

A METHODOLOGY FOR ANALYZING THE EDUCATIONAL VALIDITY OF BUSINESS SIMULATION USING VALUE GENERATION MODELS

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Abstract

The value of business simulations as pedagogic tools in education has been debated for over twenty years. This paper proposes a methodology for analyzing and understanding in-depth the educational validity of business simulations. It is based on Principal Component Analysis and Structural Equation Modelling, which are used for estimating models of educational value generation. The proposed methodology has been used for analyzing the educational validity of a business game conducted among students using the well established marketing strategy simulation package MARKSTRAT. It was found that such a simulation does indeed create value for participants and helps them to develop strategic marketing skills. We identified three types of educational value generated: capability for experimentation with strategic marketing, understanding of relevant concepts and creation of professional skills applicable and useful in future real life job situations. Also, the relations among these types of educational value have been examined. It was found that the experimentation has a very strong impact on the understanding of concepts, and both of them have medium to high direct impacts (of similar magnitudes) on professional skills development. Finally, it is the perception of the participants about the professional skills applicable in their future jobs they acquired in the business simulation game that determines their overall impression and level of satisfaction.

Keywords: business simulation, educational validity, strategic marketing, value generation model

1 Introduction

The growing use of business simulation in the last twenty years as a pedagogic tool can be attributed mainly to the fact it exposes students to real, immediate and spontaneous decision-making situations in a controlled environment, creating an environment for experimentation and experiential learning of business management concepts and methodologies (Clark et al., 2003; Clark, 2009). However, whether and to what degree participants in simulations gain some meaningful learning, is a topic that has been exciting considerable debate for over twenty years (Faria and Wellington, 2005; Clark, 2009; Anderson and Lawton, 2009; Stainton et al, 2010). Anderson and Lawton (2009), even go so far as stating that ‘little progress has been made in our knowledge of learning outcomes’ of computer-based business simulations. The validity of business simulation as an effective pedagogical tool for teaching has been explored for a long time by many scholars; however the quality of research is often questioned as for instance, Keys and Wolfe (1990) argue that “Many of the claims and counterclaims for the teaching power of business games rest on anecdotal material or inadequate or poorly implemented research designs”. After this initial questioning in the early part of the new millennium, later Clark (2009) still states that studies on the educational merits of business simulation ‘have not yet produced firm conclusions’. Swaak and de Jong (2001), Gosen and Washbush (2004), Bell et al. (2008) and Anderson and Lawton (2009) suggest that researchers should conduct more in-depth

research into understanding the effect of simulations on various educational outcomes, such as conceptual learning, transferability and adaptability amongst others as measures of knowledge acquisition.

This paper proposes a methodology for analyzing and understanding in-depth the educational validity of business simulations. It is based on the construction of a 'value generation model' theoretically founded on the broader framework proposed by Stainton et al. (2010). The proposed methodology has been used for analyzing the educational validity of a business game conducted among students using the well established marketing strategy simulation package MARKSTRAT. In particular, using learners' assessments of many different educational value measures, the main types of educational value generated are identified, and their magnitudes as well as the relations amongst them are estimated, leading finally to the construction of a 'value generation model', which allows a better understanding of the whole educational value generation mechanism.

This paper is organized in six sections. In the following section 2 reviews briefly relevant literature, while in section 3 is presented the proposed methodology for analyzing and evaluating the educational validity and value of the business simulation. In the following section 4 data collection is described. The data analysis and the main findings are then presented and discussed in section 5. In the final section 6 key conclusions are drawn and their implications for educators are discussed.

2 Review of Literature

The investigation of the educational validity of business simulations as teaching approach has been for long time a critical question among researchers and managers (Faria, 2001; Gosen and Washbush, 2004; Chin et al., 2009). However, Carvalho (1991) has opined that there is a clear lacuna of a well-accepted theory or methodology when considering the validity of a business simulation, and this argument has been put forward many times. For instance, Stainton et al. (2010) in one of their recent studies have also stated that the methodology of assessing the validity of a business simulation is an open question that has yet to be tackled conclusively.

