The impact of business simulation games on Vietnamese students' entrepreneurial intention

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ABSTRACT

In Vietnam, business simulation games have been affirmed as a very effective business learning tool for entrepreneurship education. However, few educators have properly applied them to arouse students' desire to study entrepreneurship. This paper aims to explore the role of human-system interaction and subjective norms (extrinsic) with self-efficacy (intrinsic) in building students' entrepreneurial intention using the theories of Self-Determination (SDT), and Stimulus-Organism-Response (SOR). The PLS-SEM was employed to analyze the data collected from 195 undergraduates from Vietnam's southern business universities. The results showed that self-efficacy plays a full mediator between human-system interaction and entrepreneurial intention. Additionally, subjective norms strengthens the effect of human-systems interaction on self-efficacy, implying that subjective norms plays a moderating role in this connection. It is anticipated that the study's findings will provide practical applications for universities' boards of management, game designers, and future researchers to focus on developing entrepreneurship that accommodates students' values.

Key words: Business simulations game, entrepreneurial intention, self-efficacy, simulation design, Vietnamese students

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INTRODUCTION

Entrepreneurship has been celebrated as a catalyst of revolution in the outlook of the new world economy[1]. Therefore, research dealing with the concept of entrepreneurial intention has increased exponentially, creating a new field of research, especially in the education industry[2]. The Entrepreneurship syllabus in universities has changed from learning on paper-based books to e-books and business simulation games. It has been more than two decades that business simulation games - a tool as experiential training are being used for inculcating important managerial and decision-making skills in business graduates, forming their entrepreneurial intention[3].

Extant literature has revealed a number of previous researches about the nexus between business simulation games and entrepreneurial intention[4,5]. However, literature still does not clarify and provide empirical evidence about extrinsic and intrinsic motivations to prove the role of business simulation games in developing entrepreneurial intention in business graduates. The research of Fox (2018)[5] had delivered a significant role of extrinsic motivation such as game design and flow (decision, choice, and action frameworks), therefore, concur with prior researchers who have concluded that serious games are an important

and significant tool in the entrepreneurship education, from that build the entrepreneurial intention. Despite the growth of the research on entrepreneurial intention, researchers suggested that the outcome of entrepreneurial intention research should be centered on social cognitive categories (person, context, cognition, and motivation)[6]. Previous studies focus on the impact of either intrinsic factors on EI as utilizing human perceptions, attitudes, and behaviors when using business simulation game[3,7] or extrinsic factors (fear of reprisal or social pressure, Mitchell et al., 2018). Specifically, Mitchell (2018)[8] provides a basis for deeper understanding of how gamification works as the first to empirically examine the role of extrinsic motivation. However, it does contrast with findings in some contexts showing gamification does not facilitate competency needs satisfaction and intrinsic motivation[9] or autonomy needs satisfaction[10]. Therefore, the effect of both and intrinsic factors on the entrepreneurial intention has rarely been explored. For this reason, this study examines both intrinsic and extrinsic motivations affecting the entrepreneurial intention of undergraduate students.

In this context, it is important extrinsic to explore the research model that examines the intermediate role through incorporating two theories, Self-Determination Theory (SDT) and Stimulus-Organism-Response Theory (SOR). Apart from fa-

miliar factors, to be more specific about intrinsic motivation, we substitute self-efficacy for the function of competence (a factor of SDT) and put it play an intermediate role in the SOR framework. Thus, based on these theories, four constructs of the research model variables include human-system interaction (simulation design), self-efficacy, subjective norms, and entrepreneurial intention are chosen with the aim to find deeper understandings about students' intention to become entrepreneurs and to provide important implications for teaching innovation.

LITERATURE REVIEW

Business Simulation Games (BSG) and its benefits

BSG are tools that can duplicate decision-making in a real-world business context by using students' natural capacity for technology, according to the Academy of Management (AOM) and the Association for Business Simulation and Experiential Learning (ABSEL)[11]. BSGs are also digital environments with the aim of teaching or training through an experience that extends beyond entertainment and fun (without necessarily excluding such features), utilizing technological resources, and employing gamification techniques in daily business. Students' reactions to their simulation experiences show that they enjoyed the competitive team environment and acquired knowledge from it. In addition, frequent business decision-making may help participants make better strategic decisions[12].

Previous research on "GLO-BUS" indicated that students get access to unique and rich contexts for the application of strategic management frameworks through an engaging and competitive simulation environment[13]. Decision-making, overviewing, target-based orientation, and a problem-solving focus are all characteristics of BSG[14]. Business games, in general, (1) allow students to engage with educational content in a more enjoyable and interactive way, as well as benefit from the simulation of scenarios with several factors that are difficult to represent with other methodologies; (2) allow students to gain management skills and competencies that are required in the business world[15]; and (3) assist participants in gaining experience without the risks and costs of putting their decisions on the line[15].

