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DETERMINANTS IN THE USE OF BUSINESS SIMULATORS: COMPANY GAME CASE

DETERMINANTES EN EL USO DE SIMULADORES DE NEGOCIOS: CASO COMPANY GAME

DETERMINANTES NO USO DE SIMULADORES DE NEGÓCIOS: CASO COMPANY GAME

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Abstract

The use of simulators in educational processes has gained strength in recent years, and they have become tools that support improving students' generic skills and competencies, such as assertive communication, time and information management, teamwork, and analysis techniques, however it is necessary to investigate whether other aspects may influence the time of use and application of business simulators, as well as the results obtained. The approach used in this research is quantitative-explanatory and synchronous time and uses the Company Game business game simulator database as a source of information, taking information from 1,197 records. The study's objective is to identify variables that influence the teams' performance in the game of business simulators, such as academic background, context, and training. The results of the logistic regression model and the non-parametric equation model (PLS-SEM) show that the time spent and the number of page queries associated with the simulation game is the determinants that explain the variation in the ranking results, providing a better understanding to people interested in knowledge construction processes mediated by electronic learning methods that seek to strengthen generic skills.

Keywords: student adaptation; active learning; online learning; social skills; educational technology.

JEL: C63; C88; M13; M20; O30

Resumen

El uso de simuladores en los procesos educativos ha tomado fuerza en los últimos años, y se han convertido en herramientas que apoyan al mejoramiento de capacidades y competencias genéricas de los estudiantes, como son: la comunicación asertiva, gestión del tiempo y de la información, trabajo en equipo, técnicas de análisis, entre otras, pero se hace necesario indagar si otros aspectos pueden influir en el momento del uso y aplicación de los simuladores empresariales, así como en los resultados obtenidos. El enfoque utilizado en esta investigación es de tipo cuantitativo-explicativo y de tiempo sincrónico y utiliza como fuente de información la base de datos del simulador de juegos de negocios Company Game, tomando la información de 1.197 registros. El objetivo del estudio es identificar la existencia de variables que influyan en el desempeño de los equipos en el juego de simuladores de negocios, tales como la formación académica, el contexto y el entrenamiento. Los resultados del modelo de regresión logística y el modelo de ecuaciones no paramétricas (PLS-SEM), muestran que el tiempo de dedicación y la cantidad de consultas de páginas asociadas al juego de simulación son los determinantes que explican la variación en los resultados del ranking, brindando una mejor comprensión a las personas interesadas en los procesos de construcción del conocimiento, mediadas por métodos de aprendizaje electrónico que buscan un fortalecimiento en las competencias genéricas.

Palabras claves: adaptación del estudiante; aprendizaje activo; aprendizaje en línea; competencias sociales; tecnología educacional.

JEL: C63; C88; M13; M20; O30

Resumo

A utilização de simuladores em processos educacionais ganhou força nos últimos anos, e eles se tornaram ferramentas que auxiliam no aprimoramento de habilidades e competências genéricas dos alunos, como: comunicação assertiva, gestão do tempo e da informação, trabalho em equipe, técnicas de análise, entre otras, mas é preciso investigar se outros aspectos podem influenciar no tempo de uso e aplicação dos simuladores de negócios, bem como nos resultados obtidos. A abordagem utilizada nesta pesquisa é quantitativo-explicativa e de tempo síncrono e utiliza como fonte de informação o banco de dados do simulador de jogo de empresas Company Game, tomando informações de 1.197 registros. O objetivo do estudo é identificar a existência de variáveis que influenciam o desempenho das equipes no jogo de simuladores de empresas, como formação acadêmica, contexto e treinamento. Os resultados do modelo de regressão logística e do modelo de equações não paramétricas (PLS-SEM) mostram que o tempo gasto e o número de consultas de páginas associadas ao jogo de simulação são os determinantes que explicam a variação nos resultados do ranking. melhor compreensão para pessoas interessadas em processos de construção de conhecimento mediados por métodos eletrônicos de aprendizagem que buscam fortalecer habilidades genéricas.

Palavras-chave: adaptação estudantil; aprendizado ativo; aprendizagem online; habilidades sociais; tecnologia educacional.
JEL: C63; C88; M13; M20; O30

Introduction

In this day and age, the development of competencies is being considered as a central element in the learning processes, within the framework of new pedagogical models (Alfantookh & Bakry, 2013; Savaneviciene et al., 2014) focusing on the construction of knowledge through the search and analysis of information, thus transforming the role of the teacher, who becomes a facilitator, collaborator and instructor within the learning process (Blázquez y Alonso, 2009) rather than a transmitter of knowledge.

According to Cruzado (2019), soft skills have acquired great relevance in recent years, since they belong to the group of transferable skills, essential for the functioning of various professions. Having soft skills allows graduates to better adapt to the labor market.