In a bid to solve this problem, many researchers have proposed various methodologies and frameworks to further strengthen the validity of the research in business simulations. For instance, Burns et al. (1990) divide the concept of educational validity of experiential pedagogies into three components: internal validity, external validity, and transfer-internalization validity. For them, internal validity is about learning the specific materials that are taught, external validity is about applying that learning to a different exercise, and transfer-internalization validity is about applying it in real life in a learner's career. Feinstein and Cannon (2002) divided the simulations' educational validity into only two components, i.e. internal validity and external validity. For them, internal validity is about understanding whether a simulation functions in the manner it was anticipated with respect to its direct outcomes, and external validity relates internal functioning with corresponding phenomena outside the simulation.

Recently, Stainton et al. (2010) have suggested a research methodology framework to validate the educational effectiveness of the business gaming simulation. In particular, they have proposed that such validity studies should investigate, a) the internal educational validity (Burns et al., 1990; Feinstein & Cannon, 2002; Norris, 1986), i.e. whether a simulation can provide and enhance student understanding concerning the main concepts and their interrelationship and dynamics that exist within a business environment, b) external educational validity (Burns et al., 1990; Feinstein and Cannon, 2001; Wolfe, 1976), i.e. whether this understanding relates to and is useful for the real-world business phenomena and c) external representational validity (Carvalho, 1991; Dickinson & Faria, 1994), i.e. whether the simulation reflects or models adequately the real-world business environment.

With respect to the first one, Stainton et al. (2010) has proposed that internal educational validity of a simulation depends on participant's understanding with respect to the results that occurred within the simulation. The understanding of the participant is directly related to the consequence of their decisions and analysis regarding the simulated environment, for e.g. the financial results achieved. On

other hand, we can confirm the external educational validity of a simulation if there is strong evidence indicating that participants perceive that the experiences within the business simulation have changed their attitudes and skills regarding business management in the real world. For this reason they have recommended that the analysis should be based upon the key areas of business management, such as strategic management and marketing management. Lastly, if the participants are able to relate the business simulation to the real-world business environment then the external representational validity of a simulation can be acknowledged. For this reason Stainton et al. (2010) have suggested that the levels and variations of business performance and their causes within the simulation package should replicate those that occur in the real-world business environment. Moreover, key parameters such as decisions, information and business analysis is also required to be comparable with real life.

Considerable research has been conducted for examining and understanding the educational validity and value of business simulations using various approaches and methodologies; comprehensive reviews of this research are provided by Wolfe (1997), Faria (2001), Gosen and Washbush (2004), Anderson and Lawton (2009) and Chin et al. (2009). Faria (2001) divides this research into three streams dealing respectively with factors affecting simulation performance, with effectiveness of business games/simulations and with what business games/simulation really teach. Gosen and Washbush (2004) propose another categorization of this research into five streams:

- I. Studies assessing the validity of games in strategic management/business policy courses;
- II. Studies assessing the simulation in terms of the acquisition of the skills that the simulation author proposed would be accomplished;
- III. Studies focusing on the performance of players who actually make decisions as compared with making random decisions;
- IV. Studies comparing player decisions with those expected by the simulation;
- V. Studies assessing external validity.

However, a common conclusion of the above literature review is that although considerable empirical research has taken place, further empirical methodologically sound research across multiple games will allow researchers to better understand the validity of simulations in teaching and learning. This empirical study attempts to contribute to the base of simulations research by proposing a methodology based on the construction of a 'value generation model'. This has taken on the broader framework proposed by Stainton et al. (2010).

3 Methodology – Construction of Value Generation Models

The proposed methodology for analyzing the educational validity and value of the business simulation MARKSTRAT, consists of the following six stages:

- I. Taking into account the relevant literature, a number of educational value measures are selected, which measure various aspects of the educational value generated by the game for the students.
- II. Based on the above value measures an evaluation questionnaire is formulated, including one question for each value measure, which is distributed to the students to be filled after the end of the simulation game.
- III. A Principal Components Analysis (PCA) of the above evaluation data is performed. If the principal components extracted can be interpreted from an educational viewpoint, then they correspond to the main types of educational value generated by this business simulation.
- IV. For each of the above identified types of educational value, a new aggregate variable is calculated, equal to the average of its corresponding variables (i.e. the variables scoring high on this principal component and low on all the others), which quantifies this type of educational value. Then for each aggregate variable its mean is calculated over all the

participant students, which is an estimate of the magnitude of this type of educational value generated in this business simulation.

