Conditioning factors of learning performance involving the use of a business simulation software

Abstract

This article aims at identifying the factors that influence and condition the learning performance of Business and Administration and Industrial Civil Engineering students in a Marketing subject that involves the use of business simulation software. The results show that the factors that directly influence academic performance are the perceived usefulness, perceived playfulness, learning environment and learning motivation. On the other hand, perceived attractiveness has a direct influence on learning performance through perceived usefulness and perceived playfulness.

Key words: Learning methodologies, use of technology, academic performance.

Introduction

Information technologies have a great potential in all educational fields, from primary to higher education, including in-person or e-learning continuous education and technical training. In fact, as the influence of technology on teaching and learning increases, so do the teachers' expectations of taking advantage of it (Teo, 2011), which makes teachers experience the need of switching between teaching and technology in a simple way (Pelgrum, 2001).

Chile has broken new ground in the use of computers and networks at a primary and secondary level in Latin America. In addition, higher education institutions have also been concerned to integrate ICT's into the subjects of the different courses that they offer. This is how business simulation games, whose main purpose is to help students understand how companies and the industry work, are born in the administration field more than 40 years ago. Therefore, this study intends to explain what factors condition the learning performance of engineering students by means of a business simulation game used in a marketing subject.

Literature review

The technology acceptance model (Davis, 1989) was adapted from the Theory of Reasoned Action (Fishbein & Ajzen, 1975) to the particular case of technology adoption, in which two factors, namely perceived usefulness and perceived ease-of-use, are predictors of the intention to use of the system or technology in hand. Furthermore, a causal rather than parallel

relation is found between perceived ease-of-use and perceived usefulness (Davis, 1989). Over the last decades, research has focused on improving the predictive capacity of the model, thereby giving rise to the TAM2 model (Venkatesh & Davis, 2000), which introduces into the model the external or social influence (subjective norms, voluntariness, image) and the cognitive process ((job relevance, output quality, result demonstrability, perceived ease-of-use) as factors influencing perceived usefulness and subsequent intention to use. According to Venkatesh & Davis (2000), TAM2 achieves to explain 40% to 60% of variance but under compulsory use conditions. Similarly, several studies have been conducted that have proven or disproven the TAM model in a variety of environments and with different test subjects, with convergent results that validate the model and typically explain 40% of the variance of intention to use (Legris et al., 2003). The aim of reconciling the diverse existing models gives birth to the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003); in which performance expectancy, effort expectancy and social influence determine the intention to use, which together with the facilitating conditions define the usage behavior. On the other hand, and to complement the study on the variables influencing perceived usefulness, Venkatesh & Bala (2008) propose the TAM3 model, adding variables that influence perceived ease-of-use (computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment and objective usability). Turner et al. (2009), through a literature review on the TAM model, find a strong correlation between intention to use and actual usage, but a weak correlation between perceived ease-of-use and perceived usefulness and actual usage, which leads Turner et al. (2009) to suggest to proceed with caution when taking this model out of its validation context.. Venkatesh et al. (2012) adapt the Unified Theory of Acceptance and Use of Technology to a consumption context, adding a set of variables (hedonic motivation, price value, and habit) to the original model.

In the educational field, Hu et al. (2003) study the level of technology acceptance in the classroom by teachers. Their results suggest that perceived usefulness has a direct impact on intention to use and an indirect effect on perceived ease-of-use, which is in line with Teo's (2011) subsequent findings. Gibson et al. (2010) use the TAM model to conduct research on the acceptance of on-line education. These results indicate that perceived usefulness is a relevant indicator of intention to use, whereas perceived ease-of-use, albeit significant, does not contribute much, which is coincident with the results yield by Teo (2008) with regard to the importance of perceived usefulness. Likewise, Un Jan & Contreras (2010) carry out a study with university students, which demonstrates that perceived ease-of use is not an influencing factor in this model. The above makes sense since, although students perceive certain difficulty in the use of the studied technology, they are willing to use it as part of their engineering training (Un Jan & Contreras, 2010). In addition, Escobar-Rodríguez and Monge-Lozano (2012) also demonstrate the greater importance of perceived usefulness to intention to use with respect to perceived ease-of-use.

