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Role of Perceived Playfulness/Seriousness in Learning Process Using Business Simulation
Game

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ABSTRACT

Largely due to the advances in technology and the familiarity that the younger generation has
with digital games, business simulation games have become a more significant part of business
education and training. Addressing the dearth of academic investigation in the game-based
learning process, this study sheds light on the area by providing a model that examines the role
of the perceived seriousness and playfulness associated with the participants' behaviors. From
the analysis of empirical data using MBA students, this study reveals how perceived playfulness
and perceived seriousness affects the game-based learning process. Based on the analysis of
the results, discussions and implications are presented.

KEYWORDS: Business simulation games, Seriousness, Playfulness, Game-based
                   learning process, Motivation, PLS-SEM

INTRODUCTION

Along with rapid advances in IT (Information Technology) development and application,
video/digital games have flourished over the past twenty years. While many games are played
for entertainment, some games are used for more serious purposes. One type of game that is
used for business education and training is referred to as "business simulation games." This
study is about the use of business simulation games in the context of business education and
training.

We live in the so called "digital age" (Negroponte 1995). From Moore's Law (Moore 1998) we
observe how IT advances enable new games to provide an amazing experience to gamers.
Meanwhile, so called, "digital generations," who are raised up with IT, highly value the
interconnectivity and the decentralization (Kline et al. 2003) that technology allows. Future
business education and training needs to be realigned in accordance with the characteristics of
new generations. They are not the same as the previous generations. They are exceptionally
pragmatic and very visually oriented. They also learn by doing and accept digital as the norm
(Hunter 2013). For many of them, the traditional ways of learning are not very effective.
Meanwhile, games could be a very effective method of learning because games are familiar,
interactive, and engaging. Unfortunately, however, there has been not much attention paid to
academic research on games, especially in business education and training settings, so far. We

believe this is the right time to address the importance of using games in business education and training from an academic point of view.

"Serious games" have been gaining attention in recent years due to their unique ability to combine entertainment and education (Brandão et al. 2012). Games are known to lead more active engagement of students in the learning process (Mayer et al. 2014; Azadegan et al. 2012; Klabbers 2009; Ben-Zvi 2010; Lainema 2003; Charles et al. 2011). Michael and Chen (2006) suggested serious games can be used for military, educators (primary, secondary, and higher), corporations, non-government organizations (NGOs), artists, and/or basically anyone needs to teach something, pass on a skill, or preach a message. The market for serious games which has grown in recent years dramatically is estimated to range from $2 to $10 billion depending on what areas of serious games (e.g., simulations, and virtual worlds) are included (Reuters, August 23. 2012). Adkins (2013) reported that the projected annual growth rate of revenue of game-based learning and simulation-based learning segment from 2012 to 2017 is 18%. This trend is expected to continue as the newest generation of learners prefer to have multiple streams of information, inductive reasoning, frequent and fast interactions with content, as well as highly-visual literacy skills (Van Eck 2006). They also have characteristics such as exceptional pragmatism, visually oriented, learning by doing, and accepting digital forms of communication and interacting with the world as the norm (Hunter 2013). We observe that serious games will become more and more important for these demanding learners.

Games are also becoming an important part of business education and training. Today's business environment is very complex and dynamic so the traditional linear types of learning methods (e.g., lecture, reading materials) are not enough to make students ready for business practice. Meanwhile, business simulation games can provide students with the opportunity to experience with complex situations that require them to understand multiple business concepts simultaneously. For example, business strategy games require the players to consider various business functions, such as marketing, finance, supply chain at the same time hence the players can be trained for making a better decision based on the diverse perspectives. As Keys (1989) pointed that there are three factors necessary for effective management learning – dissemination of content, opportunities for experience, and feedback, – business simulation games fulfill these three requirements as content is self-discovered, experience is rich, and feedback from simulated reality is more helpful than reality (Lane 1995). Faria and Wellington (2004) identified various advantages of business simulation games to students and teachers. Those perceived advantages include:

- Experiential learning
- Integration of different functional areas
- Theory application
- Demonstration of consequences of decisions
- Teamwork and Involvement
- Interactive/dynamic exercises
- Realistic
- Expose to business competition
- Fun, Interest and motivation

Although business simulation games are an effective way to learn business concepts, there were few academic investigations of the area, especially with regards to the learning process using simulation games in business courses. Among the many elements in the learning process using simulation games, learners' perception would play a significant role. As Miles et al. (1986) suggested, learners' perception toward education using games are important to look into, but there is still a dearth of academic research on this topic. While playfulness in a business simulation game can engage the players more in the game play, which makes the players absorbed and repeatedly play the game, seriousness can call more attention of the players so they would grasp more understanding of the lessons designed in the business simulation game. Although there were a few recent attempts to understand the learning process of individuals using business simulation games (Tao et al., 2009; Lin & Tu, 2012), the results are quite inconsistent and need more clarification.

To address this problem, this study investigates specifically how perceived playfulness and seriousness play roles in the game-based learning process, and how these elements affect participants' game behaviors, namely, game performance and game effort. To achieve this goal, a research model is proposed based on theories related to the constructs of playfulness and seriousness, game process, and learning motivation. Then the proposed research model is tested by empirical data from a survey of MBA students who used a business simulation game as a part of their Operations Management course. By analyzing the results, this study sheds some light on the learning process using simulation games, and provides some insights for business educators as well as business simulation games developers. The remainder of the paper is composed of the theoretical backgrounds related to the study topic, followed by the research model that is tested with empirical data. Then the results from the data analysis, discussions, limitations, and conclusions follow.

THEORETICAL BACKGROUND

In order to build an appropriate research model, it is necessary to address theories relevant to the study such as Game Process Theory, and Self-determination Theory (SDT), and theories related to playfulness and seriousness. Each will be briefly reviewed as follows.

Game Process Theory

Garris et al. (2002) proposed as input-process-outcome game model. They pointed out that learners' motivation is the most significant factor in modeling a game process. By stimulating learner's motivation, instructional games would develop learners self-directed and self-motivated, which ultimately leads them to achieve the desired outcomes. Their model is summarized by mainly three important points. First, the objective of instructional game studies is to design a game incorporating a certain characteristics or features. Second, the process of learning by gaming is described as a game cycle. Specifically the game features initiate a game cycle, in which a user judges the game features. Then based on the user's perception, one takes actions in the game system, which is followed by feedback on the system. After engaging the game through several game cycles, a user would achieve the expected learning outcome. An illustration of this model is presented in Figure 1.

In contrast to the traditional single-trial learning model, Garris et al.'s (2002) provides a model that incorporates multiple trials triggered by game characteristics, which is more common when a game is used as a learning method. In their view, game play involves repeated judgment-behavior-feedback loops, through which game play itself could increase user perceptions toward the game. The incorporation of the game cycle is the hallmark of the model, reflecting the defining characteristic of computer game play. This is consistent with learning theories of Dewey (1938) and Kolb et al. (2000), which emphasize experiential learning approaches.