Human-system interaction in the context of BSG

Regarding the systematization of research on the modeling of a game, the Taxonomy of Computer Simulations[16] and then adapted for the BSG[17] considers the design elements of the user interface. Human-system interaction design, also known as interactive systems design, must take into account a number of factors, including attention and basic human capacity in task execution. In the design of interactive systems, the author emphasizes the need of working on resources that recognize recourse and devices such as assistants and automatic error checkers for probable attention aberrations. These tools are useful for simulating a student's reasoning in a certain field of knowledge, as well as receiving ideas and assistance from educators[18]. Given the high level of complexity and multiplicity of operational and project requirements presented, it is critical to consider the possibility of investigating new methodologies and devices to monitor and analyze the user experience of BSG. This can contribute with essential elements to guide its design and success as a learning tool.

Entrepreneurial Intention (EI)

In the literature on entrepreneurship, intention is defined as a state of mind that focuses someone's attention towards entrepreneurship, resulting in that individual prioritizing self-employment over organizational work[19–21]. Intentions have been proved to be a well-built predictor of planned behaviours in entrepreneurship research[22,23]. Intentions define one's ability to become an entrepreneur and, more importantly, whether such ideas will be pursued effectively or not[24]. Thus, the Ndovela and Chinyamurindi Entrepreneurial careers: Circumstances Influencing Entrepreneurial Aspirations 149 lifespan of an entrepreneurial enterprise is influenced not just by environmental factors but also by the entrepreneur's intentions[25]. It has also been linked to entrepreneurship and has been seen as the heart of entrepreneurship relating to the establishment of a business. Entrepreneurial intentions have a positive effect on students' entrepreneurial attitude, therefore posing a need for educators to reinforce this sentiment[26].

Individuals, the environment, and their interactions are all involved in the phenomena of venture creation[27]. Previous researchers believe that entrepreneurial intentions are influenced largely by the happenings in the macro-environment[28]. The influence of such environmental factors can be an interacting effect with individual actions[29]. Furthermore, developing an understanding between environment and behavior is essential for determining an intent towards when and how to take advantage of entrepreneurial opportunities[30,31]. By incorporating BSG into education, it is possible to modify students'

intentions and build entrepreneurial aspirations in them[32]. After forming an entrepreneurial purpose, an individual begins to hunt for possibilities to start a new business, and if this is somewhat misleading and opportunities are not spotted or discovered, then the entrepreneurs have to imagine the future market value of their product or service[33,34]. In management, BSG is seen as critical in the development of EIs among students[5,35].

Self-efficacy

Self-efficacy explains human behavior as "a product of the interplay of intrapersonal influences, the behavior individuals engage in, and the environmental forces that impinge upon them"[36]. The interaction between these factors determines one's belief in one's capacity to effectively conduct a certain activity in a particular context, as well as one's expectations for the behavior's results[37]. Self-efficacy is the antecedent and consequence of an action choice, and it influences how people do their current task and plan for future task successes[38]. According to Bandura (2012)[36], self-efficacy is the most influential component influencing behavior since it has an impact on other processes and factors such as goal setting, outcome expectations, and intention. The notion of self-efficacy has been applied in a variety of sectors, including entrepreneurship, due to its fundamental impact on human behavior.

Subjective Norms

Subjective norms is key indicators of intentions[39,40]. Subjective norms is influenced by perceived expectation levels from significant people, such as family, colleagues, and role models, according to Peng (2012)[41]. The importance of social connection in this environment, as the presence of others influences people's thoughts, feelings, and behaviors. Others, both worldwide (e.g.,[42]) and within the South African career research literature, agree with this viewpoint (e.g.,[43]). Furthermore, subjective norms can also play a role in determining entrepreneurship intent as a characteristic that influences experiences[44].

BSG ON EI

There are limited researches derived from the previous scholars related to the process of interpreting entrepreneurial stimuli into response such as entrepreneurial intention. Therefore, we use the Stimulus-Organism-Response (SOR) model developed by Mehrabian & Russel (1974)[45], which is combined with the Self-Determination Theory (SDT) by

Ryan & Deci (2000)[46] for demonstrating the BSG effect on EI. In addition, SDT factors played an intermediate role to serve as a bridge between the SOR factors and BSG. Specifically, the model proposed in this research demonstrated the process among factors that influence EI with BSG. This study uses SOR to depict students' stimuli in their learning environment, including human-system interaction and subjective norms. As learners experience the distortion of time and enjoy the pleasures of interaction with the BSG system, it can affect their desire to adopt it as well as to continue using it[47,48]. Moreover, we postulate that people may be influenced by the opinions of others (parents and peers), as regards subjective norms, which then leads to their intention antecedents, namely intention to use[49].

Self-efficacy would be supported by a positive interpersonal climate in which parents, peers, and the BSG system provide management skills, experiences, motivation…. Thus, this study will propose another extended S-O-R model by examining the relationship between human-system interaction, subjective norms (stimuli) and self-efficacy which adapted from the SDT[46] performing as organism and EI (responses). In addition, we investigated the direct effect of self-efficacy on EI. A highly efficacious student who perceives high entrepreneurial self-efficacy can be expected to intentionally start their own business and actually engage in the long run. Recent research in BSG and EI has provided support for some elements of our proposed model. We consider some of this work below, as Figure 1.

