement students: Experimental studies. *Cahiers de Psychologie Cognitive*, 19(5-6):513–531.

Moore, D. A. (2007) Not so above average after all: When people believe they are worse than average and its implications for theories of bias in social comparisons. *Organizational Behaviour and Human Decision Processes*, 102:42-58.

Muller, D., & Fayant, M. P. (2010). On being exposed to superior others: Consequences of self-threatening upward social comparisons. *Social & Personality Psychology Compass*, 4:621-634.

Mussweiler T. (2003). Comparison processes in social judgment: mechanisms and consequences. *Psychological Review*, 110(3):472–489.

Mussweiler, T., Rüter, K., & Epstude, K. (2004) The man who wasn't there: Subliminal social comparison standards influence self-evaluation. *Journal of Experimental Social Psychology*, 40:689-696.

Mussweiler, T., & Epstude, K. (2009) Relatively fast! Efficiency advantages of comparative information processing. *Journal of Experimental Psychology: General*, 138:1-21.

Mussweiler, T., & Strack, F. (2000). Comparing is believing: a selective accessibility Model of judgement anchoring. European Review of Social Psychology, 10:135-167.

Myers, T. A., & Crowther, J. H. (2009). Social comparison as a predictor of body dissatisfaction: A meta-analytic review. *Journal of Abnormal Psychology*, 118(4), 683.

Newzoo (2018) Newzoo: Games market expected to hit $180.1 billion in revenues in 2021 https://venturebeat.com/2018/04/30/newzoo-global-games-expected-to-hit-180-1-billion-in-revenues-202/

Pando-Garcia, J., Periañez-Cañadillas, I., & Charterina, J. (2016). Business simulation games with and without supervision: An analysis based on the TAM model. *Journal of Business Research*, *69*(5):1731-1736.

Pavlas, D., Heyne, K., & Bedwell, W., Lazzara, E., & Salas, E. (2010) Game based learning: The impact of flow state and videogame self-efficacy. *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 54(28):2398-2402.

Petkov, P., Köbler, F., Foth, M., Medland, R., & Krcmar, H. (2011). Engaging energy saving through motivation-specific social comparison. In *CHI'11 Extended Abstracts on Human Factors in Computing Systems* (pp. 1945-1950).

Petter, S., & McLean, E. R. (2009). A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. *Information & Management*, *46*(3):159-166.

Qiu, L., & Kumar, S. (2017). Understanding voluntary knowledge provision and content contribution through a social-media-based prediction market: A field experiment. *Information Systems Research*, *28*(3):529-546.

Rahimi, S., Hall, N. C., Wang, H., & Maymon, R. (2017). Upward, Downward, and Horizontal Social Comparisons: Effects on Adjustment, Emotions and Persistence in Teachers. *Interdisciplinary Education and Psychology*, *1*(1), 10.

Raghunathan, R., & Corfman, K. (2006). Is happiness shared doubled and sadness shared halved? Social influence on enjoyment of hedonic experiences. *Journal of Marketing Research, 43*(3):386-394.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012) Editor's Comments: A Critical Look at the Use of PLS-SEM in MIS Quarterly. *MIS Quarterly*, 36(1):3-4.

Ringle C. M., Wende, S., & Becker, J. M. (2015) SmartPLS 3. www.smartpls.com

Rosen, P., & Sherman, P. (2006). Hedonic information systems: acceptance of social networking websites. *AMCIS 2006 Proceedings*, 162.

Rovniak, L. S., Anderson, E. S., Winett, R. A., & Stephens, R. S. (2002). Social-cognitive determinants of physical activity in young adults: A prospective structural equation analysis. *Annals of Behavioral Medicine*, 24: 149-156.

Ryan, R. M., Rigby, C. S., & Przybylski, A. K. (2006) The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion*, 30:347–364.

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, *69*:371-380.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial least squares structural equation modelling. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), *Handbook of market research*. Heidelberg: Springer.

Schmitt, M. T., Silvia, P. J., & Branscombe, N. R. (2000) The intersection of self-evaluation maintenance and social identity theories: Intragroup judgment in interpersonal and intergroup contexts. Personality and Social Psychology Bulletin, 26:1598-1606.

Schunk, D. H. (1986). Verbalization and children's self-regulated learning. *Contemporary Educational Psychology*, 11:347-369.

Schunk, D. H., & Dibenedetto, M. K. (2016). Self-efficacy theory in education. *Handbook of motivation at school, 2*:34-54.

Schwarzer, R. & Renner, B. (2000) Social-cognitive predictors of health behaviour: action self-efficacy and coping self-efficacy. *Health Psychology*, 19:487–495.