Among the studies found on university education, specifically on use of marketing software in the classroom, Tao et al.'s research (2009) stands out. In this study, the authors gather models and theories to develop a final model related to the different learning factors in order to understand how students assess the technology tools used and whether they would use these tools again. The aforementioned is associated with the dramatic increase in the use of business simulator games as well as the rise in universities that employ this tool to deliver their marketing and administration courses in Taiwan. Tao et al. (2009) take the Technology Acceptance Model (Davis, 1989), the Agency Theory, and the Expectation Confirmation Theory (ECT) to formulate 17 hypotheses about the intention to use of a business simulator game. In this regard, Premkumar & Bhattacherjee (2008) point out that the TAM and ECT models are complementary. In other words, TAM can explain the acceptance behavior before the adoption, while ECT can explain the continuity of use behavior. It must be noted that a number of studies (Bhattacherjee, 2001b; Roca et al. 2006; Thong et al., 2006), has integrated TAM and ECT to their research models.

Methodology

The methodology of this study is divided into two main stages. The first stage consist in an exploratory phase that seeks to gather information from different secondary sources and build a research model with a measuring instrument, based on the collected data. The model used is based on Tao et al. (2009) findings and retrieves the variables that have an impact on learning performance, so the model proposed and shown in figure 1 has four independent variables, namely perceived ease-of-use, perceived usefulness, learning performance, perceived playfulness, and three independent variables, perceived attractiveness, learning motivation and learning environment.

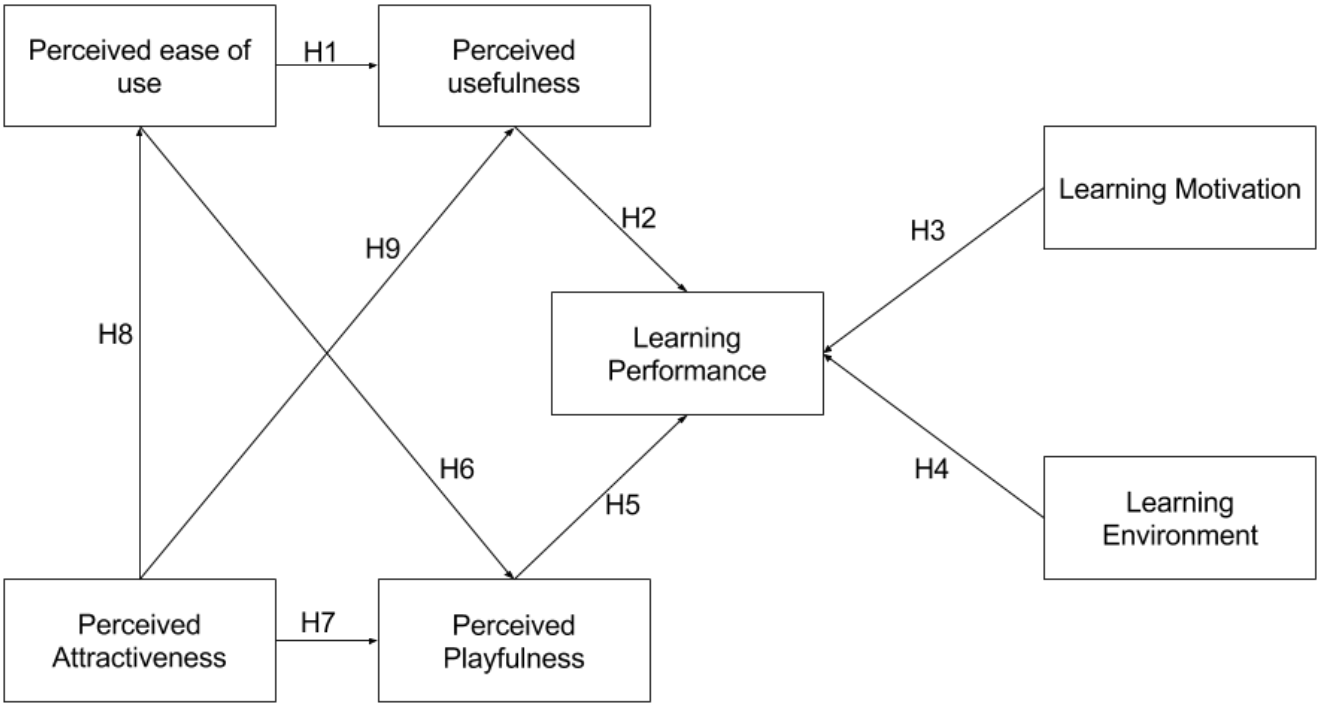

Figure N° 1. Proposed model.