- V. The relations between the above identified types of educational value are estimated using Structural Equation Modelling (SEM) (Hair et al, 1998; Kline, 2010). Each type is viewed as a reflective construct, which is reflected by its corresponding variables. The hypothesized relations among the constructs (types) are based on the framework for research on educational validity of business simulation proposed by Stainton et al. (2010). In particular, the identified (in stage III) value types are divided into two groups: the ones associated with internal validity (i.e. having to do with understanding and learning of various business concepts within this particular business simulation exercise) and the ones associated with external validity (i.e. having to do with the usefulness of this learning outside this particular business simulation exercise for improving job performance). Relations from the internal validity constructs (value types) are then hypothesised against the external validity ones, assuming that concepts' understanding and learning during the business simulation can result in performance improvements in the real work environment; we can also hypothesize relations among the constructs (value types) of each group.
- VI. Finally the findings of the above stages IV and V are combined in order to construct a value generation model, which includes the magnitudes of the types of the educational value generated, and also the relations among them, to draw final conclusions from it concerning the educational value generation mechanism.

4 Data Collection

With respect to the selection of a business simulation package, MARKSTRAT was selected, because it has been in use for more than three decades and continues to be a worldwide leader in interactive marketing simulations (Gatignon, 1997). The philosophy and rules for the simulation are very easy to understand and execute. In the simulation, several teams of students compete against each other (usually five or six in each "world"). Each team manages a company and competes against the other teams within a set of pre-defined rules. They are required to work with new product introduction, starting from the stage of designing to branding and finally marketing it in two different markets along with a budget. The final assessment of success is based on the increase achieved in the Stock Price Index and therefore on the growth in return to shareholders. (Burns, 1997; Gatignon, 1987). The game progresses through a series of rounds (up to 9 – 15 virtual "rounds" or decision periods) over a period of 3 – 4 days, in which, each team makes various strategic decisions in various areas ranging from production, market research and distribution to R&D and sales, and then views the results (depending on their decisions and also on competitors' decisions).

Through an in-depth review of the literature on simulation learning and its educational validity (see section 2) a number of measures of the educational value generated by this business simulation game were initially selected (methodology stage I). They were validated through in-depth personal interviews with four experts who have used business simulation software extensively. Based on their remarks a new form of the questionnaire was prepared. The instrument was based upon a Likert scale of 1 – 7. After this the pilot test of the preliminary questionnaire took place with 32 UK-based management students. Items that were considered as either problematic or ambiguous were either revised or eliminated and replaced with appropriate one. After these, changes, the questionnaire was finalized for the survey and given to 305 students (over five years) who had participated in a business simulation game. Each one of them filled and returned the questionnaire providing useful evaluation data (methodology stage II). This final form of the questionnaire is shown in the Appendix.

5 Data Analysis

5.1 Principal Component Analysis – Types of Educational Value

The data collected were subject to factor analysis using the Principal Component Method in order to identify the main types of educational value generated in this business simulation game (methodology stage III). The KMO Measure of Sampling Adequacy (0.955) and the Bartlett's test of sphericity ($p < 0.001$) indicated that factor analysis was valid. Four factors were extracted from these twenty eight items using the Varimax Rotation method, having eigenvalues greater than 1. The four factors that emerged out of the analysis are interpretable from an educational viewpoint as: Conceptual Understanding, Experimentation (Experience Generation), Skills Development and Overall Impression. The factors (principal components), their respective items and their corresponding factor loadings are shown in Table I (columns 1, 2 and 3 respectively).

