The International Journal of Management Education 19 (2021) 100517

Contents lists available at ScienceDirect

The International Journal of Management Education

journal homepage: www.elsevier.com/locate/ijme

Serious games in management education: An acceptance analysis

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ARTICLE INFO

Keywords:
Gamification
Serious games
Innovation
Knowledge
Training and development

ABSTRACT

Training is a key resource for fostering knowledge as a competitive asset. As in other fields, in learning, innovation emerges with disruptive methods such as gamification. Serious games are a proven efficient training method based on the incorporation of traditional elements of games, such as entertainment, into learning. But as with any other innovation, people must be willing to use the new method. The use of even a proven serious game will not have any positive effect if students do not accept it. It is thus essential to analyze the intention to use serious games in management training contexts. This research uses an adapted CAN (Cognitive-Affective-Normative) model to explore the intention to use a serious game – Lego© Serious Play© – in a sample of higher-education students in their capacity as future professionals. The results show that the most critical factor influencing the intention to use serious games is expected learning performance. The proposed model opens a new methodology for studying the behavioral intention to use other innovative management-training methods and to enrich the deployment of serious game training strategies in management education.

1. Introduction

Today management education needs to go beyond traditional teaching models (Sierra, 2020). Among the new emerging methods, the use of gamification is on the rise (e.g., Papert, 1990; Said, Roos & Statler, 2001; Kampker, Deutskens, Deutschmann, Maue, & Haunreiter, 2014; Al-Azawi, Al-Faliti, & Al-Blushi, 2016; Dichev & y Dicheva, 2017). Its growing importance is reflected in gamification market forecasts. One recent study estimates that the gamification market will be worth 11.94 billion dollars by 2021 (Business Wire, 2017). Gamification has a positive effect on learning at all ages, providing important benefits, such as facilitating knowledge and skills acquisition (Sierra, 2020), the development of higher cognitive abilities (Bernabeu & Goldstein, 2009) or increased motivational and engagement levels in students (Buil, Catalán, & Martínez, 2019; Lazzaro, 2004; McGonigal, 2011; Yee, 2006). In one survey, 89% of U.S. workers said gamification had probably improved their productivity at work (TalentLMS, 2019), testimony to the positive perception of these innovative learning methods.

Unlike other types of games, whose primary purpose is pure entertainment, the main goal of serious games is learning (Abt, 1970). Specifically, serious games are intended for training and skills development and/or for educational purposes or to effect attitudinal and

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https://doi.org/10.1016/j.ijme.2021.100517
Received 24 January 2021; Received in revised form 21 April 2021; Accepted 20 May 2021
Available online 29 May 2021

behavioral change (Ge & Ifenthaler, 2017). Serious games are one of the gamification learning methods with the highest performance expectancy (De Gloria, Bellotti & Berta, 2014; Tsekleves, 2014), and they can potentially be used across a wide range of educational and training contexts (Boyle et al., 2016) and a variety of industries, such as cosmetics, technology or defense (Allal-Chérif & Bidan, 2017). They have been proven to facilitate and energize the learning process, as their use can increase the level of interest in learning and enhance both creativity and emotional intelligence. Learning by gaming fosters an active, experiential form of learning that allows students to achieve superior performance compared to other passive, non-innovative methodologies (Corriveau, 2020). Gamification also promotes social skills, facilitating interaction and empowering students to play an active role in their own learning process (Deterding, Sicart, Nacke, O'Hara & Dixon, 2011). In addition to these benefits, serious games have a proven ability to facilitate the development of skills, abilities and attitudes (Kapp, 2012) due to their focus on problem-solving, to which players are exposed.

Among the growing alternatives in the serious games arena, Lego© Serious Play© (LSP) is carving out a remarkable position for itself in the field of management training, an achievement reflected in the scientific literature (Roos, Victor & Statler, 2004; Shih, Shih, Li, Chen, Chen & Chen, 2011; Wengel, McIntosh & Cockburn-Wootten, 2016; Zenk, Hynek, Schreder, Zenk, Pausits & Steiner, 2018). Research findings have proven that the use of such methodologies in professional learning is effective. Several studies have further demonstrated the LPS methodology's efficiency from the student's point of view, finding that it notably improves both students' motivation during training (e.g., Kurkovsky, 2015, pp. 213–218; Labrador & Villegas, 2014) and their attention and empathy due to the nature of playing itself (Steghöfer, Burden, Alahyari & Haneberg, 2017). The present research will focus on the specific case of LSP because of this demonstrated added value.

As with any other innovative management learning strategy, it is necessary to study potential users' acceptance of serious games. In the management education arena, analyzing students' acceptance of innovative learning methods is essential. Methods such as storytelling (Suki, 2017), Enterprise Resource Planning (ERP) software training (Chauhan & Jaiswal, 2016), desktop web-conferencing (Lakhal & Khechine, 2016) or mobile information systems in higher education (Koç, Hamit, Turan & Okursoy, 2016) have proven value in management education. Analyzing the acceptance of serious games is likewise considered key to their success. As several studies have pointed out (Paasivaara, Heikkilä, Lassenius & Toivola, 2014; Steghöfer et al., 2017), innovative learning methodologies must be accepted by users to succeed. Students' attitudes toward the use of serious games are a fundamental factor that should be considered in their implementation, and the intention to use them (among other variables) is highly influenced by affective-emotional variables (Kurkovsky, 2015, pp. 213–218; Labrador & Villegas, 2014). Few studies have looked at the intention to use serious games, and none has included affective-emotional factors to explain the intention to use this innovative learning method. Given the growing importance of serious games such as LSP and the knowledge gap concerning the intention to use them in learning, the present research aims to explain the factors influencing the intention to use this emerging training method. Based on an adapted Cognitive-Affective-Normative (CAN) model (Pelegrín-Borondo, Reinares-Lara & Olarte-Pascual, 2017; Pelegrín-Borondo, Reinares-Lara, Olarte-Pascual & Garcia-Sierra, 2016) that incorporates innovativeness, this paper analyzes students' intention to use serious games.