The closed-loop process in game-based learning is also proposed by other researchers. Simons (1993) stressed that the educational value of simulation comes from repeated trials. He claimed that simulation users try different strategies over time, through which they gradually build understanding of the system. The essence of learning through games is the process in which players formulate and try various hypotheses, then observe the result until they find the hidden relationships among the elements. Through the process, they can experientially learn the subject topics.

Figure 1: Input-Process-Outcome Game Model (Garris et al. 2002)
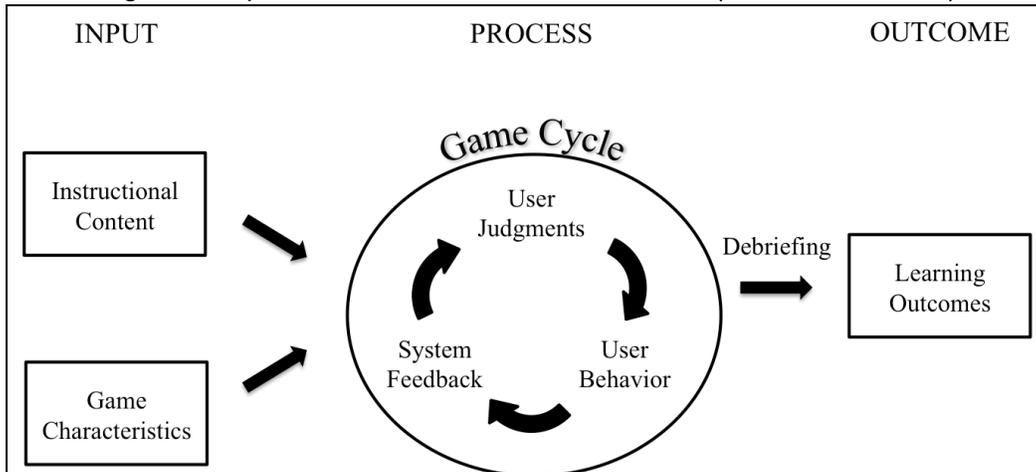
Another instructional game model to be noted is the course performance model suggested by Landers and Callen (2011). They emphasized the properties of instructional games considered for the potential in learning. Accordingly, they proposed a model incorporating indirect determinants that are mediated by direct determinants to affect course performance. The basis of this model was first proposed by Campbell (1990), who tried to explain the determinants of job performance. For example, in his model, conscientiousness (indirect determinant) is mediated by motivation (direct determinant) to influence job performance (outcome). In addition, Kraiger (2003) emphasized two definitive direct determinants of course performance, including learner trainability and motivation. Figure 2 illustrates a model proposed by Landers and Callen (2011) that incorporates indirect determinants mediated by direct determinants to yield learning outcomes in the context of game-based learning.

Figure 2: Course Performance Model (Landers & Callen 2011)
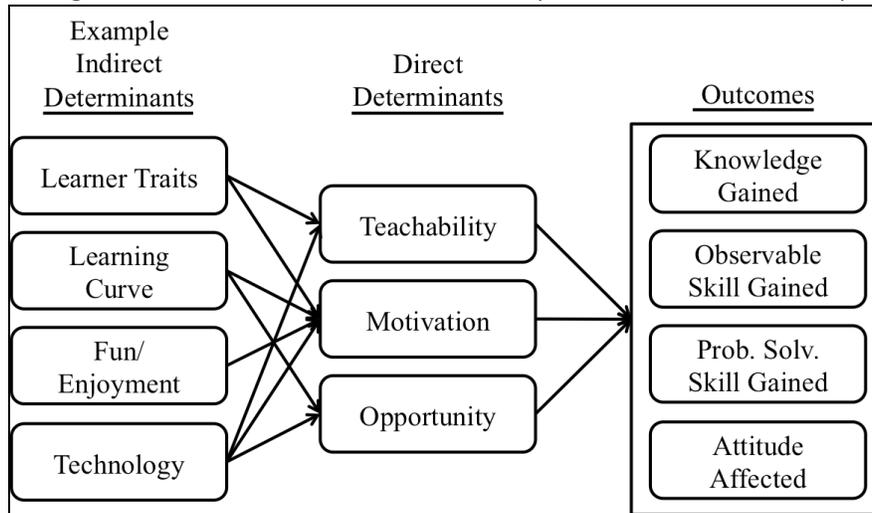
It should be addressed in the model that the indirect determinants are not connected to all the direct determinants. For example, the fun/enjoyment element affects only motivation in the model. This implies that the fun/enjoyment element of the instructional game only stimulates the learner's willingness to play the game, but does not affect the effectiveness of learning subjects. A fun element in a game would encourage a learner to engage with the game longer and, consequently, enhance motivation. Then enhanced motivation would lead to a better understanding of the materials in terms of various aspects of learning outcomes, as the instructional game is aimed for.

Self-determination Theory

Motivation is a significant element in the process of learning. Accordingly, motivation is considered an important part of educational theories. Studies have shown that motivation is positively correlated to academic achievement (Lepper et al. 2005; Harter & Connell 1984; Henderlong & Lepper 1997; Barron & Harackiewicz 2001; Harackiewicz et al. 2002; Schunk et al. 2008). One of the biggest challenges that instructors might encounter is that learners feel learning is boring and unpleasant (Malone & Lepper 1987). Motivating students so they feel excited and engaged to learn is the most effective way to achieve positive learning outcomes.

Deci, Vallerand, and Ryan (1991) highlighted, "the central features of optimal learning are conceptual understanding and the flexible use of knowledge…Correspondingly, the central features of optimal adjustment are feeling good about oneself and acting volitionally to satisfy one's own needs while being attuned to and concerned about the social surrounding (p. 326)." Self-determination theory (SDT; Deci & Ryan 1985; 1991; Ryan 1995; Ryan & Deci 2000) suggests that learning behavior could be motivated by various factors around learners' environments. Accordingly, many research concerned about the factors that promote people's motivation, especially in educational context.