Factors	Items	Loading	Mean
Concepts Understanding	Market Competition	.657	5.18
	A Strategic Perspective	.700	4.91
	Theoretical foundations of Market Behaviour	.619	4.80
	Marketing Communications	.493	5.09
	Distribution	.491	5.12
	Pricing	.603	5.42
	Product Management	.713	5.11
	Managing Information	.677	5.82
	Financial Issues	.679	4.72
	Concepts Understanding aggregate variable		
Experimentation/ Experience generation	Experiment with marketing ideas	.575	5.03
	Take risks I could not take in a real business	.669	5.66
	Experience a range of marketing activities	.660	5.10
	Experimentation aggregate variable		
Skills Development	Work in a realistic environment	.502	4.26
	Evaluate the success of particular strategies that were adopted	.601	4.93
	Learn issues that I would not normally have picked up in a classroom situation	.529	5.33
	Recognise the difference between tactics and strategies	.571	4.73
	Learn to analyse information more effectively	.637	5.17
	I will be able to use the skills absorbed in business future jobs	.728	4.93
	I will be able to work more effectively in groups	.492	5.09
	I will be able to critically evaluate marketing data	.703	5.04
	I will be able to use information more effectively	.683	5.16
	I will be able to use the skills gained in other parts of the course	.727	4.85
Skills Development aggregate variable			4.95
Overall Impression	Motivated me to want to succeed in the simulation	.714	5.27
	Motivated me to learn about business and marketing strategies	.620	4.97
	I find this type of experience conducive to learning effectively	.677	5.01
	I find a competitive environment helpful in learning marketing and business issues	.640	5.36
	This type of learning requires total immersion in the exercise	.699	5.45
	Overall I found the exercise useful	.564	5.24
	Overall Impression aggregate variable		

Table 1. Factors, Corresponding Items with Factor Loadings and Average Assessments

In Table II we can see for each factor its eigenvalue (column 3) and the percentage of the total data variance it explains (column 4). In total these four factors explain 63.46% of the variance of the data.

Factors	Reliability (Cronbach's Alpha)	Eigenvalue	% of Variance	Cumulative % Variance
Conceptual Understanding	.889	13.593	48.548	48.548
Experimentation/ Experience generation	.861	1.896	6.770	55.318
Skills development	.924	1.255	4.484	59.802
Overall Impression	.913	1.024	3.657	63.458

Table 1. Factors, Reliability analysis, Eigenvalues, Percentage of Variance and Cumulative Percentage of Variance

In particular, these four factors, taking into account the items scoring high on each of them, can be interpreted from an educational viewpoint as follows:

1. Concepts Understanding: The first factor includes items associated with understanding concepts of critical importance for strategic marketing. As one of the main objectives of this simulation is to understand the main concepts involved in formulating marketing strategy, such as market competition, pricing and distribution, marketing communications, management of relevant information, etc. This factor resembles the cognitive aspect of experiential learning and it also covers the dimension of internal educational validity (Norris, 1986; Burns et al. 1990; Feinstein and Cannon, 2001; Whiteley et al., 2004; Anderson and Lawton, 2009; Stainton et al. 2010).
2. Experimentation - Experience Generation: The second factor includes items associated with experimentation with strategic marketing and generation of relevant experiences. The computer-based business simulation gives the participant a chance to experiment with various marketing activities and to make decisions on various relevant issues gaining valuable experience. This is in line with the concept of internal validity as well, as defined by Stainton et al (2010) and also Pasin and Giroux (2011), since it is associated with an educational achievement within the business simulation game.
3. Professional Skills Development: The third factor identified through factor analysis is associated with the applicability and usefulness of the learning gained in the particular business simulation game outside it in real life in the future professional careers of participants. It is in line with the concept of transfer-internalization validity of the simulation as proposed by Burns et al. (1990) and external validity as defined by Dickinson and Faria (1994), Feinstein and Cannon (2002) and Stainton et al. (2010).
4. Overall Impression: Lastly, the fourth factor identified is associated with the overall impression of the participant from the whole business simulation game. It reflects participants' overall satisfaction from the motivation and learning provided to them by this simulation environment. This perceived usefulness enables the researchers to understand the perceived overall value of simulation as an effective pedagogical tool for learning strategic marketing.

Summarizing, the above factor analysis identified three main types of educational value generated in the business simulation game: experimentation with strategic marketing, understanding of relevant concepts and creation of skills applicable and useful in future real life job situations. Also, it identified one more factor reflecting participants' overall satisfaction.