The results enable a deeper understanding of the factors influencing the intention to use serious games as a training method. Such acceptability is fundamental to enable the effective implementation of serious games in management education. The research outcome will establish the key factors to be considered before launching a serious game to ensure that the training method will be accepted by the students who will follow the program. The proposed model will also be useful for future research on the acceptance of emerging novel technological or non-technological management education methods.

The paper is structured as follows. It begins with the theoretical framework, including an overview of serious games and the specific case of Lego© Serious Play©, the focus of this research. It continues with a review of the literature that supports the hypotheses of the proposed model and the methodology used. This literature review is followed by separate sections on the results, the discussion and conclusions, and the theoretical and practical implications. Finally, limitations and suggestions for future research are addressed in the last section.

2. Conceptual background and hypothesis development

2.1. Serious games: the case of Lego© Serious Play© (LSP)

Deterding, Sicart, Nacke, O'Hara, and y Dixon (2011) define gamification as the use of game design elements in activities that do not meet the definition of play. Similarly, Raftopoulos (2014) asserts that gamification addresses the use of strategic design elements and game mechanics in environments that are not in themselves games.

Serious games are one possible form of gamification. They seek to incorporate traditional elements of games, such as entertainment, into the learning methodology by including elements of play in the learning process (Kapp, 2012). The use of serious games has gradually been integrated into the learning process for many disciplines, including human resource management, marketing, education, health, science and research, and driver's education, among others (McGonigal, 2011; Sawyer & Smith, 2008; Shi, Cristea, Hadzidedic & Dervishalidovic, 2014; Verzosa, Greaves, Ellison, Ellison & Davis, 2018). Based on these findings, the use of serious games is spreading in the training market as an innovative method. Their use as a learning method in adult learning contexts is supported for several reasons. One of the most important is that serious games have been proven to facilitate the development of skills and abilities and knowledge acquisition (Wouters, Van der Spek & Van Oostendorp, 2009), as well as to effect the changes in behavior and attitudes that many training programs aspire to achieve (Wouters et al., 2013). Hunicke, Leblanc and Zubek (2004) recommend the use of serious games due to their ability to activate the user's cognitive process, triggering higher levels of commitment and motivation in students.

As noted, many serious games are being integrated into training programs in a variety of sectors. The present study will focus on one that is widely used in the field of business training: Lego© Serious Play©. This serious game, based on the use of Lego© blocks, is structured in different stages to enable practical learning about a skill, problem or opportunity or to promote a behavioral or attitudinal change requiring organizational learning. People attending the session create a scenario with figures and other constructions intended to reflect their personal view of the specific objective on which the training program is focused (skill acquisition, behavioral change, etc.). From this starting point, several stages are carried out to allow participants to share their individual perceptions of the targeted situation and reach a consensus regarding the diagnosis and the learning and actions required to achieve the training program's goals. This method fosters collaboration, creativity, teamwork and conflict management skills in a very practical way. It requires a certified LSP trainer to ensure success. It is a perfect example of serious games, in which students discover and learn to improve both their personal and organizational development. Since its launch in 1999 at the Massachusetts Institute of Technology (MIT) as an innovative learning product of the Media Lab (Kristiansen & Rasmussen, 2014), the method has continued to grow worldwide because of its proven efficacy. Oliver and Roos (2004) highlight the positive role this learning method plays in the construction and development of both organizational identity and the individual role that each person plays in it. This outcome is obtained during the scenario-building stage, in which both dimensions are represented via block figures and other constructions, along with their existing and desired relationships. The organization as a whole and the trainees' interdependent individual roles are thus covered in the created scenario. Said, Roos and Statler (2001) show that block constructions of situations representing concepts facilitate learning by combining conscious and unconscious learning processes, thereby reinforcing training results.

LSP is based on solid theoretical frameworks. Constructivism (Piaget, 1978) demonstrates that the construction of 3D models to represent ideas is strongly linked to the cognitive process, facilitating learning by incorporating each person's unique life experience into learning outcomes (Papert & Harel, 1991). Other studies underline the positive effect that Lego© has in terms of hand-brain connection (Deacon, 1997; Wilson & Gavaldá, 2002). Using our hands to build a scenario in LSP facilitates the learning process (Khan, & Pearce, 2015; Penfield, 1950, 1975; Piaget, 1978, 1980). The concept of flow, developed by Csikszentmihalyi (1990), also supports the efficacy of LSP. Flow occurs when an adequate combination of skills and challenges exists, creating an optimal situation for learning by entertainment. The LSP method creates ideal conditions to achieve flow in learning (Csikszentmihalyi, 1990). Storytelling is another pilar of LSP. Huizinga (1938) demonstrated the role that stories play in the construction of reality in *Homo Ludens*. More recently, Brown (2009) and Goleman and Senge (2016) have highlighted the power of storytelling as a tool for gaining awareness of a situation. Additional support for the LSP learning method can be found in Complex Adaptive Systems (CAS), a derivation of the science of complexity developed by Nobel laureate Gell-Mann (1995), and the use of different types of imagination (descriptive, creative and challenging or disruptive) based on Vygotsky (1978), Piaget (1980), De Bono (1967) and Zittoun and Cerchia (2013).

In light of this proven efficacy and theoretical support for serious games in general and LSP in particular, the variables affecting students' intention to use this innovative methodology must be studied in order to guarantee its success. In the following sections, a model is proposed and tested to identify the most important variables to be considered for any serious game use at an organization.