The direct effect of Human-system interaction on Self-efficacy

Miller (2010)[50] noted that the simulation is the "kind of learning tool that can be very effective in moving students from the lower rungs of learning to the upper rungs where true critical analysis and understanding takes place" (p. 161). Indeed, BSG is considered a successful experience learning tool "in which the learner was directly in touch with the realities being studied"[51,52]. BSGs, which provide a more realistic view of the entrepreneurial experience than theoretical teachings and allow experiential learning with no real-world consequences[53,54]. This approach can help students observe the relationship between decisions and their outcomes[55]. Furthermore, student's game performance is frequently linked to their grades, implying genuine repercussions and urging them to improve their behavior.

Studies highlight the combination of education in systems thinking and team skills training through game

Figure 1: Research Model (Source: by authors, 2022)
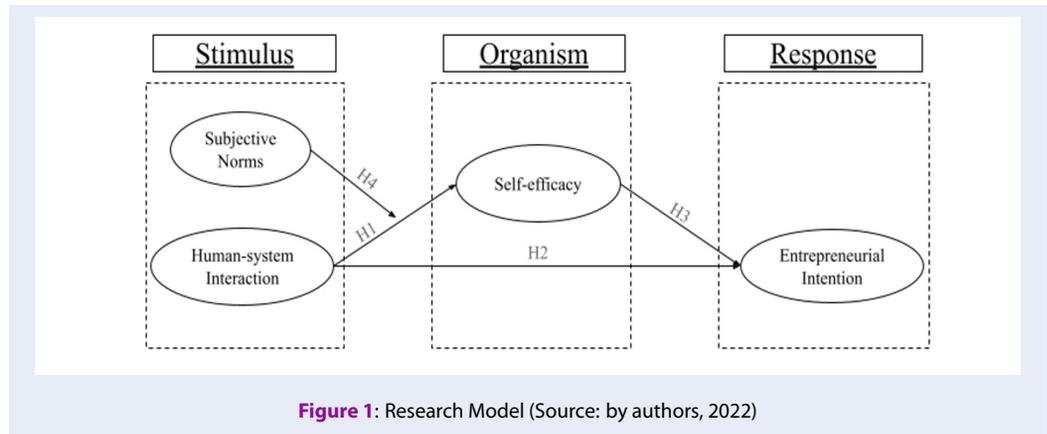
simulation, leading to more sustainable systems management. As a result, students' self-efficacy especially increases during their own game design phase. The training program for self-efficacy through gaming simulation demonstrates that the interactive design of simulation games supports change processes in educational organizations[56]. Accordingly, we hypothesize:

H1: Human-system interaction has a positive effect on Self-efficacy.

Human-system interaction and EI

Human-system interaction can be defined as "the degree to which learners believe that they can easily take and study the learning contents via interacting with the learning function of the e-learning platform"[57]. Business game human-system interaction "can develop student's entrepreneurial skills and encourage them to undertake entrepreneurial activities. The simulation experience allowed students to face challenges, overcome limitations, improve their analytical skills, and enhance their business knowledge[58]. Provided that learners find it interesting while interacting with BSG in some aspects (game design, game challenge...), they will go through high perceived playfulness[59] and they will be more likely to experience flow[60], which straightforwardly lead to the learners' engagement in BSG. Buil (2019)[61] hypothesized that engagement has a positive impact on skill development and perceived learning, which can not only meet the target of the courses but gradually form students' entrepreneurial intention as well.

In examining the relationship between EI and human-system interaction, a number of studies have yielded significant results focusing on two different aspects of human-system interaction (website quality). Students generally express a positive attitude toward BSG and the perceived learning from BSG. This positive feeling continues, as well, years after students have finished their simulation exercises and moved into the business world[62]. Accordingly, we hypothesize:

H2: Human-System Interaction has a positive effect on EI.

Self-efficacy and EI

Self-efficacy is instrumental in producing the intended or desired results of their efforts. Bandura[63,64] explains self-efficacy as "one's belief in one's ability to succeed in particular situations or to accomplish a task "and is "the confidence in one's own ability to achieve intended results". Human performance is affected by external issues such as the nature of the task, the tools being used, and the situation. So, self-efficacy is the belief in one's ability to act resulting from those actions. Merhi[65,66] noted that self-efficacy is a personal assessment of one's ability to carry out a variety of tasks and actions. The higher the confidence level is, the higher their intention to choose entrepreneurship as their future career enhances. Several researches have shown that self-efficacy strongly influences individuals' ability to become entrepreneurs, their efforts to create a new business, their persistence in the face of change, their resilience facing challenges of creating new businesses, and their success in operating the business role[67–69]. Accordingly, we hypothesize:

H3: Self-efficacy has a positive effect on EI.