Shea, P., & Bidjerano, T. (2010). Learning presence: Towards a theory of self-efficacy, self-regulation, and the development of a community of inquiry in online and blended learning environments. *Computers & Education, 55*(4), 1721-1731.

Shen, J. (2012). Social comparison, social presence, and enjoyment in the acceptance of social shopping websites. *Journal of Electronic Commerce Research, 13*(3), 198-212.

Sherlock, L. M. (2007) When social networking meets online games: The activity system of grouping in World of Warcraft. *In Proceedings of the 2007 ACM International Conference on Design of Communication*, 14–20.

Shin, D. H., & Shin, Y. J. (2011). Why do people play social network games? *Computers in Human Behavior, 27*(2): 852-861.

Shores, K., He, Y., K. Swanenburg, K., Kraut, R., & Riedl, J. (2014). The Identification of Deviance and Its Impact on Retention in a Multiplayer Game. *In Proceedings of the 17th Conference on Computer Supported Cooperative Work & Social Computing*, pages 1356–1365.

Silic, M., & Lowry, P. B. (2020). Using Design-Science Based Gamification to Improve Organizational Security Training and Compliance. *Journal of Management Information Systems*, 37(1):129-161.

Smith, R. H. (2000). Assimilative and contrastive emotional reactions to upward and downward social comparisons. In J. Suls & L. Wheeler (Eds.), *Handbook of social comparison: Theory and research* (pp. 173–200). New York: Kluwer Academic/Plenum Publishers.

Smith, R., Eyre, H., Powell, C., & Kim, S. (2006). Relativistic origins of emotional reactions to events happening to others and to ourselves. *The British Journal of Social Psychology*, 45: 357–371.

Song, J., & Kim, Y. J. (2006). Social influence process in the acceptance of a virtual community service. *Information Systems Frontiers*, *8*(3):241-252.

Stapel D. A., & Koomen W. (2005). Competition, cooperation, and the effects of others on me. *Journal of Personality and Social Psychology*, 88:1029–1038.

Stewart, T. L., Chipperfield, J. G., Ruthig, J. C., & Heckhausen, J. (2013) Downward social comparison and subjective well-being in late life: The moderating role of perceived control. *Aging and Mental Health*, 17(3):375–385.

Stone, M. (1974). Cross validatory choice and assessment of statistical predictions, *Journal of the Royal Statistical Society*, 36(2):111-147.

Su Y., Chiang, W., Lee, C., & Chang, H. (2016) The effect of flow experience on player loyalty in mobile game application, *Computers in Human Behaviour*, 63:240-248.

Suls, J. E., & Wheeler, L. E. (2000) Handbook of social comparison: Theory and research. New York: Kluwer Academic/Plenum.

Suls, J., Martin, R. & Wheeler, L. (2002) Social comparison: why, with whom, and with what effect? *Current Directions in Psychological Science*, 11(5):159-163.

Sweetser, P., & Wyeth, P. (2005). GameFlow: a model for evaluating player enjoyment in games. *Computers in Entertainment (CIE)*, *3*(3): 3-3.

Tamborini R, Bowman ND, Eden A, et al. (2010) Defining media enjoyment as the satisfaction of intrinsic needs. *Journal of Communication.* 60:758-777.

Taylor, S., & Lobel, M. (1989) Social comparison activity under threat: Downward evaluation and upward contacts. *Psychological Review*, 96:569-575.

Tennen, H., Mckee, T. E., & Affleck, G. (2000). Social comparison processes in health and illness. In *Handbook of social comparison* (pp. 443-483). Springer, Boston, MA.

Tseng, F. C., Huang, H. C., & Teng, C. I. (2015). How do online game communities retain gamers? Social presence and social capital perspectives. *Journal of Computer-Mediated Communication*, *20*(6):601-614.

Turel, O., Serenko, A., & Bontis, N. (2010). User acceptance of hedonic digital artifacts: A theory of consumption values perspective. *Information & Management*, *47*(1), 53-59.

Turel, O., Serenko, A., & Giles, P. (2011). Integrating technology addiction and use: An empirical investigation of online auction users. *MIS Quarterly*, 35(4):1043-1061.

Turel, O. (2015). Quitting the use of a habituated hedonic information system: a theoretical model and empirical examination of Facebook users. *European Journal of Information Systems*, *24*(4):431-446.

Valogianni, K., Ketter, W., Collins, J., & Zhdanov, D. (2020). Sustainable Electric Vehicle Charging using Adaptive Pricing. *Production and Operations Management*, *29*(6), 1550-1572.

Van der Heijden, H. (2004) User acceptance of hedonic information systems. *MIS Quarterly*, 28(4): 695–704.