For Singer et al. (2009) soft skills are more relevant than hard skills, and in their study they show that skills such as teamwork and leadership are significant to achieve productivity growth.

For Arroyo (2019) hard skills are easier to acquire than soft skills and the labor market demands training in the latter, which is why it is necessary for universities to implement new pedagogies and curricula, which in addition to technical knowledge, contribute to the development of soft skills.

Now based on a competency-centered scheme, it is essential that educational processes are complemented with the use of new educational tools, such as e-learning methods, defined according to Sun et al. (2008) as learning based on Information and Communication Technologies (ICT), of which business simulators are part. Among the advantages of using simulators are:

- Interaction between teachers and students gets easier, without time and space barriers, facilitating the creation of autonomous learning environments (Benito, 2009).
- Greater appropriation of knowledge is achieved through a learn-by-doing environment.
- Understanding of situations presented is promoted, since mistakes can be made and no organization is affected or compromised. In addition, feedback can be obtained on the decisions made, which allows users to put the acquired knowledge into practice.
- Having fun while learning allows simulator users to be more likely to retain and use the learning achieved in their work environments.

In recent years, business simulators have begun to play a more relevant role and their use has focused primarily on universities and business schools. This type of game allows users to immerse themselves into business environments, competing with other participants who manage other virtual companies within the same industrial sector. All the above leads to learning in an experiential way, carrying out a high-level management decision-making process.

Various studies have focused on the generic skills that students can acquire through the use of business simulators. This research focuses on identifying the variables that explain the variation in the ranking results within a business simulation game based on a logistic regression model and a non-parametric equation model Partial Least Squares Structural Equation Modeling (PLS-SEM) giving a better understanding to people interested in knowledge construction processes, mediated by e-learning methods that seek to strengthen generic skills.

Theoretical framework

Over the years, simulators have become established as a tool that allows users to have a simplified experience of reality. In the case of business simulators, these allow users to develop their ability to observe, interpret and analyze information, and in this way be able to make "good decisions" and execute them in real time according to the designed strategy.

According to Faria (2001) three types of studies can be identified in the literature aimed at evaluating the effectiveness of business simulators, as follows:

- Those that take as a study variable the performance results of the simulated companies, in order to contrast the learning process experienced by the students (Worley & Tesdell, 2009).
- Those that measure the effectiveness of business simulators versus other educational methods, such as case studies (Doyle & Browm, 2000).
- Those that seek to discover what the simulators teach students and evaluate different variables such as student satisfaction with the learning process. (Fu et al., 2009) how useful it is (Azriel et al., 2005) or what skills are acquired by the simulation game participants (Doyle & Browm, 2000).

Garrick & Clegg (2000) suggest that business simulations can be a mechanism that encourages participants to develop skills and competencies, which are strengthened as they face situations arising from the actions of other competitors, leading to better decision-making.

Similarly, Garizurieta et al. (2018) point out that business simulations are teaching-learning tools that seek to facilitate active learning based on problem solving, encouraging students to analyze, make decisions and evaluate.

In this sense, Borrajo et al. (2010) agrees with this statement by arguing that business simulators are valuable tools for teaching, since in an entertaining and enjoyable way they teach how to manage a business in a competitive market, in such a way that they help students learn to think, since the success or failure of the virtual reality that is proposed depends on the key decisions that they make regarding prices, capital investment, marketing, among others.

Other authors complement this idea by stating that simulation games, as a learning technique, "allow students to play in virtual worlds that reflect reality by playing, observing, creating and thinking about entrepreneurship" (Ruskovaara & Pihkala, 2013, p. 256); Not only do they "connect action (concrete experience) and knowledge (abstract conceptualization)" (Lacruz, 2017, p. 53), but they also increase students' motivation by awakening their curiosity and ending the monotony of traditional teaching materials and methods (Matute & Melero, 2016).

According to authors such as Pando et al. (2016), the use of simulators allows students to address different educational content and, at the same time, acquire management skills and abilities necessary in the business world without assuming the costs and risks of implementing decisions in the real environment.

Various authors have discussed about the skills and abilities that can be developed and put into practice as a result of the use of business simulators. These skills have been called generic, and include aspects such as: experimental learning, the use of analytical techniques, teamwork, decision making and information management (Doyle & Brown, 2000; Fitó et al., 2014).

Taking into account the aforementioned aspects, most studies have been aimed at evaluating the generic skills that students achieve, a very important element to understand the use of simulators, but the objective of this research is to follow another path, and to look for, if it is the case, some external factors related to the environment (GDP, type or ranking of the university), which can influence the good functional performance in the use of the simulation game.

By going through different academic literature in order to identify possible determinants that affect the performance of students in a business simulation game, it was found that authors such as Vorontsov & Vorontsova (2015) consider that business simulators are a practical tool for the development of administrative, economic and management disciplines, which allows students of these careers to acquire management skills and competencies necessary for business before entering a real scenario. The above suggests that those students who belong to the administration and business disciplines have the concepts and foundations that their training provides them and that could give them better performance in the use of business simulators. Other studies mainly show the advantages of using simulators in different business schools (Mendoza, 2017; Reyes, 2020).