The moderating variable on the relationship between Human-system interaction and Self-efficacy

In business simulation games, opinion of peers is very important for a number of reasons: (a) students interact with each other and share information and

thoughts which strongly affect their positive intention; (b) Visser and Krosnick (1998)[70] also found that young students learn more efficiently and effectively from the people who are close and important to them such as teachers and parents. Knowledge, information, and resources acquired through social and external networks can help students identify, realize opportunities and obtain external resources, advice, and information from their networks[71]. As a result, social support which is defined as subjective norms that students get from family and friends is crucial to translating business knowledge, skills, information of acquired to their confidence in abilities[72].

Additionally, it has also been suggested that entrepreneurial self-efficacy may be enhanced through appropriate training and education and, subsequently, by leveraging the rate of entrepreneurial activities[73,74]. this study was designed to investigate the impact of BSG's interactive system with students on entrepreneurial self-efficacy within the context of entrepreneurship education. The support obtained from the subjective norms is essential to change the BSGs interaction with students into a his/her belief in the ability to perform a number of tasks and to increase the motivation and desire to start a business[72,75]. Taking into account the previous arguments, there are significant differences between individuals with different subjective norms regarding human-system interaction influence on self-efficacy, we propose our first hypothesis:

H4: Human-system Interaction has a positive effect on Self-efficacy and will be moderated by Subjective Norms.

METHODS

Data collection

The data was collected via a survey using Google Forms from business universities throughout Vietnam. Data collection in Vietnam can be difficult as there are a few business universities applying BSG in their courses. Therefore, we have to investigate the number of schools throughout Vietnam that use BSG as a teaching method to develop a list of potential respondents who show willingness for survey participation. The purpose of the study was explained to the students before they were asked to fill out the questionnaire. Students who participated in the study were majoring in Marketing, International Business, Commercial Business, etc. Five participants have had experience with the BSG in courses and have played it before in several courses. A total of 238 students were interviewed to take part in the survey. Of them, 43

surveys were removed from the sample because they indicated that they had no experience in business simulation games. In the end, a total of 195 valid surveys were used for data analysis, resulting in an 81.9% usable response rate.

Measurement

To establish a rigorous measurement of the manifest variables, the instrument development process followed the prescriptions recommended in the seminal articles focused on enhancing the validity of measurements in positivist studies[76]. Measurement items were adapted from previous literature with little modifications of words and sentences in accordance with this study. The measures for subjective norms are adapted from Pender (1986)[77]. An example of the subjective norms is "The school you are studying creates many conditions to encourage you to pursue your EI". The measures for human-system interaction are adapted from Ajzen (1991)[78]. An example of the simulation design is "The business simulation game offers full detailed instructions online". Additionally, to measure intrinsic motivation, the well-known Situational Motivation Scale[79] was employed. This includes statements such as "I am confident in my ability to start my own business" (self-efficacy). The measures for entrepreneurial intention are adapted from Albert Shapero (1982)[80]. An example of the EI is "I have very serious thoughts about starting a business, setting up a company". In all cases, the 5-point Likert scale was used for almost all questions to measure the responses with 1 - indicating strongly disagree, and 5 - indicating strongly agree.

RESULTS

Contextual Qualitative Data

In terms of Human-System Interaction construct, beside the item that was collected from Cheng, Y. M. (2020)'s[57] questionnaire, we added two more items based on comments of interviewees. For the opinion "The participant's guide is very helpful not only in the game but appropriate for real-life economy as well", we added "Business simulation games allow me to learn a lot of real business knowledge" and "The business simulation game offers complete online instructions" for this construct.

With regards to Subjective Norms construct, beside the items that were collected from Frarrukh et al (2019)'s[81] questionnaire, we added three more items based on the viewpoints of our interviewees. For the comment "Family has a significant impact on student's self-efficacy because they are provided mental and physical advice to be an entrepreneur", the

item "Family influences my entrepreneurial intentions" was added. For the opinion "The comments of friends can affect his mindset that he has the ability to startup", we added "If friends around me think I am good for doing business, then I would think I am appropriate for being an entrepreneur". For the comment "The others' advice makes me think of starting a business", then the item "From the subjective effects of society, my business intentions are rekindled" was added for the construct.

Referring to Self-efficacy construct, beside the items that were collected from Yen, W. C. (2020)'s [82] questionnaire, we just added one more item "I believe I can overcome my financial limitations to gain start-up opportunities" due to the opinion "The financial status is crucial when a person considers whether he/she should startup".

Since there were no additional comments for the Entrepreneurial Intention, our items for this construct were all collected from Doanh, D. C. (2021)'s [83] questionnaire and no more items were added.