Van der Zee, K., Buunk, B., Sanderman, R., Botke, G., & y van den Bergh, F. (1999) The Big Five and Identification-contrast processes in social comparison in adjustment to cancer treatment. *European Journal of Personality*, 13(4):307-326.

Van der Zee, K. I., Buunk, B. P., Sanderman, R., Botke, G., & Van den Bergh, F. (2000) Social comparison and coping with cancer treatment. *Personality and Individual Differences*, 28:17-34.

Van Yperen, N. W., & Janssen, O. (2002). Feeling fatigued and dissatisfied or feeling fatigued but satisfied? Employees' goal orientations and their responses to high job demands. *Academy of Management Journal*, 45: 1161–1171.

Velez, J. A., Ewoldsen, D. R., Hanus, M. D., Song, H., & Villarreal, J. A. (2018). Social Comparisons and Need Fulfillment: Interpreting Video Game Enjoyment in the Context of Leaderboards. *Communication Research Reports*, *35*(5):424-433.

Venkatesh, V. (2000) Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, 11(4):342-365.

Vorderer, P., Hartmann, T., & Klimmt, C. (2003, May). Explaining the enjoyment of playing video games: the role of competition. In *Proceedings of the second international conference on Entertainment computing* (pp. 1-9). Carnegie Mellon University.

Vrugt, A. & Koenis, S. (2002) Perceived Self-Efficacy, Personal Goal, Social Comparison, and Scientific Productivity. *Applied Psychology*, 51(4):593-607.

Wheeler, L. (1966) Motivation as a determinant of upward comparison. *Journal of Experimental Social Psychology*, Supplement, 1:27-31.

White, J. B., Langer, E. J., Yariv, L., & Welch, J. (2006). Frequent social comparisons and destructive emotions and behaviours: The dark side of social comparisons. *Journal of Adult Development*, 13:36–44.

Wills, T. A. (1981) Downward comparison principles in social psychology. *Psychological Bulletin*, 90:245-271.

Wood, J. V. (1989). Theory and research concerning social comparisons of personal attributes. *Psychological Bulletin*, 106(2):231-248.

Wood, J. V. (1996) What is social comparison and how should we study it? *Personality and Social Psychology Bulletin*, 106:231-248.

Wang, Z. & Scheepers, H. (2012) Understanding the Intrinsic Motivations of User Acceptance of Hedonic Information Systems: Towards a Unified Research Model, *Communications of the Association for Information Systems*: Vol. 30, Article 17.

Wang, D., Xu, L., & Chan, H. C. (2015). Understanding the continuance use of social network sites: a computer self-efficacy perspective. *Behaviour & Information Technology*, *34*(2):204-216.

Wu, C. G., Gerlach, J. H., & Young, C. E. (2007). An empirical analysis of open source software developers' motivations and continuance intentions. *Information & Management*, *44*(3):253-262.

Wu, J., & Liu, D. (2007) The effects of trust and enjoyment on intention to play online games. *Journal of Electronic Commerce Research*, 8(2):128-140.

Wu, J. H., Wang, S. C., & Tsai, H. H. (2010). Falling in love with online games: The use and gratifications perspective. *Computers in Human Behaviour*, 26(6):1862–1871.

Wu, J., & Srite, M. (2014). How envy influences SNS intentions to use. *Twentieth Americas Conference on Information Systems, Savannah*, 2014

Yee, N., (2006) Motivations for play in online games. *Cyber-Psychology & Behaviour*, 9(6):772-75

Xu, H., Dinev, T., Smith, J., & Hart, P. (2011). Information privacy concerns: Linking individual perceptions with institutional privacy assurances. *Journal of the Association for Information Systems*, 12:798-824.

Zell, E., & Alicke, M. D. (2013). Local dominance in health risk perception. *Psychology & health*, *28*(4):469-476.

Zhang, J., Liu, H., Li, Y., Qin, X., & Wang, S. (2018). Video-driven group behaviour simulation based on social comparison theory. *Physica A: Statistical Mechanics and its Applications*, *512*:620-634.

Zhou, Z., Jin, X. L., & Fang, Y. (2014). Moderating role of gender in the relationships between perceived benefits and satisfaction in social virtual world continuance. *Decision Support Systems*, *65*:69-79.

Zhu, D. S., Lin, T. C. T., & Hsu, Y. C. (2012). Using the technology acceptance model to evaluate user attitude and intention of use for online games. *Total Quality Management & Business Excellence*, *23*(7-8):965-980.

Appendix A

Social Comparison strategies scales (source: Van der Zee et al. 2000).