On the other hand, there is a large volume of literature that delves into the difference that exists between public education and private university education, according to the countries where these empirical works are carried out (Alvarado et al., 2015; Benalcazar, 2017; Blanco y Sauma, 2020; Canal y Rodríguez, 2020), and additionally in each region and at a global level there are rankings that measure the performance of universities according to certain criteria, and depending on the ranking being analyzed, there is a greater or lesser concentration of public or private universities in the first places. Among the most important rankings are QS Ranking, Times Higher Education and the Shanghai Ranking. For this reason, these variables are taken as possible determinants in the performance of the use of business simulators.

There is another aspect to take into account, and it is the relationship between the quality of education of a country and the resources allocated to education in relation to the GDP of a country. Studies such as that of Alarcón et al. (2018) indicate that those countries that spend the most on education are not among the best educational systems.

Finally, authors such as Tamayo et al. (2017) in their article, discuss the relevance of multidisciplinarity, and mention that the skills to work in a team and in a collaborative manner are not intuitive, and state that the acquisition of these skills should take place during academic training.

Methodology

The approach used in this work is quantitative-explanatory, seeking to determine why certain phenomena or behaviors occur, and hypotheses are used to provide an explanation that will be corroborated. The research is time-synchronous and the Company Game business simulator database from 2016-2018 is used as a source of information. Therefore, the students who participated in the competition with the Company Game business simulator were taken as the object of study. With this simulator, the participating students acquire skills in improving generic capacities and competencies, related to assertive communication, time and information management, teamwork, analysis techniques, among others. Company Game brings together students from various universities in Latin America to participate for approximately one month in a business simulator game. To participate in the challenge, it is not necessary to have previous experience in the use of simulators. The only restrictions are that undergraduate students must be studying at a level equal to or higher than the fifth semester.

To carry out this work, 1,197 registrations were taken, corresponding to the number of teams that participated during the period of time described above, with the participation of 127 higher education institutions, both public and private, from 19 countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Germany, Dominican Republic, Ecuador, Spain, Guatemala, Mexico, Panama, Peru, Puerto Rico, Portugal, Paraguay, Salvador and Venezuela, as can be seen in Table 1.

Table 1

Distribution by country

Country	Relative Frequency By Country (%)
México	**44,28**
Colombia	**25,98**
España	**10,53**
Ecuador	**4,93**
Guatemala	**4,76**
Perú	**2,09**
Chile	**2,01**
Otros	**5,43**

Source: Own elaboration.

To identify the determinants that explain the variation in the ranking results within a business simulation game, a three-phase methodology is followed.

In the first phase, the research hypotheses and the design of the model constructs are defined, based on variables expressed in the theoretical framework. A series of factors were sought that could answer the question: Are there external variables that affect the performance of the teams within the business simulation game Company Game? To do so, a scan was made of the information that could be obtained from the database of the contest held by the enterprise "Game Company", taking the information corresponding to 1,197 records, from three consecutive years (2016 to 2018).

Based on this information, it was necessary to establish whether there were other variables that could directly affect the performance of the simulators, and group them according to the characteristics that were intended to be studied, giving rise to four hypotheses:

H1: Students whose careers are in administration and business have greater aptitudes to win the competition.

H2: Students who belong to private higher education institutions achieve better results than those from public institutions.

H3: The regional context in which the university is immersed influences the ability of the teams to be in the first place of the simulator.

H4: The time spent learning the simulator influences achieving better results to win the competition.

In this context, during phase two, the constructs associated with various variables were designed that would allow statistically searching for some type of correlation with the performance of the teams in the business simulation game. To do this, the following denominations were established as can be seen in Table 2:

Table 2

Latent and observable variables

Construct	Variables
Technical or training component	Total time in the simulator. Total number of pages consulted.
Training component	Team multidisciplinarity. Level of education (undergraduate and/or postgraduate) Area of training
Context component	Type of university (public or private) University Ranking Number of inhabitants of the city Gross Domestic Product of the country

Source: Own elaboration.

Table 3 presents the definition of the different independent and dependent variables used in the construction of the models:

Table 3

Dependent and independent variables of the model

Identifier	Type	Definition	Nature
T_EQUI (Total time in the simulator)	Independent	It is the total time spent by the team during the course of the competition.	Continuous variable
P_EQUI (Total number of pages consulted)	Independent	It is the total number of pages consulted by the team during the course of the competition.	Discrete variable
INTERDISC (Team multidisciplinarity)	Independent	"It takes into account if there is at least one member from another degree, or if it is a team made up of students from the same degree."	Dichotomous. 1 if it has at least one member from another degree. 0 if they are all from the same degree.