Measurement model assessment

Table 1 reveals that all the reflective constructs have high levels of internal reliability and consistency, as demonstrated by the above composite reliability values. All the constructs' reliability coefficients ranged from 0.838 to 0.893, with all of them above 0.70, indicating that the items are reliable measures for their perspective constructs [84,85]. To test the reliability of EI, human-system interaction, self-efficacy, and subjective norms, Cronbach's alpha coefficient was computed. The Cronbach's alpha values varied from 0.718 to 0.82, which exceeded the minimum acceptable values and proved good internal consistency reliability for each latent construct. For exploratory studies, values 0.70 are considered acceptable [84].

To assess the convergent validity for each construct, the standardized factor loadings were used to determine the validity of the four latent constructs [86,87]. The findings indicated that each factor loading of the constructs ranged from 0.629 to 0.892 and exceeded the recommended level of 0.50. As each factor loading on each construct was greater than 0.50, the convergent validity for each construct was established, thereby providing evidence of construct validity for all the constructs in this study [86].

Additionally, the AVE was calculated to assess the discriminant validity for the four constructs [88] for which the AVE ranged from 0.510 to 0.735. All values of all constructs were likewise found to be higher than the threshold of 0.5, demonstrating adequate convergent

validity [89]. The items utilized in this study also have strong convergent validity, since they loaded highly (more than 0.50) on their respective components, according to the results. Table 1 summarizes the findings.

The discriminant validity of the construct is shown in Table 2. Its discriminant validity is supported by the fact that the square root of the AVE between each pair of factors is greater than the estimated correlation between factors [85,88]. Table 2 compares cross-loadings and indicates that an indicator's loadings are higher than other loadings in the same column and row for its own construct. Furthermore, the results indicate that there is discriminant validity between all the constructs based on the loadings and cross-loadings criterion depicted in Table 1.

Structural model assessment and hypotheses testing

We used bootstrapping technique to analyze the significance of indicators [90]. The use of a bootstrapping technique to analyze the significance of the loadings obtained on the observed variables is based on the model's estimates and calculates the estimates of the parameters and their confidence intervals based on multiple estimated [91,92]. Table 3 presents the values of coefficients of the Structural Model – Between Constructs. The values were estimated by a bootstrapping technique. All T-values higher than 1.96 (significance level = 5%) and p-values lower than 0.05, except human-system interaction with EI [90,92].

Thus, 2 hypotheses proposed by the authors are accepted. Specifically:

- Self-efficacy has the strongest and positive impact on EI (H3) with the coefficients β = 0.576 and p= 0.000.
- Human-system interaction has the lowest and positive impact on Self-efficacy (H1) with the coefficients β = 0.140 and p= 0.023.

Mediating Effect : Self-efficacy is a mediator between Human-system interaction and EI (H2b).

Table 4 and Table 5 presents an indirect effect. T-values higher than 1.96 (significance level = 5%) and P Value less than 0.05, so indirect effect is significant. Thus, there exists an indirect relationship from HSI to EI. It can be concluded that Self-efficacy plays a mediating role between Human-system interaction and EI, hypothesis H2 is accepted.

Moderating effect: Human-system interaction has a positive effect on Self-efficacy and will be moderated by Subjective norms (H4).

Table 1: Measurement Quality Indicators

Construct	Item	Outer Loading	Cronbach's Alpha	Composite Reliability	Average
EI	EI1	0.892	0.820	0.893	0.735
	EI2	0.832			
	EI3	0.846			
Self-efficacy	SE1	0.878	0.789	0.877	0.704
	SE2	0.847			
	SE3	0.790			
Human-system interaction	HSI1	0.878	0.718	0.838	0.635
	HSI2	0.720			
	HSI3	0.786			
Subjective norms	SN1	0.629	0.764	0.838	0.510
	SN3	0.771			
	SN4	0.706			
	SN5	0.695			
	SN6	0.762			

Note: Italicized values are items that are above the recommended value of 0.5 and possess high convergent validity. Source: by authors, 2022

Table 2: Discriminant validity

	EI	Self-Efficacy	Human-System Interaction	Subjective Norms
EI	0.857			
Self-efficacy	0.601	0.839		
Human-system Interaction	0.269	0.315	0,797	
Subjective norms	0.553	0.605	0.444	0.714

Note: Diagonal elements are the square roots of AVE. Off-diagonal elements are correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. Source: by authors, 2022

Table 3: Coefficients of the Structural Model

Indicators	β	Sample Mean (M)	Standard Deviation	T statistics	P values
HSI → EI	0.087	0.090	0.066	1.315	0.189
HSI*SN → SE	0.158	0.157	0.065	2.437	0.015
HSI → SE	0.140	0.139	0.062	2.273	0.023
SE → EI	0.576	0.577	0.062	9.298	0.000
Gender → SE	0.165	0.163	0.053	3.088	0.002
SN → SE	0.573	0.577	0.048	11.918	0.000

Notes: Italicized values are items that are under the recommended value of 1.96, do not support the hypothesis. Source: by authors, 2022