Item	Description
	Following upward comparison:
UI1	...realize that it is possible to improve.
UI2	...am pleased that things can get better.
UI3	...have good hope that my situation will improve.
UC1	...it is threatening to notice that I am doing not so well.
UC2	...feel frustrated about my own situation.
UC3	...feel depressed realizing that I am not so well off
	Following downward comparison:
DI1	…experience fear to decline.
DI2	…fear that my future will be similar.
DI3	…fear that I will go along the same way.
DC1	…I am happy that I am playing so well myself.
DC2	…I feel relieved about my own situation.
DC3	…I realize how well I am playing.

Self-efficacy scale (source: Venkatesh 2000).

Item	Description
SE1	I feel confident playing an online social game even if there is no one around to show me how to play it.
SE2	I feel confident playing an online game even if I have never played it before
SE3	I feel confident playing an online game even if I have only the online instructions as a reference.
SE4	I feel confident playing an online game if I see someone else playing it before I try it myself.

Enjoyment scale (source: Ryan et al. 2006).

Item	Description
PE1	I enjoyed playing the game very much.
PE2	Playing the game is fun to do
PE3	I thought the quest was very boring. (R)
PE4	Playing this game was very enjoyable.

Continuance intention scale (source: Hsiao & Chiou 2012a)

Item	Description
CI1	In the future, I will continue to play Farm Heroes Saga.
CI2	In the future, I will play Farm Heroes Saga often.
CI3	I will say the advantages of Farm Heroes Saga to other people.

Appendix B

PLS Component-Based Analysis: inner variance inflation factors (VIF), Loadings and cross-Loadings

Items	VIF	UI	UC	DI	DC	SE	PE	CI	T1
UI1	2.45	**0,89**	-0,30	-0,39	0.49	0,53	0,67	0.42	0,50
UI2	2.69	**0,91**	-0,30	-0,49	0.60	0,51	0,77	0.49	0,56
UI3	2.30	**0,89**	-0,33	-0,40	0.58	0,56	0,69	0.50	0,51
UC1	2.62	-0,29	**0,90**	0,36	-0.36	-0,49	-0,40	-0.31	-0,35
UC2	2.88	-0,36	**0,93**	0,34	-0.41	-0,53	-0,43	-0.32	-0,38
UC3	1.41	-0,21	**0,72**	0,23	-0.33	-0,33	-0,28	-0.20	-0,35
DI1	2.05	-0,41	0,31	**0,87**	-0,35	-0,34	-0,54	-0.37	-0,40
DI2	2.69	-0,42	0,35	**0,91**	-0,37	-0,40	-0,51	-0.42	-0,46
DI3	2.54	-0,45	0,32	**0,90**	-0,38	-0,36	-0,58	-0.41	-0,44
DC1	2.20	0,55	-0,41	-0,43	**0,90**	0,60	0,66	0.55	0,55
DC2	2.22	0,58	-0,44	-0,38	**0,90**	0,61	0,69	0.53	0,57
DC3	1.37	0,42	-0,18	-0,19	**0,72**	0,42	0,45	0.39	0,45
SE1	2.36	0,57	-0,46	-0,32	0,61	**0,87**	0,62	0.55	0,56
SE2	1.92	0,45	-0,49	-0,32	0,51	**0,82**	0,53	0.50	0,51
SE3	2.22	0,48	-0,43	-0,37	0,56	**0,86**	0,61	0.58	0,59
SE4	2.38	0,53	-0,47	-0,41	0,55	**0,87**	0,63	0.60	0,63
PE1	2.40	0,67	-0,36	-0,53	0,64	0,63	**0,87**	0.62	0,71
PE2	2.57	0,76	-0,38	-0,53	0,65	0,64	**0,88**	0.63	0,73
PE3	2.66	0,70	-0,45	-0,58	0,59	0,58	**0,88**	0.56	0,62
PE4	2.37	0,62	-0,35	-0,50	0,63	0,58	**0,86**	0.66	0,62
CI1	2.72	0,50	-0,36	-0,46	0,59	0,66	0,68	**0.91**	0,72
CI2	2.62	0,54	-0,29	-0,41	0,52	0,59	0,69	**0.91**	0,77
CI3	1.56	0,30	-0,19	-0,27	0,41	0,44	0,46	**0.78**	0,49
T1	1.00	0,58	-0,42	-0,49	0,63	0,67	0,77	0.77	**1,00**

Appendix C

Discriminant results - Heterotrait–Monotrait Ratio (HTMT)

	UI	UC	DI	DC	SE	PE	CI	T1
UI								
UC	0.40							
DI	0.54	0.43						
DC	0.74	0.51	0.48					
SE	0.67	0.63	0.47	0.77				
PE	0.89	0.51	0.69	0.84	0.79			
CI	0.60	0.38	0.51	0.71	0.75	0.81		
T1	0.62	0.47	0.52	0.70	0.71	0.81	0.83	