CAR_ADM (Area of training)	Independent	It takes into account if any member of the team belongs to a business administration degree.	Dichotomous. 1 if any member belongs to a business administration degree. 0 if not fulfilled.
PREG_POS (Level of education: undergraduate and/or postgraduate)	Independent	"Assesses whether all the students that make up the team are undergraduate, postgraduate or a combination of postgraduate and undergraduate."	Categorical with three levels. 0 if all are undergraduate. 1 if all are postgraduate. 2 if they are combined undergraduate and postgraduate.
PUB_PRIV (Nature of the university: public or private)	Independent	Discriminates whether the university is public or private.	Dichotomous. 0 if it is private. 1 public.
RANK_SIR (University Ranking)	Independent	Contains the position of the university according to the SIR IBER 2018 ranking.	Ordinal qualitative
HAB (Number of inhabitants of the city)	Independent	It takes into account the number of inhabitants of the city where the university is located.	Discrete
PIB_17 (Gross Domestic Product of the country)	Independent	"Contains the country's GDP for the year 2017, where the university is located."	Continuous
RANK	Dependent	"It discriminates the teams into two groups, those that are located in the top 10 places and those that are not in these positions, from the different simulators in competition. A measure that verifies the success in decision-making."	Dichotomous. 0 if it is not among the top 10 places in the ranking. 1 if it is among the top 10 places.

Source: Own elaboration.

It is important to mention that most of the information was obtained from Company Game databases, while additional information was taken from other external databases, such as the ranking of universities worldwide, for which information from the SIR-IBER 2018 was used, which is the Ibero-American Ranking of Higher Education Institutions, the information related to

GDP was from the World Bank database, and, finally, the number of inhabitants per city was extracted from the Population City database.

In the third phase, two multivariate models were applied to analyze the information: one of a parametric type, logistic regression and a second non-parametric model, Partial Least Square (PLS SEM).

In the case of logistic regression and to be able to use multivariate models, the data of the independent variables was standardized, converting them into standardized units.

For the non-parametric multivariate statistical analysis, Partial Least Squares Structural Equation Modeling (PLS-SEM) was used. This is a general method of PATH models (causal diagrams or path diagrams) that carry latent constructs indirectly measured by multiple indicators (items) (Wold, 1982). “The main objective of this tool is predictive causal analysis in which the problems analyzed are complex and theoretical knowledge is scarce” (Barclay et al., 1995; Levy y Valera, 2006).

In general terms, the PLS-SEM measurement model is assessed by: individual item reliability, internal consistency, and discriminant validity. It is important to note that the individual reliability of the item is analyzed by examining the loadings or simple correlations of the measures with their respective construct, and as a general rule, items with loadings equal to or greater than 0.4 are accepted (Hair et al., 2014).

Results

For this work, information was taken from the business simulation game that is carried out at the Ibero-American level, where teams from various universities compete in different types of simulators according to specific business areas and processes. The information corresponds to 1,197 records, from three consecutive years (2016 to 2018). The descriptive statistics of the variables under study are presented in Table 4 and Table 5.

Table 4

Descriptive statistics of quantitative variables

Statistician	T_EQUI	P_EQUI	RANK_ SIR	HAB	PIB_2017
No. de observations	1197	1197	1197	1197	1197
Minimum	15,00	2,00	0,00	3180,00	22089,97
Maximum	5541,00	4268,00	592,00	12110000,00	3865759,08
1 st Quartile	305,00	344,00	93,00	221375,00	373470,86
Median	603,00	635,00	361,00	729279,00	1284253,19
3 rd Quartile	1148,00	1035,00	537,00	2644891,00	1284253,19
Median	826,67	745,18	321,38	2532389,72	850062,05

Source: Own elaboration.

Table 5

Descriptive statistics of qualitative variables

Variable\Statistic	No. of observations	No. de categories	Categories	Frequency per category	Relative frequency. Per category (%)
INTERDISC	1197	2	0	1057,00	88,30
			1	140,00	11,70
CAR_ADM	1197	2	0	428,00	35,76
			1	769,00	64,24
PREG_POS	1197	3	0	1152,00	96,24
			1	37,00	3,09
			2	8,00	0,67

PUB_PRIV	1197	2	0	649,00	54,22
			1	548,00	45,78
RANK	1197	2	0	1047,00	87,47
			1	150,00	12,53

Source: Own elaboration.

Figure 1 shows the Pearson correlation matrix, which allows the existing correlation between the different independent variables analyzed to be visualized. Since there were different scales for the variables analyzed, the data was standardized, converting them into standardized units.