Table 4: Specific Indirect Effects

Indicators	Original Sample (O)	Sample Mean (M)	Standard Deviation	T statistics	P values
HSI → SE → EI	0.081	0.080	0.036	2.262	0.024

Source: by authors, 2022

Table 5: Total Indirect Effects

Indicators	Original Sample (O)	Sample Mean (M)	Standard Deviation	T statistics	P values
HSI → EI	0.081	0.080	0.036	2.262	0.024

Source: by authors, 2022

Table 6: Path Coefficients of Mediator

Indicators	Original Sample (O)	Sample Mean (M)	Standard Deviation	T statistics	P values
SN*HSI → SE	0.158	0.157	0.065	2.437	0.015
SN → SE	0.573	0.577	0.048	11.918	0.000
HSI → SE	0.140	0.139	0.062	2.273	0.023

Source: by authors, 2022

From Table 6, the P-values of the relationship Subjective norm affects Self-efficacy is 0.000 < 0.05, showing that Subjective norm impacts on Self-efficacy. Regression coefficient Original Sample (O) = 0.573 > 0 shows that Subjective norm has a positive effect on Self-efficacy. The P-values of the relationship Human-system interaction affects Self-efficacy is 0.023 < 0.05, showing that Human-system interaction impacts on Self-efficacy. Regression coefficient Original Sample (O) = 0.140 > 0 shows that Human-system interaction has a positive effect on Self-efficacy. Moreover, P-values of the moderating relationship Subjective norms*Human-system interaction affects Self-efficacy is 0.015 < 0.05, showing that Subjective norm*Human-system interaction has an impact on Self-efficacy. Thus, the Subjective norm has the moderating role from Human-system interaction to Self-efficacy. Original Sample regression coefficient (O) = 0.158 > 0 shows that increasing Subjective norm will increase the impact of Human-system interaction on Self-efficacy. Therefore, hypothesis H4 is accepted.

The studies of Cohen (1988) and Faul et al., (2007) were used to evaluate the coefficient of determination (r^2), determining that the f^2 values were equal to 0.02, 0.15, and 0.35 are considered small, medium, and large effects.

Table 7 presents the effect levels of relationships:

- Subjective norms on Self-efficacy ($f^2 = 0.443$): has a large effect.
- Self-efficacy on EI ($f^2 = 0.440$): has a large effect.
- Human-system interaction*Subjective norms on Self-efficacy ($f^2e = 0.060$): has a small effect.
- Human-system interaction on Self-efficacy ($f^2 = 0.025$): has a small effect.
- Human-system interaction on EI ($f^2 = 0.010$): has a very small or no effect.

According to the responses, Table 8, the construct Self-efficacy presented an R^2 of 0.430, the construct EI presented an R^2 of 0.369, both of which were accepted.

Figure 2 shows the model that was developed as a result of this research. The path coefficients and significance levels for each hypothesis are indicated by the numbers in the arrows. The standard error and f square generated by the bootstrapping procedure were used to determine the importance of the paths. For the PLS-SEM and linear regression models, Table 9 compares the root mean squared error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE), and Q^2 Predict values (LM). For RMSE, MAE, and MAPE, the results demonstrate that PLS-SEM has higher error values than LM, indicating that PLS-SEM has low out-of-sample predictive power, with the exception of SE2. It was further confirmed in Table 9, where the Q^2 Predict values for PLS-SEM and LM show that PLS-SEM values are slightly lower than LM values except for SE2, but those were positive and greater than zero. There are a few explanations for this. PLS Predict produces case-specific predictions on the composite model level[93]. The PLS-SEM model of this study is complex as this includes both single-order and second-order formative constructs and used reflective indicators. Besides, the number of observations used (1950) was large in this study. Large sample size in PLS-SEM has the likelihood to detect some misspecifications[94]. Literature suggested that PLS-SEM offers a better solution with a small number of observations used with many constructs and many items[95], and the PLS Predict approach is useful when the dataset is very small partitioning is problematic[93].

