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# ANTECEDENTS FOR LEARNING AND PERFORMANCE IN BUSINESS SIMULATION

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**Abstract:**

**Purpose-** This research seeks to contribute by developing and testing a model that contains the features of the simulation as determinants for it's usefulness as effective teaching tool. Research aims to test the link between ease of use, sanity of the simulation and the perceived level of Negotiation and Conflict during Simulation and their effect on learning and performance.
**Research Methodology-**One hundred fifty seven students of management discipline were divided in twenty six teams of six members each and the end of the simulation; learners were examined through surveys about their perception of different aspects of the simulation experience
**Findings-** The study has given indication that both the sanity and user interface or physical architecture of the simulation is vital features to consider before selection of a simulation. Instructor's role is very crucial in by constructively guiding and facilitating the participants on the profits of strong and vigorous debates of subject matter before making their judgments and in the debriefing sessions.
**Research Limitations-** Research captures perceptions at a specific cross sectional time. Research measures the overall cumulative performance of each participating teams though balance scorecard approach rather than on interval. Role of team characteristics and role of instructor was excluded in research design.
**Originality/Value**-Preparedness of management students with Simulation training is of importance to business organizations and B-schools since simulations permit learners to solve real-world problems, and it offers an opportunity to discover recently attained skills without risk. The research will increase our understanding of the dynamics that define the effectiveness of management simulations and determine the effect of these dynamics on individual learning and team performance.

**Keywords:** Business simulation; Higher Education; Perceived Learning;Performance and Learning , Simulation Based Learning; Technology Enabled Learning

## Introduction

A computer simulation package (web-based or software-based) is a innovative teaching pedagogy that simulates a business decision. Participants in the simulation are required to take a chain of business decisions during the simulation game. Simulation is often mentioned for

bringing positivity in management education (Musselwhite, 2006). Business simulation based teaching is not a radical approach in education (Faria et al.,2009). A huge amount of literature on expected learning outcomes is been identified for and against the utility of simulations for enhanced learning. A majority of research emphasize that using Simulation (web-based or software-based) to supplement conventional teaching has the prospective to enhance students learning, attitudes and behaviors. Learning teaching using simulations can develop workplace competence while growing knowledge and skill (Rhude, 2009). The benefits of business simulations are as Teamworking (Fripp,1997; King and Newman, 2009), Motivation(Fripp,1997), Risk-free environment (Fripp,1997), Quantitative skills (Whiteley and Faria, 1989), Critical thinking (Doyle and Brown, 2000; Lane,1995; Sun, 1998), Negotiation skills (Doyle and Brown, 2000), Time management (Doyle and Brown, 2000).Business simulation has been encouraged as a widespread means of learning in both informal (Kapp, 2006) and formal settings (Lim, 2008; Prensky, 2008).

As majority of research on the learning outcome and advantages of simulations are grounded on simulation participants' learners' perceptions of learning and instructors and not objective assessments, Affective not cognitive learning is measured. So, there is so much discussion on the validity (Anderson and Lawton, 2009; De Freitas and Jarvis, 2007).The detailed examination of literature on the usage of business simulations specifies various apprehensions associated to such simulations in educational settings. The key limitations connected with the use of business simulations emphasize gaming rather than learning (Doyle and Brown, 2000), and focus the hollowness of simulations and, hence, their inclination to be too difficult on critical thinking abilities of participants (Anderson and Lawton, 2009; Wolfe, 2004). Also, the computer based or gaming style is an ineffective pedagogy for certain subjects (Anderson and Lawton, 2009; King and Newman, 2009).

Learning by graduating students from B-schools is recurrently criticized for its inadequate capability to prepare students with skill required for employability (Bennis and O'Toole, 2005; Neubaum et al., 2009). Reason can be the irrelevance of theory being taught or non-applicability of obsolete theory in today's dynamic management world (Chia and Holt, 2008; Ghoshal, 2005); and/or outdated processes used to teach the students (Bennis and O'Toole, 2005; Pfeffer and Fong, 2004). As the Simulation is often mentioned for bringing positivity in management education (Musselwhite,2006).