Figure 1

Pearson correlation matrix

-1,0 … 1,0

	T_EQI	P_EQUI	INTERDISC	CAR_ADM	PREG_POS	PUB_PRIV	RANK_SIR	HAB	PIB_2017
T_EQI		0,83	0,06	-0,02	0,06	-0,03	-0,05	0,02	-0,09
P_EQUI	0,83		0,03	-0,01	0,02	0	-0,03	0,01	-0,09
INTERDISC	0,06	0,03		0,02	0,19	-0,11	0,04	0,03	-0,03
CAR_ADM	-0,02	-0,01	0,02		0,05	0,00	0,03	0,06	0,04
PREG_POS	0,06	0,02	0,19	0,05		-0,04	0,02	0,00	-0,02
PUB_PRIV	-0,03	0,00	-0,11	0,00	-0,04		-0,57	-0,33	0,45
RANK_SIR	-0,05	-0,03	0,04	0,03	0,02	-0,57		0,27	-0,53
HAB	0,02	0,01	0,03	0,06	0,00	-0,33	0,27		-0,11
PIB_2017	-0,09	-0,09	-0,03	0,04	-0,02	0,45	-0,53	-0,11	

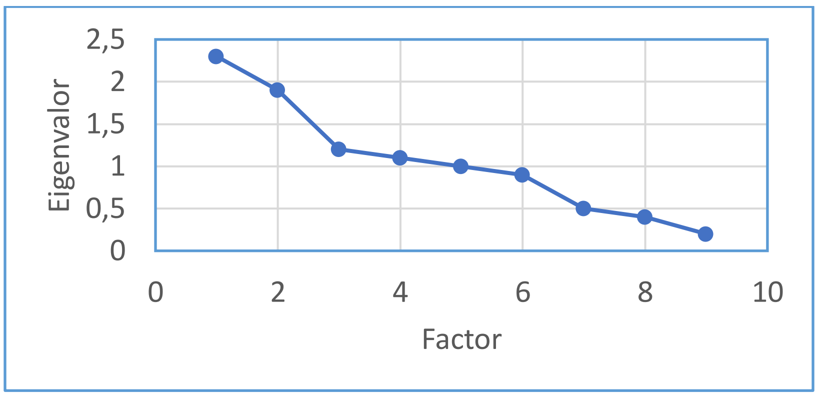
Source: Own elaboration.

The most significant aspect of the matrix is the correlation between P_EQUI and T_EQUI, which has an R index greater than 0.7.

Figure 2, based on a confirmatory factor analysis, shows the sedimentation graph showing the number of factors that account for most of the variability in the total data, showing that three factors have an eigenvalue greater than 1, explaining 58.15% of the variation in the data, as shown in Table 6.

Figure 2

Sedimentation plot



Source: Own elaboration.

Table 6

Research factor analysis

Factor Number	Eigenvalor	Percentage of variance	Cumulative percentage
1	2,20879	24,542	24,542
2	1,84156	20,462	45,004
3	1,18385	13,154	58,158
4	0,98785	11,421	69,578

5	0,88171	9,797	79,375
6	0,805206	8,947	88,322
7	0,483357	5,371	93,693
8	0,398733	4,430	98,123
9	0,168941	1,877	100,000

Source: Own elaboration.

By observing the loading matrix, Table 7, the observable variables were associated with the latent variables that were proposed in the model, called technical components, training and context.

Table 7

Loading matrix before rotation

Variable	Factor 1	Factor 2	Factor 3
T_EQUI	0,177201	0,936427	0,0509565
P_EQUI	0,16781	0,932117	0,104069
INTERDISC	0,160173	0,0926033	-0,702852
CAR_ADM	0,0165658	-0,0384214	-0,315226
PREG_POS	0,0893649	0,102819	-0,740996
PUB_PRIV	-0,818059	0,139597	0,00169968
RANK_SIR	0,816965	-0,214846	0,0759528
HAB	0,478845	-0,0968885	-0,0250866
PIB_2017	-0,741196	0,0129842	-0,146895

Source: Own elaboration.

In order to establish which of the observable variables are the most relevant to try to explain why an individual belongs to the group made up of those who are in the top 10 of the ranking, different models were proposed, where the final model includes all the variables associated with the components or latent variables. To do this, the logistic regression method was used and the results presented in Table 8 were obtained.

Table 8

Estimated regression model (maximum likelihood) for research

Parameter	**Dear**	**Standard Error**	**Estimated Odds Ratio**
CONSTANT	-2.23199	0.106181	
T_EQUI	0.255168	0.127533	1,29068
P_EQUI	0.628604	0.13205	1,87499
INTERDISC	-0.0231667	0.0934054	0.9771
CAR_ADM	-0.195179	0.0923093	0.822687
PREG_POS	0.181916	0.075009	1,19951
PUB_PRIV	-0.0182122	0.122897	0.981953
RANK_SIR	-0.11673	0.135643	0.889826
HAB	0.0432185	0.0997773	1,04417
GDP_2017	0.0470451	0.113976	1,04817

Source: Own elaboration.