3. Proposed serious game acceptance model

The acceptance of innovative products and services in management education has been studied (e.g., Suki, 2017; Chauhan & Jaiswal, 2016; Lakhal & Khechine 2016; Koç, Hamit, Turan & Okursoy, 2016). The Cognitive-Affective-Normative (CAN) model proposed by Pelegrín-Borondo et al. (2016; 2017) is ideally suited to the goal of the present research, namely, to determine the key factors influencing employees' intention to use innovative serious games as part of a management training program. The CAN model has been proven to be a valid instrument for analyzing the behavioral intention to use a wide range of emerging products and services, including cryptocurrencies (Arias-Oliva, Pelegrín-Borondo, & Matías-Clavero, 2019), cyborg technologies (Reinares-Lara, Olarte-Pascual & Pelegrín-Borondo, 2018), new wines (Olarte, Pelegrín & Reinares, 2017; García-Milon, Martínez-Ruiz, Olarte-Pascual, & Pelegrín-Borondo, 2019) and purchasing information services for tourism (García-Milon, Juaneda-Ayensa, Olarte-Pascual, & Pelegrín-Borondo, 2020). The main value that the CAN model offers compared to alternative innovation acceptance models is its inclusion of the affective component. Other models, such as the Technology Acceptance Model (TAM) (Davis, 1985; Davis, Bagozzi, & Warshaw, 1989) and its extension TAM2 (Venkatesh & Davis, 2000) or the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2003) and its extension UTAUT2 (Venkatesh, Thong & Xu, 2012), also include affective variables. These models, in turn, are based on the Theory of Reasoned Action (TRA) (Fishbein & M y Ajzen, 1975) and the Theory of Planned Behavior (TPB) (Ajzen, 1991), which include cognitive and normative variables. Affective variables have been shown to influence the understanding of learning processes (Campbell, 2007; Laverie, Kleine & Kleine, 2002; Van Osselaer et al., 2005; Zielke, 2011). A strong affective-emotional component has been observed in gamification processes (Kurkovsky, 2015, pp. 213–218; Labrador & Villegas, 2014). The following sections present the model's variables, based on the specific characteristics of gamification and serious games.

3.1. Performance expectancy and effort expectancy

According to Venkatesh et al. (2003), performance expectancy is defined as the degree to which an individual believes that using a specific technology will be helpful in improving his or her performance. Effort expectancy is defined as the degree to which an individual considers a specific innovative technological product or service easy to use. Numerous studies have demonstrated the positive effect of both performance expectancy and effort expectancy on the intention to use an innovative technological product or service (e.g., Pelegrín et al., 2016; Baptista & y Oliveira, 2017). In the field of education, both performance expectancy and effort expectancy

have been demonstrated to positively influence acceptance of the use of innovative learning technologies in many contexts, including ERP software training (Chauhan & Jaiswal, 2016), WebCT (Ngai, Poon & Chan, 2007), smartphones (Liu, Li & Carlsson, 2010) and gamification (Martí-Parreño, Méndez-Ibáñez & Alonso-Arroyo, 2016). Previous studies on the serious game LSP found that students trust the use of gamification methodologies, perceiving them as useful for their learning objectives (Paasivaara et al., 2014; Steghöfer et al., 2017). Based on these arguments and previous empirical evidence, the following hypotheses are proposed:

Hypothesis 1. (H1): Performance expectancy (PE) regarding the use of serious games positively influences the intention to use (IU) them.

Hypothesis 2. (H2): Effort expectancy (EE) regarding the use of serious games positively influences the intention to use (IU) them.

3.2. Emotions

According to the Componential Theory of Emotions, emotions are defined by several components including the need for a stimulus to generate them, the possibility of establishing the cause of this stimulus, the generation of specific physiological reactions, the existence of evaluative thought (as opposed to visceral reactions), sensations of pleasure or displeasure, qualitative uniqueness, a tendency towards specific actions, and the short duration of the process (Pelegrín-Borondo et al., 2016; Russell, 2003; Scherer, 2005). Some emotions incite action, while others inhibit it or make it disappear (Oliver, Rust & Varki, 1997; O'Neill & Lambert, 2001; Turner, Love & Howell, 2008; White & Yu, 2005). Several studies that incorporate the influence of emotions in decisions treat aspects that generate positive emotions differently from those that generate negative ones (Pelegrín-Borondo, Arias-Oliva, Olarte-Pascual, 2017).

Focusing on the role of emotions in gamification, several investigations have highlighted the existence of a strong affective-emotional component. Emotions can influence a participant's degree of engagement with a game in both directions, i.e., the desire to participate in or to reject a serious game (Kurkovsky, 2015, pp. 213–218; Labrador & Villegas, 2014).

The act of playing unlocks in the player a set of emotions, childhood memories, rules and social acceptance (Goleman & Senge, 2016); it can even generate levels of anxiety (Lazzaro, 2004) or trigger depression and emotional disorders such as addictions that compel the player to keep playing (Chou, 2015; Giessen, 2015). But the most common reaction to gaming is a positive one, because it generates fun, a component that increases motivation. As a result, students are usually positively predisposed to actively playing a serious game to address new challenges or learning objectives (Lazzaro, 2004).

Previous research has shown that the use of games in the classroom to facilitate learning triggers positive emotions in students (Simões, Díaz Redondo & Fernández Vilas, 2013). Likewise, several studies have shown that the use of Lego© (Steghöfer et al., 2017; Zenk et al., 2018), Lego© Mindstorms (Müller, Reise & Seliger, 2014) and Lego© Scrum (Paasivaara et al., 2014) for learning generates positive emotions in students. Zenk et al. (2018) demonstrate that the use of Lego© as a serious game learning method can generate both positive and negative emotions. Although the improvement in communication, collaborative learning and interaction is usually perceived as positive, in some students it arouses negative emotions related to shyness. Moreau and Engeset (2015) find a relationship between creativity and emotions. Low levels of emotional response are associated with low levels of creativity. Serious games such as LSP can increase emotional welfare, thereby improving creativity in the learning process. Based on these findings, the following hypotheses are proposed:

Hypothesis 3. (H3): Positive emotions (PEM) regarding the use of serious games positively influence the intention to use (IU) them.