**Research objective**

A lot of challenges is been discussed in using simulation as a pedagogical tool. Participants in the simulation may "psych out", if they perceive the simulation does not reflect real-life situations(Thompson et al.,1997). If they perceive the simulation as inconsequential, they may not take it seriously(Curry and Moutinho,1992). In addition, simulations is required to be complex enough to reciprocate the realism of modern business and not present a simplified perceptive of business. Altogether, simulation should not be so complex that it becomes tough to see the associations between variables that are used to model real-life and reality. Simulations must have good user-interfaces. For instance, participants in the simulation game should find it easy to input their judgments taken at various levels in the simulation and see how they relatively

ranked and what acute areas of improvement.The whole purpose of this investigation is to increase our understanding of the dynamics that define the effectiveness of management simulations and determine the effect of these dynamics on individual learning and team performance. Research is expecting to reach this objective by including factors like its ease of use, realism and sanity of the simulation and The perceived level of Negotiation and Conflict during Simulation.

This research seeks to contribute to that understanding by developing and testing a model that contains the features of the simulation as determinants for the usefulness of simulations. We extend this line of research by testing the link between ease of use, realism and sanity of the simulation and the perceived level of Negotiation and Conflict during Simulation and their effect on learning and performance.

**Review of Literature and framing hypothesis**

*Sanity of Simulation*-Many researchers have scrutinized concerns in the use and adoption of new information technologies and based on that literature we try to extrapolate and understand how architecture and interface of a simulation affects learning and behaviors.User's acceptance of new technology is reliant on two important factors: perceived ease of use and usefulness of a system (Davis, 1989; Venkatesh and Davis, 2000). People may have more positively inclined attitude for using a system when they perceive usefulness and ease of use for the system(Martins and Kellermanns, 2004). Users will have a tendency to summarize a simulation more useful when they perceive that the simulation replicates real life. A perfect simulation should be a reasonable generalization of the real world with association among their decisions and results. A simulation must be integrated and address the difficulties that are characteristic of businesses but not so difficult that users are incapable to links the abstractions and reality. If the simulation is not realistic, users may perceive that the choices they are making have no direct impact on the outcomes. In such circumstance, participants interest in the simulation will tend to be low and users will put insignificant effort into it. No significant learning will be there in such case as learning requires a deeper involvement on the part of the learner (Curry and Moutinho, 1992).In nutshell, greater realism and sanity of a simulation will assist learners in linking between their decisions and outcomes, and aid their dynamic participation in learning.

*Negotiation and Conflict during Simulation*-Key characteristics of groups is the interaction of its members (McGrath ,1984). One noticeable aspect associated with group interaction is conflict. Conflict denotes to some form of friction, disagreement, or discord within a group when the beliefs or actions of one or more members of the group are either resisted by or unacceptable to one or more members of another group. Priem and Price (1991), categorize two forms of conflict: cognitive or task-related and emotional conflict. Task-conflict is built on the tasks facing intellectual opposition among participants, deriving from the content of the agenda( Guetzkow and Gyr,1954) and emotional conflict builds from interpersonal factors which are not related to the task facing the team.Reasons for Task conflict in simulation game may be because of team members manifold strategies, perspectives, ideas and opinions for attaining the aims of the team. Task-related discussion can be related to the content or process of the task (Jehn et al., 1999). In both the ways, task-related debates navigate members to inquiry assumptions, oppose

minority viewpoitnts of groups and involve in strong intellectual discussion, leading to advanced quality conclusions and learning. As conflict leads to inquire underlying assumptions of strategic choices and broad deliberation of alternative decisions, it promotes high value team judgments (Jehn et al., 1999). Till the task conflict do not disturb team members from their objectives or subsequently lead to personal conflict in the team, such negotiation and conflict will positively affect performance and learning.

*Ease of using Simulation*- Simulations may have different levels of difficulty. Ease of use denotes to operational convenience of the program and physical architecture of the simulation. For example, compatibility with operating systems. The simulation must be friendly enough so that, the output must be easy to read and understand, easy to sanctioning users to rectify mistakes, or alter their decisions as required before submitting them for processing. Simulations with good user interfaces should be able to deliver appropriate information in the outputs; or else, students will have information overload and would be incapable to interpret the results (Curry and Moutinho ,1992).Ease of use with the simulation should positively affect learning and performance. Users will have better importance for the simulation if they perceive that it is easy to use. As the simulations requires participants to make challenging strategic choices,it is vital that participants should be able to see the impact of decisions taken during the simulations. In nut shell, students should focus on making relevant decisions rather than wasting time in understanding the simulation.