The following hypotheses arise from the proposed model:

- H1: Perceived ease-of-use has a positive impact on the perceived usefulness of the business simulation game (Davis, 1989).
- H2: The perceived usefulness of the business simulator has a significant impact on learning performance (Doll & Torkzadeh, 1998).
- H3: A student's learning motivation in the business simulator has a significant impact on learning performance (Pintrich & De Groot, 1990).
- H4: The learning environment has a significant impact on learning performance when using a business simulator s (Moos, 1971).
- H5: Perceived playfulness has a significant impact on students' learning performance.
- H6: The perceived ease-of-use of the business simulator has a significant impact on perceived playfulness (Van der Heijden, 2003; Liao et al., 2007; Venkatesh & Davis, 2000).
- H7: The perceived attractiveness of the business simulator has a significant impact on perceived usefulness (Van der Heijden, 2003; Tractinsky et al., 2000).
- H8: The perceived attractiveness of the business simulator has a significant impact on its perceived ease-of use (Van der Heijden, 2003).

Taking the hypotheses and the proposed model, a questionnaire containing 28 questions is elaborated. Out of the 28 items, 4 correspond to demographic questions that serve the purpose of characterizing the sample, while the rest of them are related to the model and the subsequent confirmatory factor analysis.

The next stage of this research is the conclusive phase, in which a questionnaire is administered to 195 students and former students of Business Administration and Civil Industrial Engineering from Universidad Técnica Federico Santa María, Casa Central of Valparaíso, who have also attended the Business Games or Market Simulation subjects between 2010 and 2015. Students and former students' databases were used for the data collection stage, while fieldwork was conducted via e-mail, face to face or through the social networks of the abovementioned courses. The results of the survey were then analyzed in three stages: a descriptive analysis to characterize the sample, a reliability analysis of the used scales to construct the model, and, lastly, a confirmatory factor analysis using the IBM SPSS Amos software to assess the relationships proposed for the model.

Results

The descriptive analysis indicates that 26% of the sample were students at the time of responding the survey, while 25% of the respondents graduated in 2015. The least numbers are students graduated in 2011 with 9%, followed by those graduated in 2012 with 11%, in 2013 with 14%, and in 2014 with 16%. Regarding the course attended, 128 Business and Administration students, corresponding to 80.5% of the sample, and 31 Industrial Civil Engineering students, corresponding to the remainder 19.5%, were surveyed. The difference in number is because the subjects in hand are elective for the Industrial Civil Engineering course. On the other hand, the variable sex shows that the sample is composed of 52.8% men and 47.2% women. As for age, 54% of respondents are 25 to 29 years old, followed by 36% of 20-to-24-year-old participants and, finally, by people older than 30 year old, who correspond to 10% of the total sample.

Subsequently, a scale reliability analysis evidences the good reliability of the scales used (Oviedo & Campo-Arias, 2005). The following table shows the results by each latent variable of the model.

Table N° 1. Scales reliability.

Factor	Cronbach's alpha
Perceived Usefulness (PU)	0.866
Perceived Ease-of-use (PE)	0.798
Perceived Attractiveness (PA)	0.769
Perceived Playfulness (PP)	0.766
Learning Motivation (LM)	0.638
Learning Environment (LE)	0.793
Learning Performance (LP)	0.733

After reviewing the reliability of the scales used to assess the factors conditioning or influencing the learning performance when using business simulators, a confirmatory factor analysis, whose results are shown in Figure 2, is carried out.