The traditional view claimed that motivation is a unitary phenomenon. However, people may have different degrees of motivation as well as different types of motivation (Ryan & Deci 2000).
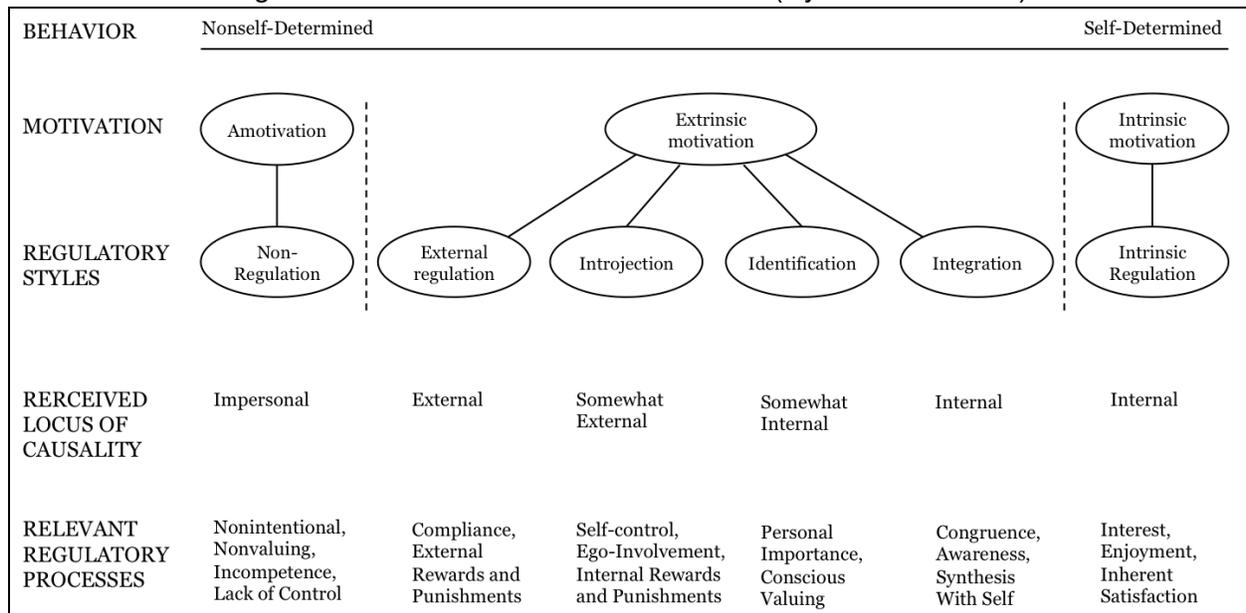
Studies of SDT have suggested that there are largely two types of motivation, namely, intrinsic and extrinsic motivation (Deci & Ryan 1985). It is generally accepted that intrinsic motivation is associated with doing something because of inherent interest or enjoyment, whereas extrinsic motivation is associated with doing something by expecting a separable reward (Ryan & Deci 2000).

Ryan and Deci (2000) defined intrinsic motivation as "the doing of an activity for its inherent satisfactions rather than for some separable consequences (p. 56)." An intrinsically motivated person does an activity pursuing fun and/or enjoyment that is innate in the activity. Discovered first by White (1959), the intrinsic motivation phenomenon has been studied to explain human behaviors. Unlike Skinner's (1953) operant theory, which claims all behaviors are motivated by rewards, perspectives from Hull's (1943) learning theory, which asserts all behaviors are motivated by physiological drives, support researchers' effort to find the human's psychological needs satisfied by intrinsically motivated behaviors (Ryan & Deci 2000).

With assumption that intrinsic motivation exists, previous research has shown the conditions that elicit, sustain, and enhance intrinsic motivation as well as those that subdue or diminish it (Ryan & Deci 2000). Cognitive Evaluation Theory (CET), which is a sub-theory of SDT, presented by Deci and Ryan (1985) identifies the factors in social contexts producing variability in intrinsic motivation. In CET, social contexts (e.g. interpersonal events and structures) yielding feeling of competence can increase intrinsic motivation (Ryan & Deci 2000). Thus, conditions such as proper challenge and effective feedback can facilitate intrinsic motivation. Furthermore, CET specifies that a sense of autonomy (also termed as internal perceived locus of causality) accompanied with feeling of competence is important to enhance intrinsic motivation (Ryan & Deci 2000). Simply put, people would have high intrinsic motivation when they feel satisfaction of the need both for competence and autonomy.

On the other hand, extrinsic motivation is defined as "a construct that pertains whenever an activity is done in order to attain some separable outcome (Ryan & Deci 2000, p. 60)." It focuses on the external values expected by doing an activity, in contrast to intrinsic motivation that focuses on the internal values from doing activity itself. SDT suggests that, unlike intrinsic motivation, extrinsic motivation varies based on the degrees of autonomy (Ryan & Deci 2000). For example, a student would study a subject expecting different types of rewards. It could be teacher's praise, or good grades, or even getting a better job in the future. These different rewards are associated with a different degree of autonomy. In SDT, it is termed as the internalization and integration of values and behavioral regulations (Deci & Ryan 1985). Internalization refers to the process of taking in a value or regulation, whereas integration refers to the process of transforming the regulation into their own sense. Based on the degree of internalization and integration, external motivation can be divided into several different forms (Deci & Ryan 1985). As illustrated in Figure 3, the types of motivation are on a continuum of the extent to which the motivation for one's behavior emanates from the sense of self (Ryan & Deci 2000).

Figure 3: Continuum of human motivation (Ryan & Deci 2000)

BEHAVIOR	Nonself-Determined					Self-Determined
MOTIVATION	Amotivation		Extrinsic motivation			Intrinsic motivation
REGULATORY STYLES	Non-Regulation	External regulation	Introjection	Identification	Integration	Intrinsic Regulation
RERCEIVED LOCUS OF CAUSALITY	Impersonal	External	Somewhat External	Somewhat Internal	Internal	Internal
RELEVANT REGULATORY PROCESSES	Nonintentional, Nonvaluing, Incompetence, Lack of Control	Compliance, External Rewards and Punishments	Self-control, Ego-Involvement, Internal Rewards and Punishments	Personal Importance, Conscious Valuing	Congruence, Awareness, Synthesis With Self	Interest, Enjoyment, Inherent Satisfaction

Playfulness and Seriousness

Many business educators use simulation games in their courses because they believe simulation games provide two benefits: student's engagement and learning effectiveness. Business simulation games refer to games that enable students to simulate the real business practices for the purpose of learning business topics by game playing (Tao et al. 2015). Game-based learning contains two simultaneously existing elements, which are playing and learning. By mixing them together, game-based learning uses entertainment, a part of the natural learning process in human development (Bisson & Luckner 1996), to motivate students. Hence, it is not only reasonable but also essential to consider the two elements when we try to understand the game-based learning process.

Seriousness

The concept of seriousness has been considered necessary but often neglected in education (Wilson 1998). If a student doesn't feel serious about school, s/he would lose interest in school and stop paying attention to school activities. Meanwhile, if a student feels serious about school, s/he realizes the importance of school activities, thus puts more efforts into them. With serious attitude, one concentrates, pays attention, and accepts a learner's posture, hence learn (Wilson 1998). It is actually claimed that the students' serious attitudes towards tests could affect their performance (Park 2004; Biggs 1996).

Seriousness is closely related to human's tendency to stick to ideology, or faith to live by (Wilson 1998). When in the serious state of mind, one is said to be "… earnest, committed, wholehearted, sincere, not superficial or pretending (Wilson 1998, p.145)." Seriousness is also closely related to a clear discipline of reason in one's mind to keep monitoring her/his everyday behaviors. Therefore, seriousness promotes one's awareness of situations s/he encounters and efforts to seek the most effective solutions. Ruch (1993) tried to conceptualize the seriousness

first in his work on humor. He found that seriousness should be considered as a factor to describe the human mind. Ruch et al. (1996) suggested that there are six facets of the concept of seriousness as Table 1.