Hypothesis 4. (H4): Emotional states of anxiety (A) regarding the use of serious games negatively influence the intention to use (IU) them.

Hypothesis 5. (H5): Negative emotions (NEM) regarding the use of serious games negatively influences the intention to use (IU) them.

3.3. Social influence

Social influence is defined as the degree to which an individual believes that using a new product or service is important for other people (Venkatesh et al., 2003). Social influence represents the social pressure that compels a specific behavior (Ajzen, 1991). Drawing on Venkatesh et al. (2012), the proposed model uses an adapted version of social influence, defining it as the degree to which an individual perceives that his or her peers (CEO, other company executives, colleagues, subordinates, management gurus, etc.) accept the use of serious games such as LSP as a learning method.

Based on the TRA, the TAM2 model demonstrated the influence of social aspects on the intention to use new products and services. Social norms are highly influential in the acceptance of very innovative products and services (Jin, 2014; García-Milon et al., 2019). In gamification services, social influence has been proven to play a role in online games (Harborth & Pape, 2017), educational contexts (Alshare, El-Masri, & Lane, 2015) and online banking (Baptista & y Oliveira, 2017). All serious games generate specific psychological-social effects in the players (Sailer, Hense, Mayr & Mandl, 2017), such that social norms influence both gaming behavior and the intention to use the game for learning.

The effect of social norms specifically on the intention to use LSP has been demonstrated in the context of learning healthy habits (DeSmet et al., 2014) and learning improvement (Hanus & Fox, 2014; Mekler, Brühlmann, Tuch & Opwis, 2017). Mekler et al. (2017) show that learning motivation and learning performance are higher when a social component is incorporated (e.g., sharing and socialization of game information such as points won, levels achieved by each player or rankings). In contrast, Hanus and Fox (2014) find

performance levels are lower in groups of students using LSP than in groups using traditional methods. This could be because the strong social component of serious games is a potential source of distraction. Regardless, the influence of social aspects, whether positive or negative, has been demonstrated. Based on these findings, the following hypothesis is formulated:

Hypothesis 6. (H6): Social influence (SI) regarding the use of serious games positively influences the intention to use (IU) them.

3.4. Personal innovativeness

Personal innovation or innovativeness is defined as the degree to which an individual prefers to adopt innovations earlier than others (Midgley & Dowling, 1978). The modified CAN model incorporates this variable based on existing studies in the field of education. The more positive a person's attitude is toward the use of new products and services in general, the more likely his or her behavioral intention to use serious games will be.

The degree of personal innovativeness is a determining factor in decision-making regarding the use of a new product or service (e.g., Citrin, Sprott, Silverman, & Stem, 2000; Goldsmith & Hofacker, 1991). In educational contexts, Liu et al. (2010) prove that personal innovativeness indirectly influences students' perception of the intention to use m-learning services, making it a key factor in acceptance of innovative learning methodologies. Based on this evidence, the following hypothesis is proposed:

Hypothesis 7. (H7): Personal innovativeness (PI) regarding the use of serious games positively influences the intention to use (IU) them.

Fig. 1 shows the proposed model to explain the intention to use LSP.

4. Method

4.1. Sample, survey development and data collection strategy

As noted, many training offers in a variety of fields include serious games. Asking about serious games in general could result in a lack of understanding among survey respondents of what a serious game really is. Consequently, to test the hypothesis of the proposed model, this research focuses on LSP, a specific serious game with a proven impact on skills acquisition and behavioral change. The sample consists of undergraduate and master's degree students from different disciplines at eight Spanish universities with a view to including future professionals from a wide range of industries and activities. Several lecturers assisted with the data collection during their lectures. Students were shown a video offering basic information about how LSP is used before being asked to complete an online survey via Google Forms, which they mainly did using their smartphones. Before being shown the 2-min video, the students were provided with a brief overview of the context for using serious games, which were described as methods for achieving learning outcomes in relation to soft skills such as enhanced creativity, leadership, conflict management, etc. The video showed students working with LSP to provide the respondents with a general idea of how the specific method works.

The questionnaire also included the following introductory information:

"Lego© Serious Play© is a skill-learning methodology that uses collaborative games involving Lego© pieces. Through games that are explained and guided by the teacher, students are able to learn by playing as an alternative to learning by other more conventional methods. The collaborative play involved in Lego© games makes it possible to learn, develop and improve skills such as teamwork, leadership, communication and creativity."

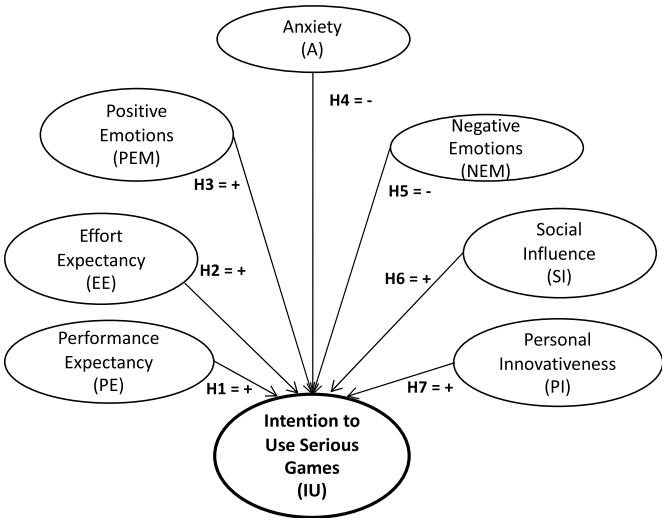

Fig. 1. Proposed model for studying serious game acceptance.