The review of literature and discussion for Sanity of Simulation, Negotiation & Conflict during Simulation and Ease of using Simulation lead to subsequent hypothesis:

H1a. Sanity of the simulation is positively related with individual learning
H1b. Perceived sanity of the simulation will be positively associated with team performance
H2a. The perceived level of Negotiation and Conflict during Simulation will be positively related with individual learning
H2b. The perceived level of Negotiation and Conflict during Simulation will be positively related with performance
H3a. Ease of using simulation will be positively related with individual learning
H3b. Ease of using simulation will be positively related with performance

**Research Design**

The simulation based course reported in this study was taught in Academic year 2015-16, between August and October. One hundred fifty seven students in management were divided in twenty six teams of six members' each. At the end of the simulation, learners were examined through surveys about their perception of different aspects of the simulation experience. The responses were utilized to assess the influence of each of the learning dynamics on self-perceived learning by learners participating in the business simulation. Almost all the items in the structured questionnaire were in a Likert-5 scale, varying from 1 (strongly agree) to5 (strongly disagree). Question related to performance by the student for simulation is been evaluated for each group from the simulation website. The balanced scorecard is the measure of total performance. It provides a single number that can be compared between companies and hence

group performance. The balanced scorecard is used extensively in industry too. The Cumulative Balanced Scorecard will be the measure used to evaluate your overall game performance at the end of the exercise. The final evaluation will be based upon an average of your balanced scorecard over the final four quarters.As each team consist of six members each, the software automatically calculates the Cumulative Score for each team.

Total Business Performance = Financial Performance * Market Performance * Marketing Effectiveness * Investment in Future * Wealth * Asset Management(Marketplace Maverick,2011).

If one of the performance indicators is less than zero, then the total overall performance measure will be zero. The Total Business Performance measure is computed by multiplying five indicators (cumulative score for eight quarters) of business performance.

The technique used to assess the impact of the different dynamics in the perceived learning by the learner was a multiple regression analysis. Multiple regressions was selected for its ability to predict the proportion of the variance of learning constructs (derived from factor analysis) and performance (Balanced scorecard score taken from simulation) described by the independent variables and the comparative predictive significance of independent variables. Preceding regression, a confirmatory factor analysis was made to evaluate the validity and reliability of the instrument. The outcomes of this examination revealed that the all the constructs in the instruments instrument were valid and reliable.

**Results**

Table-02 consists of descriptive statistics. Multicollinearity nature of the data was checked because serious correlations amongst the independent variables may create our results questionable. A variance inflation factor (VIF) was calculated for entire predictor variables. VIF greater than 10 signifies multicollinearity problems (Neter et al.,1989). By the biggest VIF as an indicator it was established that multicollinearity was not a serious concern with this data. Convergent and discriminant validity were also evaluated by inspecting the within and between item and inter-item correlation.

The learning measure constructs were factor analyzed (Table-01 ). Exploratory factor analysis ,principal components will be used as the method of factor extraction. While principal component analysis does not provide a measure of goodness of fit of the factor model, the appropriateness of applying the analysis will be tested using Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. Bartlett's test examines whether or not the population correlation coefficient is an identity. In circumstances where it is, factor analysis is not advised (Hair et. al.,1998). The KMO test examines the relationship between the correlation coefficients among the variables and their partial coefficients. Scores below 0.5 are considered unacceptable (Hair et. al.,1998). Bartlett's test of sphericity ($\chi^2$= 613: df=105; p<.000) and the KMO test for sampling adequacy (0.71) support the appropriateness of factor analysis.

Factor analysis extracted three factors that were able to explain 78.95 percent of the total variance. The factor loadings clearly display items grouping together under common factors and meaningful factors emerging. These three were named as Analytical Based Learning, Team Work Based Learning and Leadership Based Learning.

Analytical based learning improves the ability of learners to analyze and solve business problems. The Team Work Based Learning ability to work with others in a group or team and the Leadership Based Learning enables learner's ability to perceive themselves as managers with a strategic perspective of the business as a whole.