Table 1: Elements of seriousness	
ELEMENT	DESCRIPTION
Prevalence	"Prevalence of serious states"
Earnest	"A perception of even everyday happenings as important and considering them thoroughly and intensively (rather than treating them superficially)"
Readiness	"The tendency to plan ahead and set long-range goals (and attaining the closest possible harmony with these goals in every action and decision)"
Rationale	"The tendency to prefer activities for which concrete, rational reasons can be produced (thereby considering activities which don't have a specific goal as a waste of time and nonsense)
Sober	"The preference for a sober, object-oriented communication style (for example, saying exactly what one means without exaggeration or ironic/sarcastic undertones)"
Humorless	"Humorless attitude about cheerfulness-related behavior, roles, persons, stimuli, situations, and actions"

There are basically two perspectives of the concept of seriousness. The first view is to consider seriousness as a trait (Ruch et al. 1997). In this view, those who have a high-level trait-seriousness tend to perceive things important and consider thoroughly and intensively. The trait-seriousness is related to one's set of mind to accept her surroundings to the extent of significance. Thus, trait seriousness is represented by one's habitual feelings/actions towards events happening every day.

On the other hand, there are perspectives seeing the seriousness as a state (Ruch et al. 1997). The state generally indicates "affective or cognitive episodes that are experienced in the short run and fluctuate over time (Webster & Martocchio 1992, p. 203)." In this view, seriousness is described as a person's readiness to behave seriously at a moment. Someone who has a high-level state-seriousness is characterized by being "attentive, immersed in deep thought, involved in something perceived as really important, applies a sober or objective perspective or style, is earnest in purpose, and mentally set for levity or amusement (Ruch et al. 1997, p. 478)." This state-seriousness is more closely related to the perceived seriousness towards an event or object. In this sense, this study follows the definition of seriousness as a user's perception to the extent that she thinks about the game in serious aspects.

Playfulness

Play is generally accepted as an inseparable element from games. Indeed, play and games almost always come together, as we refer to game participation as play (Makedon 1984). However, they don't have to be always together. Makedon (1984) suggested that playing and gaming are a necessary but not sufficient condition for each other. Actually we see that some games have a high level of playfulness, whereas others are less playful. It is also possible that

some people find high playfulness from a game, while others feel less playful from the same game. Riezler (1941) described a playful attitude as when a player plays within the game itself, regardless of pursuing her/his own goal or a goal set by the rule of the game. Makedon (1984) pointed three important elements of playful game as voluntariness, spontaneity, and intrinsic worthiness.

Although Scholosberg (1947) stated, "the category of playful activity is so loose that it is almost useless for modern psychology (p.215)," several attempts have been made to identify and/or characterize the attributes of playfulness. Dewey (1913) defined playfulness as "the capacity to draw satisfaction from the immediate intellectual development of a topic, irrespective of any ulterior motive (p. 727)." Lieberman (1977) claimed that playfulness could be viewed as a unitary concept. However, she also suggested that there could be multiple dimensions in the concept of playfulness. It is generally accepted that playfulness is a multifaceted construction encompassing factors such as cognitive spontaneity, social spontaneity, physical spontaneity, manifest joy, and sense of humor (Webster & Martocchio 1992; Barnett, 1991; Lieberman, 1977). This study follows this perspective for a relevant theoretical framework. In Table 2, the elements of playfulness are described.

Table 2: Elements of playfulness		
PLAYFULNESS DIMENSIONS (Lieberman 1977)		ELEMENTS OF PLAYFULNESS DIMENSIONS (Barnett 1990)
Sense of Humor		Joking, teasing, funny, laughs, clowning
Manifest Joy		Expressing enjoyment, demonstrating exuberance, showing enthusiasm, freely expressing emotion, singing/talking
Spontaneity	Physical spontaneity	Coordination b/w movements and activities, physical activeness, active-preferred, frequent runs
	Social spontaneity	Easy response to other's approach, initiating activities, cooperation, leadership role
	Cognitive spontaneity	Inventing own games, using unconventional objects, different character roles, changing activities

Like seriousness, playfulness can also be viewed from two perspectives, as a trait and a state. In the view of trait-playfulness, playfulness is conceived as relatively stable characteristic of an individual (Lieberman 1977; Moon & Kim 2001). Lieberman (1977) earlier mentioned that playfulness might be accepted not only as part of behavior but also as a personality trait of the individual. Thus, this view emphasizes more on the individual characteristics of personality pursuing enjoyment (Glynn & Webster 1992).

Another view is to see the playfulness as a state of mind. In this view, playfulness is a subjective characteristic of an experience (Ellis 1973), which could be varied based on the context. It is generally accepted that computer-related playfulness as a state has three dimensions: concentration, curiosity, and enjoyment (Moon & Kim 2001). Concentration refers to the process that one's attention is focused on the interactions so she loses self-consciousness, becomes absorbed intensively in the activity (Moon & Kim 2001). Likewise, curiosity is a part of playfulness. When a person's sensory or cognitive curiosity aroused by an activity, she would keep doing an activity (Malone 1981). It is known that people tend to pay more attention to more

complex or incongruous things (Berlyne & Lawrence 1964). When children choose their playing object, they are more likely to select toys with novelty and complexity (Ellis & Scholtz 1978). This can be also applied to people's preference of information technology devices. When companies introduce devices with new technology, more attentions and interests are given. The last element of playfulness is enjoyment. People prefer activities that are interesting and fun to one that is boring and uninteresting.

Several studies have previously explored the playfulness in the context of IT usage. Webster and Martocchio's (1992) work is one of the first attempts investigating the playfulness in the context of microcomputer interaction. They depicted that microcomputer playfulness is a situation-specific individual characteristic, which is defined as "an individual's tendency to interact spontaneously, inventively, and imaginatively with microcomputers (p. 202)." Their approach to the playfulness was trait-based. On the other hand, Webster et al. (1993) examined flow in human-computer interaction in which they borrowed many aspects of flow (Csikszentmihalyi 1990), a state-based approach. Yager et al. (1997) examined the several aspect of microcomputer playfulness and found that playfulness is a stable trait. This study adopts Moon and Kim's (2001) definition of perceived playfulness in the context of human-computer interaction as a simulation game user's perception to the extent that s/he thinks about the game in three dimensions, namely, concentration, curiosity, and enjoyment.

In sum, intrinsic/extrinsic motivation and seriousness/playfulness would play a significant role when a person learns something by using serious games. In the next section, a specific research model of this study will be presented based on the theoretical background mentioned above.

RESEARCH MODEL

Based upon the theoretical framework in the previous section, here we suggest a research model that focuses on the relationship among the elements that are relevant to game-based learning.

To begin, seriousness is defined as the extent of readiness to which a person perceives, acts, or communicates seriously regarding an activity (Ruch et al. 1997). In a high state of seriousness a person is very attentive, earnest in purpose, perceives things important, and applies an objective perspective. As mentioned in the previous section, serious mindset of a student would be connected to better learning. With serious attitude, a learner would concentrate, pay attention, and be willing to accept teacher's instruction, which consequently helps her/him learn (Wilson 1998). Indeed, several previous studies have revealed the positive relationship between seriousness and individual performance in the context of learning, professional environments (Park 2004; Biggs 1996; Day & Silverman 1989).