The data were collected from April 5, 2019, to May 5, 2019.

A total of 339 valid surveys were obtained. Undergraduate students accounted for 85.5% of the sample; the remaining 14.5% were master's students. The breakdown by discipline was as follows: business administration and finance (32%); education (30%); marketing, audiovisual communication and advertising (22%); law and labor relations (6%); and journalism (10%). The average age of the study participants was 21.93 years old. With regard to gender, 69.6% of the respondents were women and 30.4% men.

The scales used in the questionnaire were adapted from reliable scales that have been tested in the literature (Table 1). The Intention to Use scale was based on the scales used by Venkatesh and Davis (2000) in their well-known TAM model. The Performance Expectancy and Effort Expectancy scales were based on the scales developed by Venkatesh et al. (2012) for their UTAUT2 model. For the emotional variables, the model uses the Positive and Negative Affect Schedule (PANAS) scale developed by Watson, Clark and Tellegen (1988), asking respondents to indicate the degree to which they felt the emotions included on the scale in relation to the use of LSP for training activities. These emotions fall into three categories: Anxiety, Negative Emotions and Positive Emotions. Personal Innovativeness was measured using the scale developed by Juaneda-Ayensa, Mosquera and Sierra Murillo (2016), who adapted the scale developed by Goldsmith and Hofacker (1991). A Likert scale from 0 (strongly disagree) to 10 (strongly agree) was used for all variables except the emotional ones. For the emotional variables, in accordance with the PANAS scale, the scale ranged from 0 (very slightly or not at all) to 10 (extremely) (Watson et al., 1988).

A pilot study was carried out to ensure the questionnaire's understandability. This work was done by one of the authors, who is a training consultant with more than 25 years of experience and a certified LSP facilitator. This person provided the questionnaire to 17 students, making the necessary modifications until it was understood by all the participants.

This research analyzes the intention to use serious games. The behavioral intention to use is a widely used variable in the study of new technology acceptance. Among others, it is included in the TAM (Davis, 1985; Davis et al., 1989), UTAUT (Venkatesh et al., 2003)

Table 1
Constructs, scales and items.

CONSTRUCT (SCALE)	ITEMS	
Intention to Use (IU)	IU1	Assuming the trainer proposes learning with Lego© Serious Play©, I intend to use it
TAM model (Venkatesh & Davis, 2000)	IU2	Assuming the trainer proposes learning with Lego© Serious Play©, I predict that I will use it
Performance Expectancy (PE)	PE1	Using Lego© Serious Play© will make my learning more useful
UTAUT2 model (Venkatesh et al., 2012)	PE2	Using Lego© Serious Play© will increase the opportunities to achieve important goals for my learning
	PE3	Using Lego© Serious Play© will help me acquire skills more quickly
	PE4	Using Lego© Serious Play© will increase my learning productivity
Effort Expectancy (EE)	EE1	It will be easy for me to learn how to use Lego© Serious Play©
UTAUT2 model (Venkatesh et al., 2012)	EE2	Playing with Lego© Serious Play© will be clear and understandable for me
	EE3	It will be easy for me to use Lego© Serious Play©
	EE4	It will be easy for me to become an expert in the use of Lego© Serious Play©
Social Influence (SI)	SI1	The people who are important to me will think that I should use Lego© Serious Play© for my learning
UTAUT2 model (Venkatesh et al., 2012)	SI2	People who influence me will think that I should use Lego© Serious Play© for my learning
	SI3	People whose opinions I value would like me to use Lego© Serious Play©
Personal Innovativeness (PI)	PI1	When I hear about a new innovative product or service aligned with my needs, I try to test it as soon as I can
(Adapted from Juaneda-Ayensa et al. (2016), based on Goldsmith and Hofacker (1991))	PI2	Among my friends or family, I am usually the first to try out new innovative products and services
	PI3	I like to experiment and try out new innovative products and services
Positive Emotions (PEM); Anxiety (A); Negative Emotions (NEM)	E1	Interested
PANAS scales (Watson et al., 1988)	E2	Distressed
	E3	Excited
	E4	Upset
	E5	Strong
	E6	Guilty
	E7	Scared
	E8	Hostile
	E9	Enthusiastic
	E10	Proud
	E11	Irritable
	E12	Alert
	E13	Ashamed
	E14	Inspired
	E15	Nervous
	E16	Determined
	E17	Attentive
	E18	Jittery
	E19	Active
	E20	Afraid

and CAN (Pelegrín-Borondo et al., 2016, 2017) models. This study uses this variable to focus specifically on acceptance of LSP, exploring potential obstacles and barriers to this acceptance that might arise during its deployment, such as student complaints or low student engagement.

4.2. Data analysis

To test the proposed model for analyzing the intention to use serious games using a concrete example (LSP), Structural Equation Modeling (SEM) was used, specifically, the consistent Partial Least Squares (PLSc) SEM technique. Compared to the Partial Least Squares (PLS) technique, PLSc is less sensitive to Type I and Type II errors, and it is recommended in models, such as the one proposed here, in which all constructs are reflective (Dijkstra & Henseler, 2015). PLS has been shown to overestimate factor loadings and underestimate regression coefficients (Gefen, Rigdon, & Straub, 2011). The set of PLS-SEM techniques that includes PLS and PLSc is less sensitive to the violation of normal data assumptions than other SEM techniques (Chin, 1998; Ram, Corkindale & Wu, 2014). Additionally, PLSc-SEM is appropriate when the research has predictive and explanatory purposes, as in the present case (Mosquera, Juaneda-Ayensa, Olarte-Pascual, & Pelegrín-Borondo, 2018).