5.2 Calculation of Magnitudes of Educational Value Types

For each of the above four factors an aggregate variable, equal to the average of its variables was calculated. After that for each individual and aggregate variable its mean over all participating

students was calculated, which provides a measure of the magnitude of the corresponding educational value aspect or type (methodology stage IV). The results are shown in the fourth column of Table I. Taking into account that all these variables are in a Likert scale 1 to 7, the two extreme levels 1 and 7 indicate very low and very high levels of perceived value respectively, while levels 2 and 6 indicate low and high levels of value, levels 3 and 5 indicate moderate to low and moderate to high value, and finally level 4 indicates moderate perceived value. Therefore from the above results it can be concluded that participants on average perceive more than moderate to high concepts understanding and experimentation value (means 5.13 and 5.26 respectively). They also perceive on average slightly less than moderate to high professional skills development value (mean 4.95). Finally, they perceive little more than moderate to high overall educational value generated in this game (mean 4.95). Furthermore, in all four factors there are remarkable differences between the means of their component variables, which means that for each of the identified educational value types, strengths can be identified (i.e. corresponding to individual variables with higher means) and weaknesses (i.e. corresponding to individual variables with lower means). For instance with respect to the concepts understanding value as a strength of this business simulation, participants felt quite strongly about its capability in helping them to understand information management and pricing concepts (means 5.82 and 5.42 respectively). At the same time this business simulation seems weaker in helping participants understand financial issues and the theoretical foundations of market behaviour (means 4.72 and 4.80 respectively).

5.3 Estimation of relations between types of educational value

Based on an in-depth review of the relevant literature (section 2), and also the results of the above factor analysis that identified the four factor structure, a conceptual model of relations among these educational value types has been formulated, which is shown in Figure 1, and then estimated based on participants' evaluation data (methodology stage V). In the proposed model, it is hypothesized that experimentation in the form of the computer-based simulation game will help the students acquire a better conceptual understanding of strategic marketing (hypothesis H1). Experimentation and concepts understanding (both associated with internal validity) will both help them to acquire skills applicable and useful in real life job situations in their future career (this being associated with external validity), based on the framework proposed by Stainton et al. (2010) (hypotheses H2 and H3). Finally we expect that all these three types of educational value (experimentation, concepts understanding and professional skills development) will contribute to positive overall impression and educational value perception of the participants (hypotheses H4, H5 and H6).

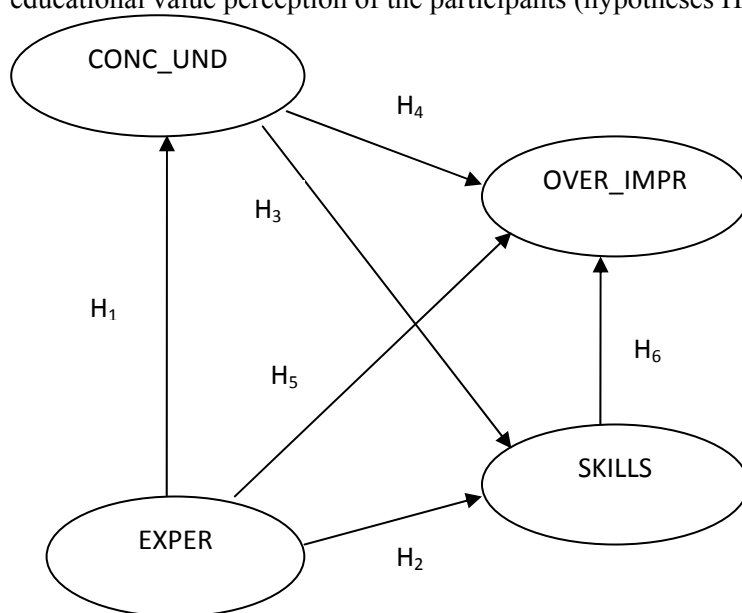


Figure 1. Hypothesized relationships model

An estimation of the paths of the above model and a rigorous test of all the formulated hypotheses was performed through SEM (Hair et al, 1998; Kline, 2010). In order to validate all the constructs under investigation, before performing SEM, Confirmatory Factor Analysis (CFA) was performed by using the AMOS 16.0 software. The results are shown below in Table 3. Overall, we can see (in the third column) that all items loaded significantly and substantially on their underlying constructs, thus providing evidence of convergent validity; for this reason all items were retained in the model (there was no need for ‘purification’). In order to assess the overall model fit without being affected by sample size, the fit indices which are less sensitive to sample size according to the literature were used; these indices included the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) (Joreskog and Sorbom, 1993; Browne and Cudeck, 1993; Kline, 2010). This literature recommends that in order to have a good model fit GFI should be higher than 0.90, AGFI higher than 0.80, CFI higher than 0.9, and RMSEA less than 0.05 (Joreskog and Sorbom, 1993; Hair et al., 1998). An assessment of the measurement model indicated an acceptable model fit (GFI = 0.900; AGFI = 0.872; CFI = 0.969; RMSEA = 0.042).