Meanwhile, the relationship between seriousness and task effort and performance would be mediated by extrinsic motivation. As suggested in Landers and Callen's (2001) model, motivation mediates indirect determinant's effects on learning outcomes. Seriousness, one of the potential elements to influence the learning outcome, may increase an individual's motivation, especially extrinsic side, which would ultimately increase the effort and performance. For example, a student who is serious about a school activity (e.g. homework) would pay

attention to the benefits s/he could gain by doing the activity, which consequently would evoke her/his extrinsic motivation to keep doing it hard. Hence, seriousness may mediate its relationship with learning effort through extrinsic motivation.

It is generally accepted that high-motivated individuals yield better performance (Ryan 1995; Vallerand 1997). Although the degree of influence of extrinsic motivation on performance is known relatively less than intrinsic motivation (Harlow et al. 1950; Amabile 1979; Deci 1975; Harackiewicz et al 1984; Lepper et al. 1973), especially in regards to the learning process (Deci et al. 1999; Deci & Ryan 1991), several studies shows that extrinsic motivation still plays significant role in learning (Van Etten et al. 1998; Lin et al. 2003). In addition, extrinsic motivation consists of a spectrum of various degrees of internalization. Among them, more internalized motivations, such as integrated regulation, could be closely related to individual's behavior for doing a task well (e.g. high score in game). Hence, extrinsically motivated students may perform well in the simulation game.

On this basis, it is hypothesized as follows:

> H1: Perceived seriousness has a positive effect on extrinsic motivation in the learning process using business simulation games.

> H2a: Extrinsic motivation has a positive effect on game effort in the learning process using business simulation games.

> H2b: Extrinsic motivation has a positive effect on game performance in the learning process using business simulation games.

Playfulness is defined as a game player's perception that the game would fulfill her/his intrinsic motives, which include concentration, enjoyment, and curiosity. This definition conforms to Moon and Kim's (2001) the definition of perceived playfulness towards World-Wide-Web usage. Also it is connected to the stream of studies that focus on the intrinsic interest, voluntariness, spontaneity of playfulness (Riezler, 1941; Makedon 1984). Playfulness is one of the direct drivers for intrinsic motivation. Given that intrinsic motivation requires an individual's satisfaction of psychological innate needs (Ryan & Deci 2000), playfulness could be a trigger for one's intrinsic motivation toward an activity. For example, young children show characteristics of intrinsic motivation such as activeness, inquisitiveness, curiosity, and playfulness, even without extrinsic rewards (Harter 1978). Without the fun element, a game would hardly attract people to be engaged intrinsically. Reversely, a playful game would easily motivate players to play repeatedly. Hence, playfulness is closely related to intrinsic motivation in a game-based learning process.

While previous literature claimed a significant connection between intrinsic motivation and performance (Tauer & Harackiewicz 2004), the relationship would be mediated by time or efforts spent on the activity (Deci & Ryan 1985; Harackiewicz & Sansone 1991; White 1959). When people are intrinsically motivated, they tend to put great effort on the task, by which they develop better skills and achieve a more favorable performance rating. Thus, in the game-based learning process, intrinsic motivation is related to the efforts that a learner puts in the game, and then the cumulative efforts would be related to the game performance.

On this basis, it is hypothesized as follows:

> H3: Perceived playfulness has a positive effect on intrinsic motivation in the learning process using business simulation games.

> H4a: Intrinsic motivation has a positive effect on player's effort in the learning process using business simulation games.

> H4b: Player's cumulative effort has a positive effect on player's game performance in the learning process using business simulation games.

It should be noted regarding the relationship between game effort and performance that not everyone who plays multiple runs of the game records a high score. For example, a student may really enjoy a simulation game in a course and play it many times, but s/he might not achieve a high performance rating compared to other students who plays relatively less. One possible explanation of this would be the role of seriousness in the game-based learning process. As mentioned above, seriousness could increase students' attention to learning, which consequently makes her/him prudent to the course materials including the simulation game. Hence, with high seriousness, a student would play game with much carefulness and thoughtfulness when s/he takes an action in the game. Consequently, s/he would reach a desirable score faster than those who are less serious.

On this basis, it is hypothesized as follows:

> H5: Perceived seriousness moderates the effect of game effort on game performance in the game-based learning process.

An overall research model of this study is summarized in Figure 4.

Figure 4. Proposed Research Model
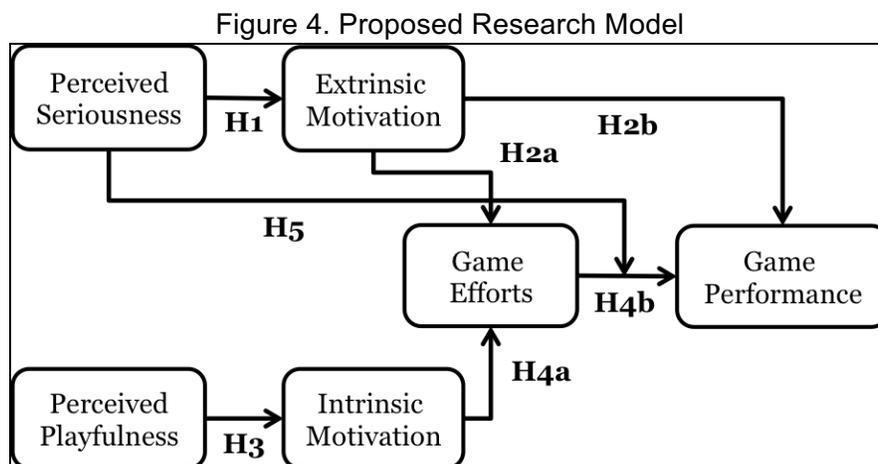
Research Methods

Samples

For quantitative analysis of the proposed model, surveys measuring the constructs in the research model were distributed to 120 MBA students at a Southern public university. The survey respondents enrolled an Operations Management course in three different programs, namely, Full-time, Professional, or Online MBA programs. Regardless of the program formats, in the Operations Management course, students are assigned to play a simulation game related to the project management topic. Before playing the game, students attend an in-class presentation providing game backgrounds, instructions, and game playing tips. Then students can play the game individually and repeatedly as many times as they want by the due date announced (typically in two weeks from the date the simulation game is introduced) outside the class hours. After the due date, students were asked to take the survey on a voluntary basis. For students who participated the survey, a small amount of bonus credits was awarded toward their grades (e.g. depending on the course format, usually worth 0.1 – 0.5% of total course grade). More details about the sample and simulation game are described in Table 3 and Table 4.