The following sequential process was used to test the hypotheses:

Stage 1. Exploratory factor analysis

An exploratory factor analysis of the main components was performed with Varimax rotation to test for the possible existence of more than one dimension in the scales.

Stage 2. Analysis of the measurement model

In this stage, the scales' reliability and convergent and discriminant validity were analyzed. Some items were eliminated from the scales as a result.

Stage 3. Structural model analysis

The proposed explanatory model of the intention to use LSP as a serious game was analyzed. The R^2 and Q^2 values were evaluated based on the predictive test, path coefficients and their estimated significance level. The structural models for each of the explanatory variables of the intention to use LSP were analyzed separately, making it possible to determine the individual effect of each variable on the intention to use LSP and respond to the posited hypotheses.

5. Results

5.1. Exploratory factor analysis

Exploratory factor analysis was used to test the factors formed from the scales' observable variables. In all cases, the results for the Performance Expectancy, Effort Expectancy, Social Influence, Personal Innovativeness and Intention to Use scales showed a single factor. For these scales, the statistical instrument thus works properly: (i) the Kaiser-Meyer-Olkin (KMO) test value was greater than 0.8 for all scales with more than 2 items and greater than 0.5 for scales with 2 items; (ii) Bartlett's sphericity tests yielded a significance level lower than 0.001 for all scales.

The results for the emotions scale showed three factors that explain 61.38% of the variance. The first factor includes the Positive Emotions of feeling excited, determined, active, strong, proud, inspired, attentive, alert and interested (Watson et al., 1988). The second factor includes the Anxiety group emotions of feeling distressed, nervous and alert. The third factor comprises variables related to Negative Emotions according to the PANAS scale (Watson et al., 1988), including feeling irritable, upset, scared, guilty, afraid, ashamed, jittery and hostile. The disaggregation of the PANAS scale into these three dimensions is consistent with that found in Pelegrín-Borondo et al. (2016) in the development of the CAN model, on which this research is based.

Table 2
Construct reliability and convergent validity.

CONSTRUCT	COMPOSITE RELIABILITY >0.7	CRONBACH'S ALPHA	AVE >0.5
Performance Expectancy (PE)	0.92	0.92	0.75
Effort Expectancy (EE)	0.93	0.93	0.78
Positive Emotions (PEM)	0.93	0.93	0.60
Anxiety (A)	0.78	0.78	0.55
Negative Emotions (NEM)	0.91	0.91	0.55
Social Influence (SI)	0.94	0.94	0.83
Personal Innovativeness (PI)	0.81	0.81	0.68
Intention to Use (IU)	0.90	0.89	0.81

5.2. Measurement model analysis

The requirement for standardized loadings to be greater than 0.7 (Hair, Ringle & Sarstedt, 2013) was met in all cases, except for six of the observable variables. Five of these were nevertheless maintained because their values were close to 0.7 and they had t-values greater than 1.96. In this regard, Chin (1998, pp. 295–336) establishes that the 0.7 limit for standardized loadings is flexible, particularly when the indicators contribute to content validity. Only one observable variable was removed, namely, the variable "Among my friends or family, I am usually the first to try new technologies" from the Personal Innovativeness scale, which had a standardized loading <0.7 and a t-value < 1.96. Consequently, the reliability of each item included in the model is adequate (Hair, Sarstedt & Ringle, 2011a).

Table 2 shows the results for composite reliability and Cronbach's alpha. The composite reliability values of all construct scales were very high, above 0.9 (in all cases exceeding the cut-off value of 0.7). As for convergent validity, all constructs had an average variance extracted (AVE) well over 0.5, which is the minimum level required.

The results of the discriminant validity analysis are shown in Table 3. The square root of the AVE was larger than the correlations between the constructs (Roldán & Sánchez-Franco, 2012) in all cases except for the Anxiety and Negative Emotions constructs (although the values were still very close: 0.74 vs. 0.75). However, the heterotrait-monotrait ratio of correlations (HTMT) for measuring discriminant validity shows satisfactory results with values in all cases < 0.9 (Henseler, Ringle & Sarstedt, 2015).

5.3. Structural model analysis

To evaluate the significance of the structural model's path coefficients, bootstrapping with 5000 samples was used (Hair, Sarstedt and Ringle, 2011b). Table 4 shows the results of the overall structural model (with all the explanatory variables), the R^2 and the Q^2 obtained with the PLSPredict procedure. The value of R^2 is 0.64. The model is highly predictive of the intention to use, with a Q^2 of 0.45. As stated by (Hair et al., 2011b, 145), "Q^2 values greater than zero indicate that exogenous constructs are relevant in predicting the endogenous variable of the model." Based on these results, the model has good goodness-of-fit and high explanatory power with regard to the intention to use serious games. Performance Expectancy was the variable with the largest influence on the intention to use serious games.

To test the predictive value of the proposed model, the Q^2 was tested separately with individual models for each variable. The results show four of the individual models have predictive power ($Q^2 > 0$), while three do not ($Q^2 < 0$) (Table 5). The measurement models with predictive power were analyzed. The variable EE2 was eliminated from the Expected Effort model due to reliability problems, as were the variables E1 from the Positive Emotions model and SI2 from the Social Influence model. The resulting models were tested for goodness-of-fit and their effect on the intention to use serious games. Table 5 shows the results for each of the partial models. Performance Expectancy was the most influential variable with predictive power regarding the intention to use serious games. It was the variable with the highest explanatory power in both the overall model and the individual models, explaining 61% of the variance in the intention to use serious games. Based on these results, H1 was accepted.