To assess the reliability of the constructs composite reliability (CR) was used. All the constructs’ composite reliability values (shown in the fourth column of Table 3), ranging from a low of 0.829 to a high of 0.919, exceeded the recommended cut-off value of 0.80 mentioned in the literature (Fornell and Larcker, 1981; Joreskog and Sorbom, 1993; Hair et al., 1998). Finally for each construct the average extracted value was calculated (shown in the fifth column of Table 3). The values for the extracted variance in all the constructs exceed the recommended cut-off level of 0.5 as suggested by Fornell and Larcker (1981) and also Bagozzi and Yi (1988), this being another indication of convergent validity. In addition, an assessment of discriminant validity has been made by examining the results of the PCA described above. For each factor all the pertaining items have high loadings (higher than 0.5) while all the other items have much lower loadings, so the existence of discriminant validity can be ascertained. Together the results of the above tests for reliability, convergent validity and discriminant validity provide evidence of internal and external validity of the scales used in this study.

Construct	Items	Standardized Loadings	CR	AVE
Conceptual Understanding	Market Competition	0.698**	0.906	0.518
	Strategic Perspective	0.736**		
	Theoretical foundation of Market Behaviour	0.717**		
	Marketing Communic.	0.713**		
	Distribution	0.615**		
	Pricing	0.792**		
	Product Management	0.824**		
	Managing Information	0.728**		
Experimentation	Financial Issues	0.628**	0.829	0.618
	With marketing ideas	0.792**		
	Take risks	0.778**		
Skills development	With marketing activities	0.787**	0.919	0.532
	Work in realistic environ.	0.694**		
	Evaluate success of strat.	0.745**		
	Learn issues	0.796**		
	Recognise diff. between tactics and strategies	0.672**		
	Learn to anal. information	0.711**		
	Use the skills absorbed in business future jobs	0.846**		
	To work more effectively in groups	0.562**		
To critically evaluate	0.74**			

	marketing data			
	To use information more effectively	0.745**		
	To use the skills gained in other parts of the course	0.750**		
Overall Impression	Motiv. to succeed in the simulation	0.743**	0.905	0.619
	Motiv. to learn about business/marketing strateg	0.852**		
	Conducive to learning effectively	0.895**		
	Helpful in learning marketing/business issues	0.782**		
	Motiv. total immersion	0.526**		
	I found the exercise useful	0.865**		

*Table 3. Results of the validation of the measurement model
(Note: ** denotes significance at $p < 0.01$)*

Since no problem was observed in the measurement model, structural equation modelling was then employed to estimate together all the path coefficients (Anderson and Gerbing, 1988; Kline, 2010) using the AMOS 16.0 software again, through Maximum likelihood (ML) estimation. The major results (structural part of the model – statistically significant paths among constructs) are shown in Figure 2 below. The overall fit of the model is acceptable since all the measurement of fit are within the acceptable limit ($\chi^2 = 487.161$, $p = 0.001$; GFI = 0.900; AGFI = 0.872; CFI = 0.969; RMSEA = 0.042).

From the above results the following conclusions can be drawn:

- The experimentation and experience value generated by the tool has a very strong impact on the concepts understanding value it generates (standardised coefficient 0.706). Therefore hypothesis H1 is supported. This clearly indicates that experiential learning in this business simulation game can be quite effective in not only generating experiences in an artificial environment but also leads to an understanding of the relevant management concepts.
- Both the experimentation and experiences value and the concepts understanding value have medium to high direct impacts (of similar magnitudes) on the skills development value generated (standardised coefficients 0.528 and 0.417). Therefore hypotheses H2 and H3 are supported. Therefore experimentation and experiences value generated by the tool affects the skills development value it generates both directly and indirectly (through the concepts understanding value generation): the total effect is $0.528 + 0.706 * 0.417 = 0.822$, so 64% ($0.528/0.822$) of it is direct, while the remaining 36% is through the concepts understanding it drives. This implies that if due emphasis is given to a computer-based business simulation in management education, the experiences and concepts understanding it offers can lead to the development of much required professional skills that can improve job performance, such as handling marketing research information, team work, discriminating between tactics and strategies, evaluating the success of adopted strategies, etc., in management students.
- Finally the overall impression and satisfaction level of the user depends mainly and quite strongly on the professional skills development (standardised coefficient 0.888). On the contrary the direct effects of experimentation/experiences generation and concepts understanding on the overall impression and satisfaction level are statistically non-significant; so both of them affect participants' overall impression and satisfaction through the professional skills development they drive. Therefore hypothesis H6 is supported, while hypotheses H4 and H5 are not. This indicates that it is the perception of the participants about the applicability of the professional skills they acquired in the business simulation game in their future jobs that determines their overall satisfaction level. In a sense this is essentially a perception and future research will need to follow up participants in real business situations to further validate this further.

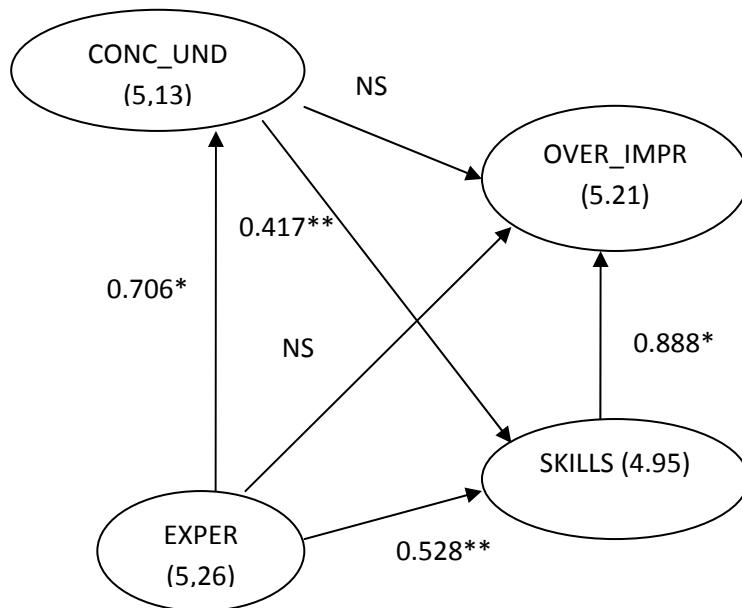


Figure 2. The value generation model
 (Note : ** denotes significant at $p < 0.01$, NS denotes statistically non-significant)

In the above Figure 2 we can see, in addition to the path coefficients (=relations between the types of educational value generated), the mean for each construct as well in parenthesis (= the magnitude of the corresponding educational value type). Therefore the model shown in this Figure constitutes a 'value generation model', which visualizes in a compact and easily comprehensible manner the main types of educational value generated, their magnitudes and also the relations among them (this is the final stage VI of the methodology).

6. Conclusions

The research objective of this paper was to understand to what extent and how computer-based business simulation games, such as MARKSTRAT, are able to generate educational value for students and thereby to validate the use of computer-based business simulation for management education at large. For addressing the above question a methodology based on the construction of a 'value generation model' of the business simulation game, theoretically founded on the broader framework proposed by Stainton et al. (2010), was developed. This value generation model, based on students' assessments of a number of educational value measures, includes the main types of educational value generated, their magnitudes and the relations among them, so it provides a deeper understanding of the educational value generation process.