DISCUSSIONS

Human-system interaction is associated with one's successful experience of one's ability to directly get in touch with the realities being studied[51,52]. Willy C. Kriz (2003)[96] and other studies document a positive relationship between human-system interaction and self-efficacy, Table 10. In the same manner, we postulated that human-system interaction increases the level of self-efficacy using BSG (H1). Our data failed to confirm this direct relationship but after further analysis, we found that human-system interac-
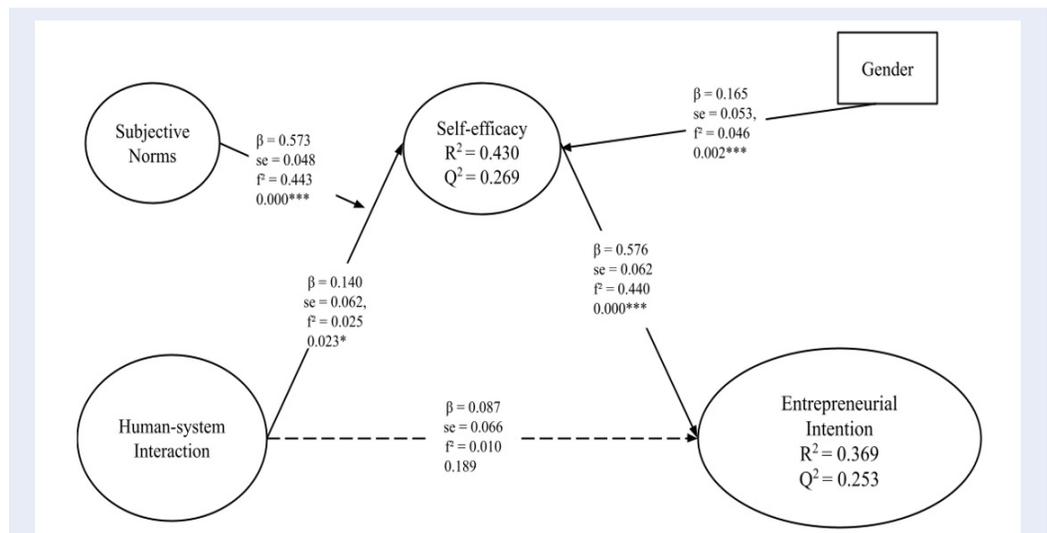
Table 7: Effect size (f square)

	EI	HSI*SN	SE	HSI
EI				
HSI*SN			0.060	
SE	0.440			
HSI	0.010		0.025	
			0.443	

Source: by authors, 2022

Table 8: Result R square and R square Adjusted

	R Square	R Square Adjusted
EI	0.369	0.359
SE	0.430	0.418

Source: by authors, 2022

Figure 2: Structural Model[a]

[a] *Notes: ***: Significant at 0.001 level; ** Significant at 0.01 level; * Significant at 0.05 level; dashed lines are not significant. Source: by authors, 2022*

tion indirectly impacts self-efficacy through subjective norms which is a full moderator.

We expected that a higher level of human-system interaction can develop students' entrepreneurial skills and encourage them to undertake entrepreneurial activities. Mummalaneni (2005)[97] found that website design elements, including layout organization, display, and signage, have a positive effect on users' stimulation. In support of this notion, the data collected validate that human-system interaction has a positive effect on EI (H2). This finding also speaks to the publishers about the importance of improving the design of simulation games to develop students' system interaction and their EIs.

The study's findings among university students demonstrates that higher levels of confidence as a result of simulation games would boost learners' EI. Trevelyan (2011), Chen et al. (1998), and Boyd & Vozikis (1994)[67–69] found that a high level of competence boosted their intention to pursue entrepreneurship as a future career. Self-efficacy has been demonstrated to have a significant impact on people's abilities to become entrepreneurs, their efforts to start a new business, their tenacity in the face

Table 9: PLS Predict test results

	RMSE		PLS	MAE	MAPE		Q^2_predict	
	PLS	LM	PLS	LM	PLS	LM	PLS	LM
EI3	0.752	0.745	0.612	0.607	17.325	16.797	0.135	0.151
EI2	0.791	0.784	0.651	0.602	18.477	16.929	0.183	0.197
EI1	0.815	0.793	0.665	0.617	19.785	17.621	0.183	0.226
SE1	0.739	0.731	0.606	0.587	17.479	16.896	0.219	0.235
SE3	0.807	0.770	0.645	0.626	19.602	18.587	0.256	0.322
SE2	0.782	0.797	0.609	0.633	20.053	20.358	0.302	0.276

Note: MAE = mean absolute error; PLS = partial least squares; LM = linear model.
Source: by authors, 2022

Table 10: Synthesis of the Study Hypotheses Tests

Hypothesis	Description	Result
H1	Human-system interaction has a positive effect on Self-efficacy	SUPPORTED
H2	Human-system interaction has a positive effect on EI	NOT SUPPORTED
H3	Self-efficacy has a positive effect on EI.	SUPPORTED
H4	Human-system interaction has a positive effect on Self-efficacy and will be moderated by Subjective norms	SUPPORTED

Source: by authors, 2022

of change, and their resilience in the face of change in the past, the difficulty of starting a new business and its success in fulfilling its job and mission. We found supporting evidence that self-efficacy has a positive effect on students' EI (H3)

Finally, subjective norms is defined as perceived social pressure to perform or not to perform a particular behavior[78]. Subjective norm has been linked to evaluations of learners' usefulness in a good way[98]. In this paper, we argue that when using BSG, learners' self-efficacy is boosted by the subjective norms that comes with social pressure. Furthermore, students' self-efficacy is not only influenced by the environment but also the features, or additive studying interactions with software. Thus, our data provide supporting evidence for our argument that the human-system interaction has a positive impact on self-efficacy which is supported by subjective norms within the context of BSG, not examined by previous studies (H4). This result indicates that positive motivational communications provided by the people surrounding students which combines with a great interactive system can increase students' confidence in their own abilities to perform entrepreneurship.