Logistic regression model: Grouping the technical, training and context components. Taking the nine variables that are part of the different components, the information recorded in Table 9 and Table 10 is obtained:

Table 9

Deviation analysis

Fountain	Deviation	Gl	P-value
Model	128,268	9	0.0000
Residue	775,178	1187	1,0000
Total (corr.)	903,446	1196	

Source: Own elaboration.

There is a statistically significant relationship between the variables because the P value is less than 0.05 and the confidence level is 95.0%.

Table 10

Likelihood ratio tests

Factor	Chi-Square	Gl	P-value
T_EQUI	3.98365	1	0.0459
P_EQUI	22,6495	1	0.0000
INTERDISC	0.0621494	1	0.8031
CAR_ADM	4,41878	1	0.0355
PREG_POS	5,09771	1	0.0240
PUB_PRIV	0.0219634	1	0.8822
RANK_SIR	0.74171	1	0.3891
HAB	0.186135	1	0.6662
GDP_2017	0.169982	1	0.6801

Source: Own elaboration.

The output shows the results of fitting a logistic regression model to describe the relationship between RANK and 9 independent variables. The equation of the fitted model is presented in Equations 1 and 2.

Equation 1

$$RANK = exp(eta)/(1 + exp(eta)) \qquad (1)$$

Where

Equation 2

$$eta = -2{,}23199 + 0{,}255168 * T\_EQUI + 0{,}628604 * P\_EQUI - 0{,}0231667 * INTERDISC - 0{,}195179 * CAR\_ADM + 0{,}181916 * PREG\_POS - 0{,}0182122 * PUB\_PRIV - 0{,}11673 * RANK\_SIR + 0{,}0432185 * HAB + 0{,}0470451 * PIB\_2017 \qquad (2)$$

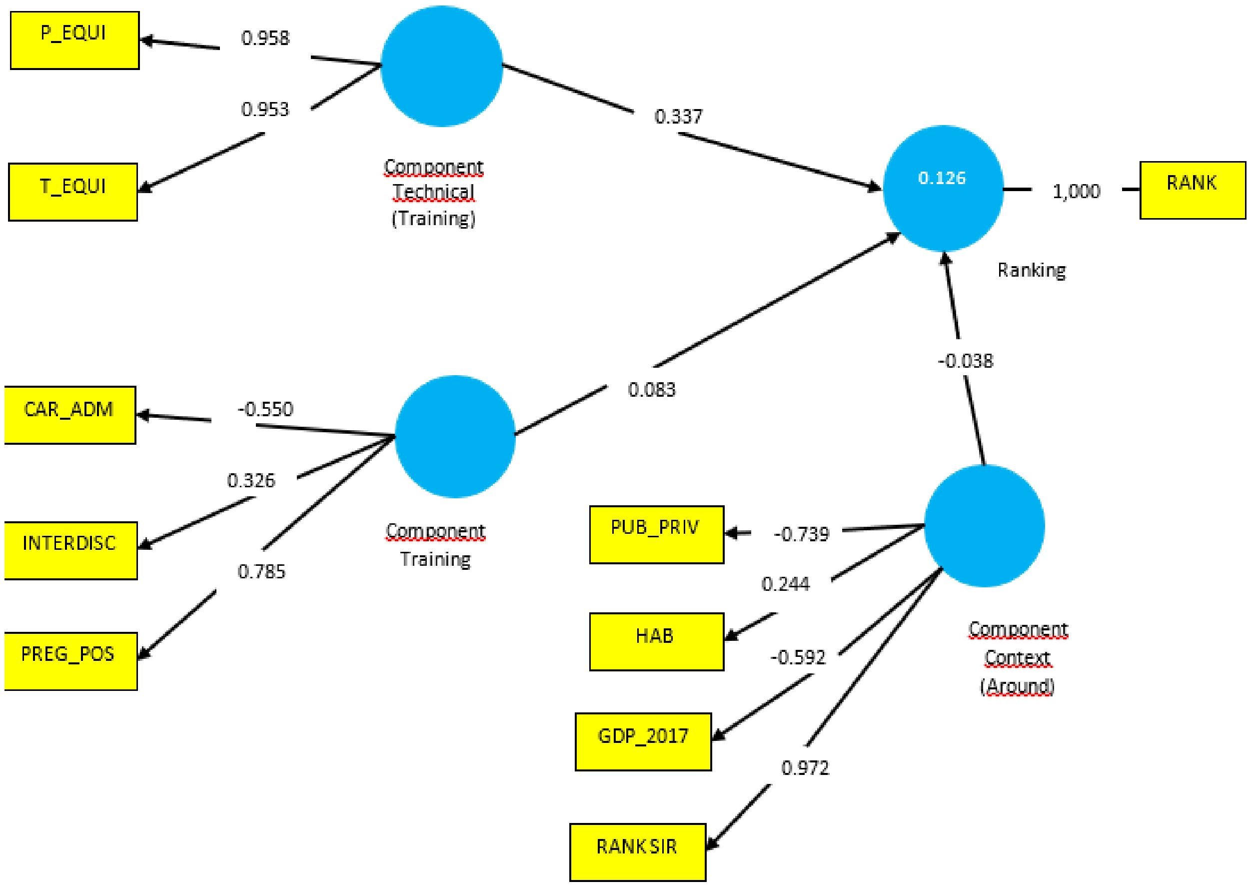
The percentage of RANK deviation explained by the model is equal to 14.1976%. This statistic is similar to the usual R-Squared statistic. The adjusted percentage, which is more appropriate for comparing models with different number of independent variables, is 11.9839%.