The proposed methodology has been used for analyzing the educational validity of a business game that was conducted among students based on the well established marketing strategy simulation package MARKSTRAT. In order to tease out educational value generation types, by initially performing Principal Component Analysis (PCA) we identified three types of educational value generated in the business simulation game: experimentation with strategic marketing, understanding of relevant concepts and creation of skills applicable and useful in future real life job situations. In particular, it was found that this simulation leads to better understanding of the relevant concepts of marketing management and this is related to cognitive aspects as described in Hoover and Whitehead (1975) and Anderson and Lawton (2009). Additionally another type of value is associated with the experimentation or experiential value generation, as simulations gives a student a chance to make decisions and to understand the impact of these decisions on the overall profitability of a fictitious company. This is akin to a real-life-manager working under pressure and deadlines to make correct

decisions. In testing an operations management simulation Pasin and Giroux (2011) argue that simulations are more effective in developing decision making abilities in complex and dynamic situations. These two types of educational values identified provide evidence for the internal educational validity of business simulation. The third factor identified through PCA revealed that a simulation indeed helps a student in not only learning and understanding useful concepts in the strategic management domain, but also enhances his/her ability to work more effectively in groups, evaluating and using appropriate marketing data and information and work in a realistic environment. This type of educational value that was identified provides evidence for the external educational validity of the business simulation. Finally, the fourth factor identified is related to the overall impression and satisfaction from the business simulation. In this, it was identified that simulation has been a valued motivator to the student for learning business and marketing strategies, and that this type of experiential learning is quite conducive, effective and useful to the participants. This factor is in line with those studies in past who have given due recognition to the self-motivation as an important part of learning (Gentry, 1990; Jacques, 1995). Tao et al., (2009), however found in their research that, the agency theory failed to be sustained as a useful tool in motivating students' learning activities. This area needs to be studied further.

Additionally, through Structural Equation Modelling (SEM) the relationships among the above types of educational value generated by the business simulation have been identified. It was found that the experimentation and experience has a very strong impact on the concepts understanding value, and both of them have medium to high direct impacts (of similar magnitudes) on professional skills development. Finally, it is the perception of the participants about the applicability of the skills in their future jobs they acquired in the business simulation game that determines their overall impression and level of satisfaction. The above results indicate that the effect of both experimentation/experiences generation and concepts understanding on the overall satisfaction are mediated completely by the development of professional skills that are applicable and practically useful in their future jobs; the participating business students feel that the experimentation/experiences generation and concepts understanding that takes place during the business simulation do have value per se, and have value only to the extent that they lead to applicable and practically useful professional skills that can increase their job performance and result in a more successful career.

There are several limitations of the study that can be addressed by future research. It would make sense to add more constructs in order to understand in even more detail the educational value generated by the simulation, and also the value generation process. It would also be useful to conduct a post simulation study focusing on how useful and relevant are the experience gained and the concepts learnt in business simulation games in real life professional careers of participants. The study could be extended to other kinds of simulations that cover a wider area of management area. Another future direction of study would be around students' personality types or their learning styles in relation to the utility of a business simulation and its effectiveness. This would help to devise different forms of business simulations for different types of students. Finally, similar studies should be conducted for business games amongst professionals, instead of students, who have more knowledge on business concepts and operations, and can better assess the applicability of the skills they gain in real-world business environments, and examine if there will be different results.

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Appendix

Evaluation Survey Questionnaire

“When working with MarkStrat, did you manage to understand the following?”

- P1. Market Competition
- P2. A Strategic Perspective
- P3. Theoretical foundations of Market Behaviour
- P4. Marketing Communications
- P5. Distribution
- P6. Pricing
- P7. Product Management
- P8. Managing Information
- P9. Financial issues

“MarkStrat gave me the opportunity to...”

- OL1. Experiment with Marketing ideas
- OL2. Take risks I could not take in a real business
- OL3. Experience a range of Marketing activities
- OL4. Work in a realistic environment
- OL5. Evaluate the success of particular strategies that were adopted
- OL6. Learn issues that I would not normally have picked up in a classroom situation
- OL7. Recognise the difference between tactics and strategies
- OL8. Learn to analyse information more effectively

“On the basis of this exercise I feel that...”

- II1. I will be able to use the skills absorbed in business future jobs
- II2. I will be able to work more effectively in groups
- II3. I will be able to critically evaluate marketing data
- II4. I will be able to use information more effectively
- II5. I will be able to use the skills gained in other parts of the course

“This type of learning environment...”

- AE1. Motivated me to want to succeed in the simulation
- AE2. Motivated me to learn about business and marketing strategies
- AE3. I find this type of experience conducive to learning effectively
- AE4. I find a competitive environment helpful in learning marketing and business issues
- AE5. This type of learning requires total immersion in the exercise

- OV1. Overall I found the exercise useful