Table 3. Classes and Survey Participants				
PERIOD	PROGRAM	FORMAT	NUMBER OF STUDENTS ENROLLED	NUMBER OF SURVEY PARTICIPANTS
Spring 2014	Full-time MBA	Traditional face-to-face day classes	48	44
Summer 2014	Online MBA	100% online, no face-to-face meetings	16	15
Fall 2014	Professional MBA	Evening classes (part-time students)	40	35
Spring 2015	Online MBA	100% online, no face-to-face meeting	16	16
Total			120	110

Data Analysis

In the survey, students were asked to answer the questions regarding the perceptions towards the simulation game they played. Among 120 students who were enrolled in this course, 110 responded to the survey. Among them 1 survey was excluded due to the incompleteness, which resulted in a total of 109 survey data observations available. In addition, data for the students' game behaviors, such as game effort and performance, were collected. Game effort was measured by the number of repeated runs played by the students in the simulation game. Then it was converted to a standardized score within each class to control for the effect of the difference among the class settings. Similarly, game performance is measured by the best overall score each student achieved from all of their simulation game results, which was also converted to a standardized score within each class.

Table 4. Game description	
TITLE	NEW PRODUCT RELEASE PROJECT GAME
Topic Area	Project Management
Learning Objectives	Understand how the project management levers (scope, resources, and schedule) improve project outcomes and interact each other project characteristics affect team morale and work quality
Game play	Make weekly decisions as a product development manager to complete a new project development project successfully 3 different scenarios (easy – hard)
Game score	Given at the end of each game play based on four performance dimensions (project scope, schedule, budget, and human resource), Maximum score is 1000
Decisions	Decisions are made individually
Competition	Students can see other students' results
Repeatability	Students can play repeatedly as they want

To analyze the data obtained from the survey, PLS-SEM (Partial Least Squares - Structural Equation Modeling) was used. Being used widely in IS research, PLS-SEM analyzes direct, indirect, and interaction relationship of structural models consisted of constructs measured by multiple items (Venkatesh 2000; Hair et al. 2014). According to Goodhue et al. (2012), 49% of the path analysis studies published in ISR, JMIS, and MISQ from 2006 to 2010 used PLS analysis. The technique has advantages in developing theories especially in exploratory research due to its robustness against measurement and/or sample size (Hair et al. 2010; Gefen et al. 2011; Hair et al. 2014). Given that this study is among the first exploratory attempts to reveal the role of seriousness and playfulness in the simulation game in business education, PLS-SEM is determined to be an appropriate analysis technique. For the statistical analysis purpose, the SmartPLS version 3.2 software was used (Ringle et al. 2015).

In addition, to ensure the validity of the measurement, several steps of the measurement model of the latent constructs, which include examination of factor loadings/weights, reliability of constructs, and discriminant validity were performed. Details of this measurement model are presented in Appendix A.

Analysis Results

The model below depicts the result of the analysis of the proposed game-based learning process model, exploring how seriousness and playfulness works in the learning process through business simulation games. As shown in Figure 5, all the proposed paths except two paths (from extrinsic motivation to game effort and game performance are statistically significant.

DISCUSSIONS

The results of the analysis suggest that the perceived seriousness and playfulness play significant roles in game-based learning processes, especially with business simulation games. Specifically, the two constructs ultimately affect the learners' behaviors in the game, namely,

effort and performance. However, the way the two factors affect the game behaviors of learners are different.

Figure 5. PLS-SEM Model Result
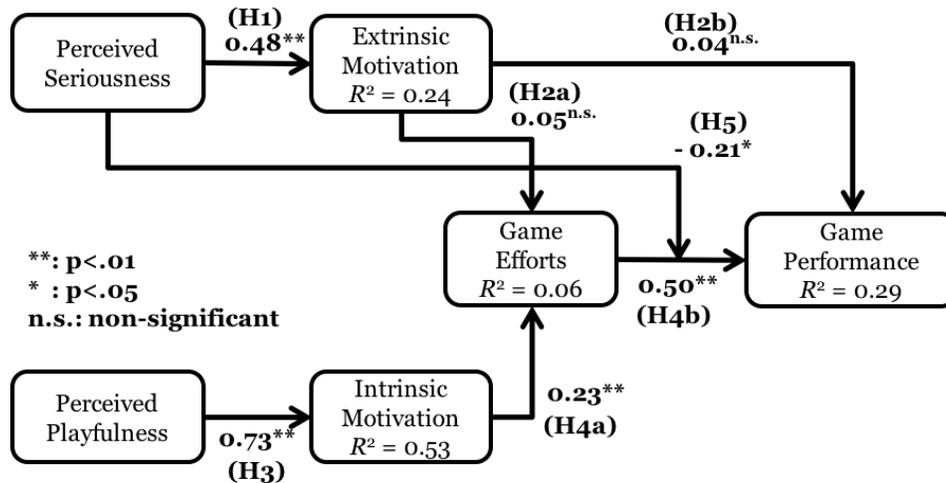
To begin, the effect of the learner's perceived playfulness toward the business simulation game on the game performance is mediated successively by the learner's intrinsic motivation and the game efforts. Hence, H3, H4a, and H4b are supported. This is consistent with the previous literature in motivational theory. Basically individual enjoyment in an activity leads one's intrinsic motivation to repeat the activity multiple times, which eventually increases skill levels and performance (Ryan & Deci 2000). This study is one of the first attempts to apply this relationship to the context of the learning process using business simulation games, thus contributing to the area of game playing for business education and training. By better understanding the relationships among playfulness, motivation, effort, and performance, game designers who develop business simulation games could be more affective in developing instructional games that improve players learning experience. In addition, instructors who intend to use business simulation games effectively in their curriculum can focus on emphasizing the playful element of the game for their students to enhance learning experience.

Meanwhile, the results of the analysis regarding the perceived seriousness raises a couple of cautions in interpretation. First, it is shown that extrinsic motivation directly affects neither the game efforts nor the game performance although the perceived seriousness directly affect extrinsic motivation. This fails to support the hypotheses regarding the effects of extrinsic motivation on the game efforts and the game performance (H2a and H2b), while it supports the hypotheses regarding the effect of the perceived seriousness on extrinsic motivation. This could be explained in an alternative way. Given that extrinsic motivation is more closely related to individual's awareness to the external rewards consequently following an activity, it is important to consider the ultimate goal for learners to pursue by playing the business simulation games. For example, in the Operations Management courses where this study collected data, the MBA students' goal is to learn about the topics related to Operations Management to increase their management skills, and ultimately, to work successfully at the job they desire. The simulation

game play is merely one of the many activities in the process that they need to do to achieve the goal. Hence, those who feels high seriousness toward the business simulation game is more likely to have high seriousness toward their course works and future career. Then, they might focus less on the game itself but more on the learning outcomes they could get out of the game. In this sense, they would try to conduct the most cost-effective strategy in their learning process. Learners who have high-seriousness would not spend too much time on playing the game. Instead, they give only a small number of attempts enough to find a relationship underneath and focus more on learning the essential knowledge out of the business simulation game.

It is actually supported by the results of the analysis where the perceived seriousness moderates the relationship between the game efforts and the game performance, which supports H5 in the proposed research model. Shown in Figure 6, there is a disordinal interaction effect with different levels of the seriousness toward the relationship between the game efforts and the game performance. It suggests that a student who perceives high seriousness on the business simulation game would perform well in the game with relatively small efforts. To the contrary, a student who has low seriousness needs to put more effort (i.e. play the game many times) to improve their performance significantly in the game.