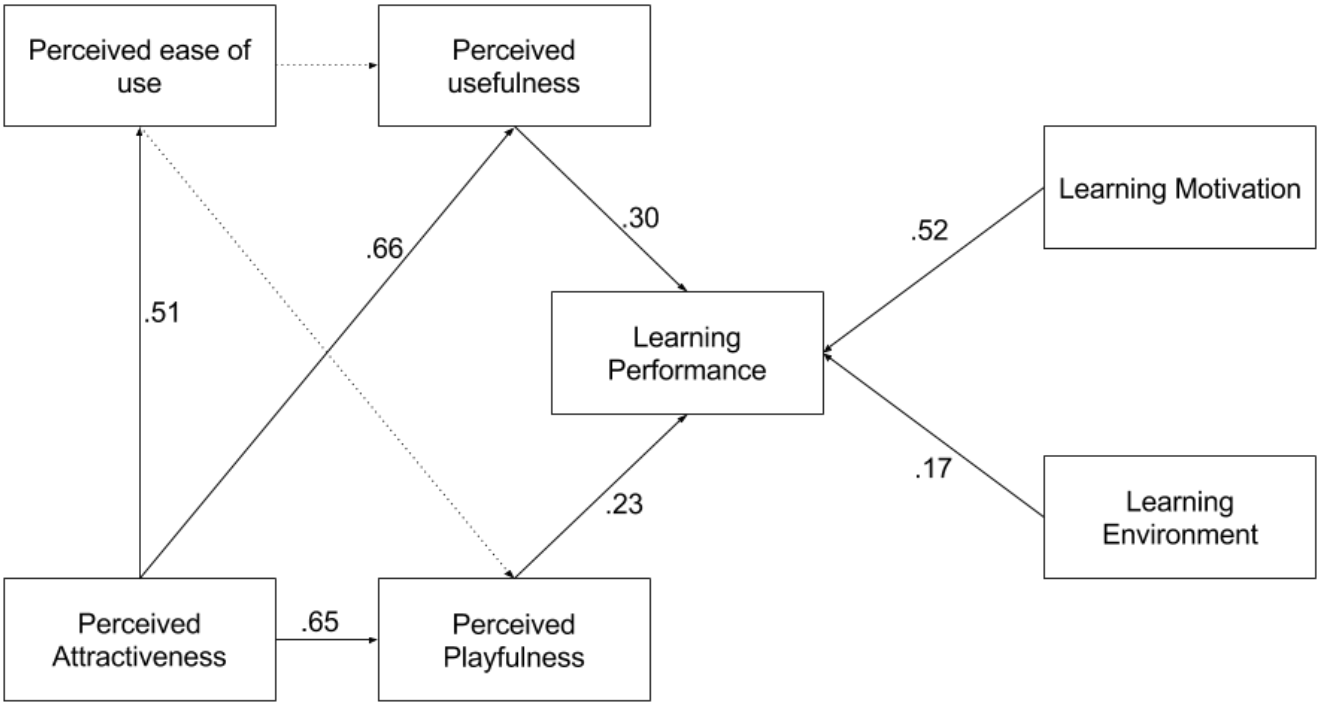

Figure N° 1. Obtained model.

First, non-significant values are observed in the existing relationships between the endogenous latent variable perceived ease-of-use (PE), and the two variables perceived usefulness (PU) and perceived playfulness (PP); thereby demonstrating that perceived ease-of-use has not a sufficient relative weight for the users of business simulation games. In fact, according to Ho Cheong & Park (2005), several previous studies have pointed out that perceived ease-of-use should be excluded from a user acceptance model for a particular technology or service, since it reduces the reliability and validity of the model.

The latent variable perceived attractiveness (PA) has a relative weight of high importance to perceived usefulness (PU) and perceived playfulness (PP), with a standardized regression value observed of 0.66 and 0.65, respectively. Although perceived attractiveness (PA) does not directly relate to learning performance (LP), it may be related by means of the two

variables aforementioned. Therefore, it may be said that the more attractive the interface of a business simulation game, the more the fun times and the perception of usefulness of the software, which, in turn, will enhance the learning performance of the involved students. Finally, in spite of the non-relevance of perceived ease-of-use (PE) for the model, it is implied that, to a certain extent, the attractiveness of a simulator game will also have an effect on the perception of the ease of learning to use it, i.e. the more attractive the software interface, the easier to use the software.

Out of the six latent variables found in the literature review, four were directly related to the variable learning performance. In addition, the results show the most influencing variable to be learning motivation (LM). When comparing learning environment (LE) with learning motivation (LM), a standardized regression coefficient of 0.17 can be observed for learning environment (LE), which is significantly less than the value of learning motivation (0.52). Thus, students find it more important to have an adequate motivation at the time of doing well academically than having a pleasing learning environment.

On the other hand, other variables that also significantly influence learning performance are perceived playfulness (PP) and perceived usefulness (PU). In the case of the former, the regression value is 0.23, while the standardized weight of the latter is 0.3 over learning performance.

Conclusions

As a first outcome, this study identifies the factors that condition or influence the learning performance of engineering students when they make use of a business simulator. In this respect, the factors that directly influence learning performance are perceived usefulness, perceived playfulness, learning motivation and learning environment. Finally, the perceived attractiveness has an indirect effect on learning performance through perceived usefulness and perceived playfulness. On the other hand, it must be noted that the perceived ease-of-use of a business simulator has no significant influence on learning performance.

From the variables abovementioned, learning motivation stands out as the main factor influencing learning performance. Thus, students improve their performance to the extent to which a subject arouses their curiosity; to which the content taught seem to be practical and worth learning; and to which they think they would learn more or better using a business simulator.

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