CONCLUSIONS

Limitations and future research

Despite the fact that this paper has a number of significant contributions, the acknowledgment of its shortcomings must not be taken for granted. These limitations also suggest the directions for further research. *Firstly*, due to the lack of universities in Vietnam applying BSG as a teaching method, the range of respondents who participate in the survey is exceedingly undiversified, with the majority from UEH University and Southern universities. Validating this model in other locations, such as extending to North and Central Vietnam, will augment the body of knowledge and enrich our understanding about elements of business-based gamification appreciably influencing students' EI. Consequently, future research may authenticate the model and hypotheses presented above in other locations.

Secondly, owing to the fact that the number of students who have been playing BSG before is scant, data analysis is conducted from a small size of the sample. Accordingly, future research could collect data in a larger size, especially respondents with entrepreneurial experiences.

Thirdly, this study only focuses on investigating the relationship between proficiency in BSG and EI which is based on one factor of SDT (namely, competence). Thus, future research might magnify the research

model to comprise other factors of SDT such as autonomy or/and relatedness to completely understand the power of intrinsic motivation in the case of BSG and its functions to create EI. Furthermore, BSG mentioned in this study in general definition, means that the research does not thoroughly point out the name of the game that is being investigated and the related domain of business. Hence, future research could scrutinize the research model and hypotheses presented above with regard to more specific games which simulate the risk-free economy, remarkably in more exclusive fields and departments such as Logistics, Marketing, etc. to have deeper expertise about users' EIs in terms of distinctive business-based gamification.

Finally, in this study, we have focused on only two types of external conditions (namely, subjective norms and simulation design). However, other types of conditions exist. Therefore, future research could focus on examining other types of exterior stipulation such as human-human interaction (peer-to-peer interaction, tutor-student interaction), reward, punishment... to fully comprehend the relationship between independent and dependent variables from all aspects.

ABBREVIATIONS

SDT: Self-Determination

BSG: Business Simulation Games

AOM: Academy of Management

ABSEL: Association for Business Simulation and Experiential Learning

SOR: Stimulus-Organism-Response

EI: Entrepreneurial Intention

AVE: Average

MAE: mean absolute error

PLS: partial least squares

LM: linear model

SEM: Structural Equation Modeling

HSI: Human-System Interaction

SN: Subjective norms

RMSE: Root mean squared error

MAPE: Mean absolute percentage error

SE: Self-efficacy

UEH: University of Economics Ho Chi Minh City

H1, H2, H3…: Hypothesis

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHORS' CONTRIBUTION

- Author Hoang Cuu Long is responsible for the following components: Literature review, result intepretation and suggesting policy implications.

- Authors Vo Thi Hong Nhung, Nguyen Thi Nha Quynh, Bui Nhat Thien Thanh, Le Nguyen Yen Nhi are responsible for the following components: data analysis, suggesting policy implications, drafting and editing the manuscript.

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Bài nghiên cứu

Tác động của trò chơi mô phỏng kinh doanh đến ý định khởi nghiệp của sinh viên Việt Nam

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TÓM TẮT

Tại Việt Nam, trò chơi mô phỏng kinh doanh đã được khẳng định là một công cụ học tập kinh doanh rất hiệu quả cho giáo dục khởi nghiệp. Tuy nhiên, ít nhà giáo dục vận dụng đúng cách để khơi dậy khát khao học tập khởi nghiệp của sinh viên. Bài viết này nhằm mục đích khám phá vai trò của sự tương tác giữa con người và hệ thống và các chuẩn mực chủ quan (bên ngoài) với năng lực bản thân (nội tại) trong việc xây dựng ý định khởi nghiệp của sinh viên bằng cách sử dụng các lý thuyết về Quyền tự quyết (SDT) và Phản ứng kích thích (SOR). PLS-SEM được sử dụng để phân tích dữ liệu thu thập được từ 195 sinh viên chưa tốt nghiệp từ các trường đại học kinh doanh phía Nam của Việt Nam. Kết quả cho thấy sự tự tin vào năng lực bản thân đóng vai trò hòa giải đầy đủ giữa sự tương tác giữa con người và hệ thống và ý định kinh doanh. Ngoài ra, chuẩn chủ quan tác động tăng cường sự tương tác giữa con người và hệ thống đối với năng lực bản thân, điều này ngụ ý rằng chuẩn chủ quan đóng vai trò điều hòa trong mỗi liên hệ này. Những phát hiện của nghiên cứu sẽ cung cấp các ứng dụng thực tế cho ban quản lý của các trường đại học, các nhà thiết kế trò chơi và các nhà nghiên cứu trong tương lai để tập trung vào phát triển tinh thần kinh doanh phù hợp với các giá trị của sinh viên.

Từ khoá: Trò chơi mô phỏng kinh doanh, ý định khởi nghiệp, năng lực bản thân, thiết kế mô phỏng, sinh viên Việt Nam

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