The variable with the second highest explanatory power was Positive Emotions, with an R^2 value of 0.26 and a Q^2 of 0.13. The individual model with this variable explains 26% of the intention to use serious games. Social Influence was likewise shown to influence the behavioral intention to use, with an R^2 of 0.26, but a lower Q^2 value (0.08). These results provide support for H3 and H5, although these factors had notably less influence than Performance Expectancy. Effort Expectancy had an R^2 value of 0.23, and the Q^2 value was positive but low (p-value = 0.02). Based on these results, H2 was accepted.

For the other variables, the Q^2 results were negative, making them nonpredictive variables. Therefore, support was not found for the hypotheses regarding Anxiety (H4), Negative Emotions (H5) and Personal Innovativeness (H7).

6. Discussion and conclusions

The research goal of this paper is to explain the factors influencing the intention to use serious games such as Lego© Serious Play© in management education using an adapted version of the Cognitive-Affective-Normative model (Pelegrín-Borondo et al., 2016). Specifically, the variable Personal Innovativeness was added to the model. The hypotheses were tested in a sample of future

Table 3
Discriminant validity.

	PE	EE	PEM	A	NEM	SI	PI	IU
Performance Expectancy (PE)	**0.87**	0.59	0.65	0.20	0.11	0.76	0.22	0.78
Effort Expectancy (EE)	0.59	**0.88**	0.51	0.10	0.19	0.48	0.38	0.51
Positive Emotions (PEM)	0.64	0.51	**0.77**	0.62	0.21	0.53	0.34	0.56
Anxiety (A)	0.20	0.05	0.62	**0.74**	0.74	0.28	0.08	0.20
Negative Emotions (NEM)	−0.08	−0.19	0.19	0.75	**0.74**	0.10	0.13	0.13
Social Influence (SI)	0.76	0.48	0.53	0.28	0.07	**0.91**	0.23	0.55
Personal Innovativeness (PI)	0.22	0.38	0.34	−0.01	−0.13	0.23	**0.82**	0.26
Intention to Use (IU)	0.78	0.51	0.55	0.19	−0.11	0.56	0.25	**0.90**

Note: Bold data on the diagonal are the square root of the AVE. Data located below the diagonal are the correlations between the constructs. Data above the diagonal are the HTMT values.

Table 4
Goodness-of-fit and effects on endogenous variables of the overall model.

	R^2	Q^2	Direct effects	p-value	t-value
Intention to Use (IU)	0.64	0.45			
Performance Expectancy (PE) => Intention to Use (IU)			0.81	0.00	7.21
Effort Expectancy (EE) => Intention to Use (IU)			0.05	0.55	0.59
Positive Emotions (PEM) => Intention to Use (IU)			−0.08	0.65	0.45
Anxiety (A) => Intention to Use (IU)			0.26	0.26	1.13
Negative Emotions (NEM) => Intention to Use (IU)			−0.19	0.20	1.28
Social Influence (SI) => Intention to Use (IU)			−0.11	0.15	1.44
Personal Innovativeness (PI) => Intention to Use (IU)			0.08	0.28	1.09

Table 5
Goodness-of-fit and effect of partial models.

Partial model result for each variable	R^2	Q^2	Direct effects	p-value	t-value
Performance Expectancy (PE) => Intention to Use (IU)	0.61	0.42	0.78	0.00	16.59
Effort Expectancy (EE) => Intention to Use (IU)	0.23	0.02	0.47	0.00	6.18
Positive Emotions (PEM) => Intention to Use (IU)	0.26	0.13	0.51	0.00	9.04
Anxiety (A) => Intention to Use (IU)	n/a	−0.65	n/a	n/a	n/a
Negative Emotions (NEM) => Intention to Use (IU)	n/a	−0.70	n/a	n/a	n/a
Social Influence (SI) => Intention to Use (IU)	0.26	0.08	0.51	0.00	8.55
Personal Innovativeness (PI) => Intention to Use (IU)	n/a	−0.51	n/a	n/a	n/a

Note: n/a = not applicable due to lack of predictive power ($Q^2 < 0$).

professionals from several disciplines at various Spanish universities.

Performance Expectancy was the most predictive variable in explaining the intention to use a serious game in management education. This finding corroborates previous studies conducted in both non-educational (e.g., Pelegrín-Borondo et al., 2016) and educational contexts (e.g., Liu et al., 2010; Ngai et al., 2007; Suki, 2017), extending the findings to the field of serious games. The perceived usefulness of serious game methodologies is the key variable explaining their acceptance by students.

The second most predictive factor with regard to acceptance of serious games in training activities was Positive Emotions. Previous studies have demonstrated the influence of affective factors in gamification used in learning environments (Labrador & Villegas, 2014; Simões et al., 2013) and professional ones (Korn, Boffo & Schmidt, 2015). LSP triggers positive emotions in users (Müller et al., 2015; Paasivaara et al., 2014; Steghöfer et al., 2017; Zenk et al., 2018). The present findings support the same conclusions; however, positive emotions were not found to be as important as performance expectancy. The other emotional factors (Negative Emotions and Anxiety) were not found to be statistically significant.

Other people's opinions about the use of serious games as a training method were also found to be a relevant variable. Social Influence affected acceptance, as found in previous studies on gamification (Alshare et al., 2015; Baptista & y Oliveira, 2017; Harborth & Pape, 2017). Sailer et al. (2017) underlined the psychological and social effects that emerge when people interact while playing.

The effort required to learn how to use a serious game had a significant and positive influence on the intention to use it, but of very low intensity (p-value = 0.02). The results obtained enrich the findings of earlier studies that found Effort Expectancy to play an important role in acceptance (Liu et al., 2010; Martí-Parreño et al., 2016; Ngai et al., 2007). The low intensity of the influence can be explained by the nature of the serious game used, i.e., LSP. People perceive that playing with Lego© Serious Play© blocks to use the serious game does not require previous knowledge or much effort to learn.