Figure 6. Interaction effect of perceived seriousness on game effort – performance
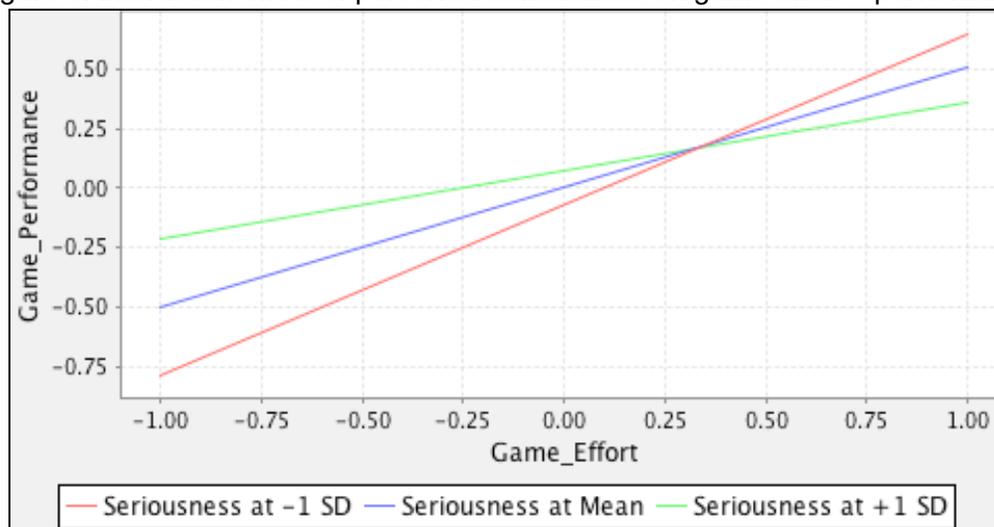
This finding gives a significant implication to the area of business simulation game. Although many previous studies claimed that playfulness is positively related to the performance (Webster & Martocchio 1992; Potosky 2002), few have considered seriousness in the game-based learning process. Moreover, very few could give us a clear explanation why some students learn faster than the others through business simulation games. Many focus on the game-based learning process in which learners experience "trial-and-error" to achieve a certain goal (Higgins 2000; Wideman et al. 2007). However, it is also essential to lead the students to get the goal at a minimum cost (e.g., less playing time). This study reveals that the perceived seriousness could be a key to solve the issue. As Snow et al. (2002) suggested, different styles of introducing simulation games could make difference in students' attitude and performance. By emphasizing and facilitating the seriousness in the game-based learning process, instructors

would maximize the efficiency of using simulation games in their course. Likewise, game designers would also apply the principle that emphasizing seriousness in the simulation game would increase the players' learning experience while there still should be playfulness to engage players in the game play. Hence, it is necessary to balance the degree of the seriousness and the playfulness in designing business simulation games to maximize the learning through the games.

LIMITATIONS

This study has limitations with regards to some aspects that should be noted here. First, this study relies on data from a particular business simulation game. Although the game has many common elements with the other business simulation games, and the data were obtained from multiple courses in different formats, the generalizability of the findings could be limited due to the homogeneity of the game used and the topic which the game is about. In addition, as mentioned above, instructional style could affect the students' attitude and performance in game-using learning (Whiteley & Faria 1989; Snow et al. 2002). This study does not capture the difference in instructional styles because all the courses were instructed by the same instructor. Future study might consider including different games and instructional settings to overcome the limitation.

Second, as it is discussed briefly in the previous section, the ultimate goal of using business simulation game in the course is not to make the student get a high score in the game, but to enhance the students' understanding of the course topics and management skills. Although there is close relationship between students' behavior in the simulation game and the learning outcomes (Whiteley & Faria 1989), it is still unclear how the connection works with all things included. By using game performance as the dependent variable, this study fails to investigate the whole process of learning using business simulation game.

Lastly, there might be factors that could influence the perceived seriousness and playfulness of business simulation game. In the future study, it would be worthwhile to include the antecedents of the perceived seriousness and playfulness to understand the whole process of learning through business simulation games.

CONCLUSIONS

With increasing interests and attentions, the area of business simulation game has become a significant part of business education and training. However, there is still a lack of understanding of game-based learning process, especially with regards to the role of perceived seriousness and playfulness. This study sheds light on the area by providing a model of game-based learning process incorporating the perceived seriousness and and playfulness of the players and by analyzing empirical data from the survey of students who enrolled to Operations Management courses in MBA program. From the result of PLS-SEM analysis, it turns out that the perceived playfulness plays a role of antecedent of intrinsic motivation, which affects game efforts and game performance successively. On the other hand, the perceived seriousness affects player's extrinsic motivation as well as moderates the relationship between game efforts and game performance. From this result, it is revealed that the perceived seriousness is important for students to learn more effectively through business simulation game.

The findings of the study give helpful insights to developers who design business simulation games as well as instructors who use business simulation games as a part of their teaching materials. Specifically, developers and instructors can balance the seriousness or playfulness of the game and enhance the effectiveness of the business simulation games depending on the situation and setting. By doing so, they can use different strategies; one might emphasize more on playfulness so students enjoy the game for a substantial amount of time and put more efforts to enhance the learning experience. On the other hand, they can focus more on seriousness so that students might have more attention to the learning itself and complete the tasks in the game in a relatively short time still with good learning outcomes. In either way, providing a balanced approach would be necessary to maximize the effectiveness of game-based learning.

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APPENDICES

Appendix A

Table A1. Construct Definitions and Measurement Items		
CONSTRUCT NAME	DEFINITION	MEASUREMENT ITEMS [ITEM CODE]
Seriousness	Participant's readiness to perceive, act, or communicate seriously. In a high seriousness state, the individual is attentive, involved in something perceived as really important, applies a sober or objective perspective or style, is earnest in purpose, and not mentally set for levity or amusement (Ruch et al., 1997)	- I am prepared to play the simulation game in earnest. [SR1] - Playing the simulation game is a important thing on my mind. [SR2] (Dropped) - When playing the simulation game, I have a serious mental attitude. [SR3] - When playing the simulation game, I regard my situation objectively and soberly. [SR4] - When playing the simulation game, I am a serious frame of mind. [SR5] - When playing the simulation game, I am in a thoughtful mood. [SR6] (Dropped) - When playing the simulation game, I am not prepared for silliness or nonsense. [SR7] (Dropped) (Revised from Ruch et al., 1994; Ruch et al., 1997)
Playfulness	Participant's perception that the simulation game will fulfill the participant's intrinsic motives, including factors such as concentration, enjoyment, curiosity (Moon & Kim, 2001); Play a game within the game itself (Riezler, 1941); Voluntariness, spontaneity, intrinsic worthiness (Makedon, 1984)	- When playing the simulation game, I do not realize the time elapsed. [PL1] - When playing the simulation game, I am not aware of any noise. [PL2] (Dropped) - When playing the simulation game, I often forget the work I must do. [PL3] (Dropped) - Playing the simulation game gives enjoyment to me. [PL4] - Playing the simulation game gives fun to me. [PL5] (Dropped) - Playing the simulation game keeps me happy. [PL6] (Dropped) - Playing the simulation game stimulates my curiosity. [PL7] - Playing the simulation game leads to my exploration. [PL8] - Playing the simulation game arouses my imagination. [PL9] (Dropped) (Revised from Moon & Kim, 2001)
Extrinsic Motivation	Playing the simulation game to attain the outcome from outside of the simulation game, e.g. grades, higher rank among classmates	- Identified - I think that playing the simulation game will help me better prepare for my job. [EM_ID1] - Playing the simul ation game eventually will enable me to get the better job that I like. [EM_ID2]