Structural models

The R square measures the amount of variance explained by the constructs; in this particular case, the constructs Training, Academic Training and External Context explain 12.6% of the variability of the Ranking, as can be seen in Figure 3.

Figure 3

Structural model in a SEM diagram



Source: Own elaboration.

The standardized beta regression coefficients called Path Coefficients allow to analyze the hypotheses raised, the latent variable Training has a positive effect of 0.337 on the Ranking parameter higher than 0.3, so it is considered statistically significant (Hair, et al., 2017). In the case of the latent variables: Training and Context, they are not considered statistically significant, their load is less than 0.3.

Table 11 presents the loading of the path coefficients, showing the effect they have on the model.

Table 11

Path coefficients

Latent variable	Ranking
Technical Component (Training)	0.337
Context Component (Environment)	-0.038
Training Component	0.083

Source: Own elaboration.

Communality is the measure of reliability (convergent validity) of the indicators in relation to the total variance, it must be greater than 50% (Fornell & Larcker, 1981; Sharma, 1996). The latent variable Training has a communality value of 0.91 and the latent variable Context of 0.47. Redundancy is another prediction measure that expresses the average variance of the indicators, explained by the latent variables. In this case, the percentage of explanation of the indicators of the latent variables Context, Training and Formation is 0.001969. Both communality and redundancy can be observed in Table 12.

Table 12

Measures of commonality and redundancy

Latent variable	Communality
Technical component (Training)	0.913718
Context Component (Environment)	0.475475
Training component	0.341299
Ranking	1

Source: Own elaboration.

Composite Reliability allows measuring the internal consistency of the construct, an acceptable level is equivalent to 0.60, a more appropriate value being 0.80 (Bagozzi & Yi, 1988; Hair et al., 2017; Nunnally & Bernstein, 1994). The Training construct is the only one that presents a composite reliability higher than 0.8 with 0.955.

The AVE (Average Variance Extracted) is a measure of convergent validity which must be greater than 0.50 and is applied to reflective indicators (Fornell & Larcker, 1981). In this case, the latent variable Training presents convergent validity with 0.914. Both the composite reliability and the AVE can be observed in Table 13.

Table 13

Reliability and construct validity measures

	Cronbach's alpha	Composite reliability	Average Variance Extracted (AVE)	R squared
Technical component (Training)	0.906	0.955	0.914	
Context Component (Environment)	-0.934	0.006	0.475	
Training component	0.216	0.137	0.341	
Ranking	1,000	1,000	1,000	0.126

Source: Own elaboration.

To evaluate the discriminant validity between constructs of the model, it is suggested that the AVE measures be superior to the correlations between the latent variables (VL) (Fornell & Larcker, 1981; Hair et al., 2011), to measure whether there is discriminant validity between the latent variables and Ranking (Table 14).

In the case of the Context and Ranking Component, discriminant validity is observed, since the Context AVE 0.475 > -0.045 Ranking-Context Correlation, for the Technical and Ranking Component there is discriminant validity, since the Technical AVE 0.914 > 0.343 Ranking-

Training Correlation and in the Training and Ranking Component they present discriminant validity, because the Training AVE 0.3412 > 0.101 Ranking-Training Correlation.

Table 14

Correlations of latent variables

	Technical Component (Training)	Context Component (Environment)	Training Component	Ranking
Technical Component (Training)	1,000	-0.025	0.053	0.343
Context Component (Environment)	-0.025	1,000	0.024	-0.045
Training Component	0.053	0.024	1,000	0.101
Ranking	0.343	-0.045	0.101	1,000

Source: Own elaboration.

The factor loadings indicate the results of the observable variables with their respective latent variable. The factor loadings are explanatory if they exceed the 70% threshold (Carmines & Zeller, 1979; Cepeda y Roldán, 2004). In the case of the latent variable External Context, the item RANK_SIR_IBER_2018 is significant, while the variable COD_PUB_O_PRIV is indicative in the construction of External Context, in the opposite direction with -0.7389. In the latent variable Training, the items PAG_EQUIP and TIEMPO_EQUIP are significant at 0.9584 and 0.9532 respectively. Finally, for the latent variable Academic Training, the explanatory item is PREGOPOST with 0.7846. These values can be observed in Table 15.