Contrary to expectations, Personal Innovativeness was not found to significantly influence the intention to use LSP. This variable had not been studied in the educational context (Liu et al., 2010), making the inclusion of this factor a novel contribution of the present research. For other innovative products and services, the higher an individual's personal innovativeness is, the more likely he or she is to be willing to use the new product or service.

The results of the empirical analysis enable the prioritization of the factors that should be considered in any innovative training program using serious games. The model makes it possible to explain acceptance with three variables. The most important one is for students to consider the use of a serious game in a training activity to be a high-performance method. This variable is followed by the positive emotions that playing produces and the opinions of other influential people.

7. Theoretical and practical implications

This paper uses an adapted version of the Cognitive-Affective-Normative model (Pelegrín-Borondo et al., 2016) to explain the intention to use serious games such as Lego© Serious Play© in management education. It extends the CAN model developed by Pelegrín-Borondo et al. (2016) by including Personal Innovativeness. The proposed model opens a new methodology for studying the behavioral intention to use other innovative management-training methods and to enrich the deployment of serious game training strategies in management education. The results have the following theoretical and practical implications:

First, previous research has demonstrated the importance of performance expectancy in acceptance of the use of innovative

learning technologies (Liu et al., 2010; Ngai et al., 2007; Suki, 2017) and gamification methodologies (Martí-Parreño et al., 2016; Paasivaara et al., 2014; Steghöfer et al., 2017). The present research goes one step further. The results show that when all the model's variables are included (Performance Expectancy, Effort Expectancy, Positive Emotions, Anxiety, Negative Emotions, Social Influence, and Personal Innovativeness), performance expectancy accounts for all the explanatory power. Only when the influence of each of the other explanatory variables is analyzed independently (i.e., when they are tested separately with individual models for each variable) are they found to have explanatory power. It can thus be concluded that perceived usefulness is the key variable explaining the acceptance of serious game methodologies by students. This finding is very relevant for innovation based on serious games in management education. Any training strategy including the use of innovative serious games for learning should consider how students perceive learning performance. If the students do not perceive the gamification-based innovation as useful, nothing else will matter. Messages about this learning method's learning outcomes should thus be included in the preliminary information for attendees to predispose them to serious game training methods.

Second, the present findings support the positive influence of positive emotions on the acceptance of LSP. The importance of the fact that gamification generates emotions has been demonstrated elsewhere (e.g., Goleman & Senge, 2016; Kurkovsky, 2015, pp. 213–218; Labrador & Villegas, 2014). However, the present research makes additional contributions: first, positive emotions were not found to be as important as performance expectancy; and second, only the generation of positive emotions was found to influence acceptance, not negative ones. One important implication of this finding is that once students have been persuaded to perceive gamification as useful, the focus should shift to ensuring that the gamification in question generates positive emotions. Students may also perceive that adapting to gamification requires effort (Martí-Parreño et al., 2016), and this effort expectancy could cause negative emotions. However, this is not a priority issue. It is more important to ensure that students perceive the gamification as useful and for it to generate positive emotions to offset the negative ones. Additionally, in the specific case of LSP, people do not perceive playing with LSP blocks to use the serious game as requiring previous knowledge or much effort to learn. This perception is a strength for LSP, because it is a method that participants can begin to use without the need to make a significant prior effort.

Third, previous research has demonstrated the potential importance of other people's opinions (social influence) for acceptance of gamification (e.g., Harborth & Pape, 2017; Mekler et al., 2017), teaching innovations (Baptista & y Oliveira, 2017), and even, specifically, the intention to use LSP (DeSmet et al., 2014; Hanus & Fox, 2014; Mekler et al., 2017). In contrast, other studies have found that social norms may not influence the acceptance of teaching innovations (Boubker, Arroud, & Ouajdouni, 2021). The present findings help clarify this discrepancy. This paper shows that while other people's opinions can be important (when the variable is tested separately with individual models), they cease to matter once people consider an innovation useful. The key implication is that when teachers perceive that a group of students in a class is opposed to a serious game, in order to prevent them from influencing the other students, they should focus their discourse on ensuring that the students perceive its usefulness.

Fourth, based on earlier studies (e.g., Citrin et al., 2000; Goldsmith & Hofacker, 1991; Liu et al., 2010), it was hypothesized that innovative people would be more willing to use serious games, but no evidence was found to support this hypothesis. In this regard, the practical implication is that it is thus not necessary to choose more innovative participants over less innovative ones to use LSP in training.

The proposed model opens a new method for evaluating the acceptance of innovative methods for learning in corporate environments.

8. Limitations and future lines of research

In the context of a quantitative study, the nature of the sample limits the generalization of the results. This study used a sample of future professionals consisting of higher-education students from different disciplines at various Spanish universities. Samples from other countries, or a sample concentrated in a specific discipline, could yield different results. The average age of the sample is another limitation. Future research should seek to conduct similar studies in other countries and with broader samples in terms of age and professional experience. The results may also differ depending on gender. Future research should thus obtain a large enough sample to study gender as a moderating variable. Additionally, the present study focuses on a specific serious game: Lego© Serious Play©. Further research with other business serious games could also yield different results. Finally, this research has focused on the explanatory variables included in technology acceptance models (discussed in the "Conceptual background and hypothesis development" section). However, other variables could also influence LSP acceptance, such as the player's personal characteristics (e.g., Mostefai et al., 2019). Future research could thus add some of these variables to the CAN model to analyze their ability to explain the acceptance of serious games.

Authors state of commitment

All authors contributed equally to Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/Writing - original draft; Writing - review & editing.

Acknowledgments

This research was funded by the ACUP - Recercaixa (PIN2015F); EURITAGE PROJECT; Code 2015ACUP 00059.

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