	(Ryan & Deci, 2000); Participants' belief that s/he is stimulated to do well in the simulation game seeking for rewards (Guthrie & Wigfield 2000)	o Playing the simulation game will help me make a better choice regarding my job. [EM_ID3] o I believe that playing the simulation game will improve my competence as a worker. [EM_ID4] • Introjected o I play the simulation game to prove to myself that I am capable of completing this course successfully. [EM_IJ1] o I play the simulation game because of the fact that when I succeed in this course I feel important. [EM_IJ2] o I play the simulation game to show myself that I am an intelligent person. [EM_IJ3] (Dropped) o I play the simulation game because I want to show myself that I can succeed in this course. [EM_IJ4] (Dropped) • External regulation o Without playing the simulation game I would not find a better job later on. [EM_RG1] (Dropped) o I play the simulation game in order to obtain a more prestigious job later on. [EM_RG2] o I play the simulation game because I want to have "the good life" later on. [EM_RG3] o I play the simulation game in order to have a better salary later on. [EM_RG4] (Revised from Vallerand et al, 1989)
Intrinsic Motivation	Playing the simulation game for the inherent satisfaction of the simulation game playing itself (Ryan & Deci, 2000); Participants' willingness to participate in the simulation game itself regardless of rewards (Shernoff et al. 2003; Reeve et al. 2004)	• Challenge o I like playing the simulation game because it's a challenge. [IM_CH1] (Dropped) o I like to learn as much as I can from the simulation game. [IM_CH2] o I like to go on to new simulation game that is at a more difficult level. [IM_CH3] o I like complex simulation games because I enjoy trying to figure them out. [IM_CH4] o I like difficult simulation games because I find it more interesting. [IM_CH5] • Curiosity o I ask questions about the simulation game because I want to learn new things. [IM_CU1] o I do extra effort in simulation game because I can learn about things that interest me. [IM_CU2] o I play the simulation game because I am interested in the subject. [IM_CU3] (Dropped)

		o I play the simulation game really hard because I really like to learn new things. [IM_CU4] • Independent mastery o I like to try to figure out how to do well in the simulation game on my own. [IM_MA1] o When I don't understand something in the simulation game right away, I like to try to figure it out by myself. [IM_MA2] o When I make a mistake in the simulation game, I like to figure out the right answer by myself. [IM_MA3] o If I get stuck in the simulation game, I keep trying to figure out the problem on my own. [IM_MA4] o I like to play the simulation game without help. [IM_MA5] (Revised from Lepper et al., 2005)
Game Efforts	Participants' behavior to make efforts to the game	• Standardized score based on the number of runs a participants played repeatedly in the simulation game [Game_Effort]
Game Performance	Set of psychological adaptations to the constraints of the simulation game (Ericsson & Lehmann, 1996); Performance that is yielded from more understanding, skills and abilities in simulation game (Salas et al., 2009)	• Standardized score of game result (Best result if multiple runs is applicable) [Game_Performance] (Sheldon et al., 2002; Salas et al., 2009)

Appendix B

First, a confirmatory factor analysis (CFA) was conducted to ensure the constructs used in the research model are tapped correctly by the items. After reviewing the CFA, some items were removed. Then, to examine the adequacy of the measures, loadings and weights of individual items were viewed as following Table A2. Most of the items' loadings are over 0.7, which is desirable, and all are over .5, which is acceptable (Chin 1998).

Table A2. Factor Loadings and Weights			
CONSTRUCT	VARIABLE	LOADINGS	WEIGHTS
Seriousness	SR1	0.705	0.260
	SR3	0.885	0.336
	SR4	0.787	0.266
	SR5	0.878	0.353
Playfulness	PL1	0.533	0.167
	PL4	0.886	0.352
	PL7	0.893	0.338
	PL8	0.894	0.332
Extrinsic Motivation	EM_ID1	0.839	0.224
	EM_ID2	0.808	0.176
	EM_ID3	0.850	0.197
	EM_ID4	0.868	0.254
	EM_IJ1	0.570	0.150
	EM_IJ2	0.651	0.162
	EM_RG2	0.620	0.021
	EM_RG3	0.605	0.070
	EM_RG4	0.595	0.060
Intrinsic Motivation	IM_CH2	0.767	0.111
	IM_CH3	0.786	0.128
	IM_CH4	0.786	0.120
	IM_CH5	0.735	0.112
	IM_CU1	0.509	0.071
	IM_CU2	0.684	0.103
	IM_CU4	0.760	0.130
	IM_MA1	0.828	0.124
	IM_MA2	0.834	0.122
	IM_MA3	0.823	0.103
	IM_MA4	0.613	0.066
	IM_MA5	0.754	0.135

Then, composite reliabilities and Cronbachs Alpha were examined to ensure the construct validity. As shown in Table A3, all the variables exceeded the value of 0.80 for composite reliability and 0.70 for Cronbachs Alpha, which indicates the measurements are all reliable.

Table A2. Composite Reliability and Cronbachs Alpha			
CONSTRUCT	NUMBER OF ITEMS	COMPOSITE RELIABILITY	CRONBACHS ALPHA
Seriousness	4	0.889	0.831
Playfulness	4	0.885	0.824
Extrinsic Motivation	9	0.905	0.895
Intrinsic Motivation	12	0.937	0.925
Game Efforts	1	1.000	1.000
Game Efforts	1	1.000	1.000

Lastly, to examine discriminant validity among the constructs, the average variance extracted (AVE) for each construct is reviewed. As shown in the first column of Table A4, all AVEs are above 0.5, which is recommended (Fornell & Larcker 1981). Also, the square root of the AVEs (in bold on the diagonal) are greater than the correlations between the constructs, which ensures the variables are measuring discriminant constructs.

Table A4. Discriminant Validity							
CONSTRUCT	AVE	SERIOUS-NESS	PLAYFUL-NESS	EXTRINSIC MOTIVATION	INTRINSIC MOTIVATION	Game Efforts	Game Perfor-mance
Seriousness	**0.668**	**0.817**					
Playfulness	**0.666**	0.659	**0.816**				
Extrinsic Motivation	**0.520**	0.484	0.648	**0.721**			
Intrinsic Motivation	**0.556**	0.674	0.729	0.582	**0.746**		
Game Efforts	**1.000**	0.144	0.279	0.169	0.233	**1.000**	
Game Performance	**1.000**	0.178	0.177	0.167	0.225	0.485	**1.000**