Table 15

Factor loadings

Variables	Technical Component (Training)	Context Component (Environment)	Training Component	Ranking
CAR_ADM			-0.550	
HAB		0.244		
INTERDISC			0.326	
GDP_2017		-0.592		
PREG_POS			0.785	
PUB_PRIV		-0.739		
P_EQUI	0.958			
RANK				1,000
RANK SIR		0.972		
T_EQUI	0.953			

Source: Own elaboration.

Discussion

According to the theoretical review, there are various factors that can influence the performance of students and that in some way could reveal differences in their "educational quality". For this reason, for this study it was decided to take indicators grouped according to their level of correlation in constructs that could measure the influence of these variables in the classification of the teams in the simulation game promoted by the Company Game company.

Taking into account the training component and given that studies show the relationship between the use of business simulators and administration careers (Mendoza, 2017; Reyes, 2020; Vorontsov & Vorontsova, 2015), as well as working in multidisciplinary teams (Tamayo et al., 2017), hypothesis H1 was drawn up, in which it was stated that students whose careers are in administration and business have greater aptitudes to win the competition, but after carrying out the corresponding statistical analysis, it was possible to demonstrate that the relationship of the construct with the dependent variable RANK does not have statistical significance.

Regarding the context component, the literature shows empirical evidence about the relationship between the type of university, the region or the expenditure on education versus the GDP (Alvarado et al., 2015; Benalcazar, 2017; Blanco y Sauma, 2020; Canal y Rodríguez, 2020) where they present that these factors can influence the type of education received by the students, which allowed to raise hypotheses 2 and 3, in which it was said that students who belong to private higher education institutions and the regional context in which the university is immersed, influence the ability of the teams to be in the first places of the simulator. The results obtained demonstrated that the relationship of the Context construct with the dependent variable RANK is not statistically significant either.

Finally, several authors point out the relevance of business simulations in learning processes and highlight the importance of dedication and responsibility in the learning process (Garizurieta et al., 2018; Lacruz, 2017; Matute & Melero, 2016; Pando et al., 2016; Ruskovaara & Pihkala, 2013). This allowed the formulation of hypothesis 4, which indicated learning time as a factor to achieve better results in order to win the competition. Particularly these last indicators, grouped in the technical or training component, showed that their relationship with RANK is statistically significant for the model.

Conclusions

Based on the logistic regression technique (model 1) and the Partial Least Squares regression – PLS (model 2), two models have been built that explain the variability of the data: model 1 with 14.1976%, showing that the relationship between the technical component and the ranking in the simulator obtained by the teams (RANK) is statistically significant because they have a p value less than 0.05; on the other hand, model 2 presents an R2 with a value of 12.6%.

These models reveal the importance of the variables that are part of the technical component, since within the equation they are those that have the greatest weight when it comes to whether an individual classifies or not in the first 10 places in the ranking of the simulators, allowing us to infer that the participants present a better performance if they carry out a technical preparation process.

This research allows a better understanding for people interested in knowledge construction processes mediated by e-learning methods, since it leads to understanding the role and importance of different variables in processes mediated by simulators.

The research also helps to understand that factors such as having a career in administration and/or business, as well as the formation of teams from multiple disciplines, are not factors that affect the management and results of business simulations called Company Game, and that external factors such as spending on education, the type of university, or the region where the students are located are also not elements that are significant in said results.

For future research, other models may be developed where more variables are taken into account or a combination of variables is made that manage to increase the R2 and allow us to understand the impact of other factors on the use of business simulators.

Hypotheses H1, H2 and H3 are rejected, since the relationships between the variables were not statistically significant, only H4 is relevant, given that training showed a significant weight within the model.

The models applied in this research could also be used in other business simulators in order to determine whether there is a relationship with the factors that were statistically significant.

Ethical considerations

This study did not require approval from an Ethics or Bioethics Committee since it did not use any living resources, agents, biological samples or personal data that represent any risk to life, the environment or human rights.

Conflict of interest

All authors made significant contributions to the paper and declare that there is no conflict of interest related to the article.

Authors' contribution statement

Jaime Enrique Sarmiento Suárez: conceptualization, methodology, validation, formal analysis, investigation, data curation, writing, drafting, visualization, supervision, project administration, and funding acquisition. Julio César Ramírez Montañez: conceptualization, methodology, validation, formal analysis, research, writing, drafting, and funding acquisition. Maryory Patricia Villamizar León: conceptualization, methodology, validation, formal analysis, writing, drafting, and visualization. Reinaldo Arenas Fajardo: conceptualization, methodology, validation, formal analysis, writing, drafting, and visualization. Llorenç Huguet Borén: conceptualization, methodology, validation, formal analysis, and visualization.

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