**Table 01- Factor Analysis of Learning Items**

| Sr.No. | Items | Fator 01 Analytical Based Learning | Factor 02 Teamwork Based learning | Factor 03 Leadership Based Learning |
|---|---|---|---|---|
| 1 | Enabled to recall/recognize relevant theories of business management | 0.801 | 0.301 | 0.321 |
| 2 | Enabled to apply relevant theories and models from the curriculum to practical scenario | 0.795 | 0.321 | 0.295 |
| 3 | The decisions taken had forecasted effects in the simulation game | 0.835 | 0.298 | 0.254 |
| 4 | The simulation was good tool to test my decision making ability | 0.823 | 0.323 | 0.225 |
| 5 | The simulation provided me with knowledge that I can apply in managing real businesses | 0.805 | 0.405 | 0.285 |
| 6 | The simulation game was good tool to test my analytical skills | 0.847 | 0.311 | 0.292 |
| 7 | The simulation increased my knowledge of strategic issues in Business management | 0.772 | 0.398 | 0.196 |
| 8 | Simulation gave me the chance to speak out and be a part of decision making process | 0.567 | 0.625 | 0.211 |
| 9 | The simulation game increased my understanding of strategic decisions and its impact | 0.423 | 0.696 | 0.398 |
| 10 | The simulation increased my awareneds of other sunderstanding of strategic decisions and its impact | 0.567 | 0.693 | 0.176 |
| 11 | Simulation assisted in defending our point through efficient communication | 0.454 | 0.771 | 0.112 |
| 12 | Simulation helped in developing collective group working skills | 0.199 | 0.798 | 0.299 |
| 13 | Simulation augment to negotiate within team | 0.501 | 0.765 | 0.201 |
| 14 | Simulation augment to negotiate across team | 0.499 | 0.754 | 0.181 |
| 15 | Simulation improved my planning skills | 0.243 | 0.711 | 0.453 |
| 16 | Simulation motivated for cultural/demographic empathy | 0.198 | 0.717 | 0.511 |
| 17 | Simulation lead to learn new behaviour | 0.401 | 0.545 | 0.571 |
| 18 | The simulation game increased my knowledge in managing business at corporate level | 0.421 | 0.454 | 0.569 |
| 19 | Business simulation offers me a dynamic learning experience | 0.501 | 0.291 | 0.591 |
| 20 | Business simulation Is like a challenging real environment | 0.232 | 0.311 | 0.769 |
| Eigen Values | | 14.26 | 1.51 | 1.05 |
| Percent of Variance Explained | | 66.96 | 6.98 | 5.01 |
| Total percent of Variance Explained | | | 78.95 | |

**Table 02- Descriptive Analysis and Inter-Item Correlation**

| Variables | Mean | Standard Deviation | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| **01**.Analytical Based Learning | 4.45 | 1.39 | | | | | |
| **02.**Teamwork Based learning | 4.29 | 1.41 | 0.77** | | | | |
| **03.**Leadership Based Learning | 3.98 | 1.43 | 0.71*** | 0.82*** | | | |
| **04.**Sanity of Simulation | 3.97 | 1.27 | 0.69*** | 0.53*** | 0.69*** | | |
| **05.**Negotiation and Conflict during Simulation | 2.18 | 1.09 | -0.05 | 0.11 | 0.09 | -0.07 | |
| **06.**Ease of Using Simulation | 4.09 | 1.36 | 0.39** | 0.29** | 0.24** | 0.43** | -0.09 |
| Note: *p<0.05; **p<0.01; ***p<0.001 | | | | | | | |

**Table 03- Regression Test Outcomes**

| Variables | Model 01 Analytical Based Learning | | Model 02 Teamwork Based learning | | Model 03 Leadership Based Learning | | Model 04 Multdimensional Performance | |
|---|---|---|---|---|---|---|---|---|
| | ***b*** | ***t*** | ***b*** | ***t*** | ***b*** | ***t*** | ***b*** | ***t*** |
| Constant | 1.45 | 1.17 | 0.39 | 0.28 | 1.47 | 1.15 | -5.23 | -1.77 |
| Sanity of Simulation | 0.59 | 7.22*** | 0.58 | 5.75*** | 0.82 | 8.93*** | -0.09 | -0.21 |
| Negotiation and Conflict during Simulation | 0..09 | 1.61 | 0.19 | 1.97* | 0.21 | 2.01* | 0.49 | 2.12* |
| Ease of Using Simulation | 0.21 | 2.01* | 0.09 | 1.29 | -0.09 | -0.47 | 0.81 | 3.98** |
| F | 13.54*** | | 8.02*** | | 13.97*** | | 6.29 | |
| R2 Square | 0.49 | | 0.41 | | 0.49 | | 0.61 | |
| Adjusted R Square | 0.43 | | 0.36 | | 0.43 | | 0.54 | |
| Note: *p<0.05; **p<0.01; ***p<0.001 | | | | | | | | |

Using regression procedure (Tables-03), we can conclude that sanity of simulation was positively related with analytical based learning dimension (b=0.59, t=7.22 and p < 0.001). Sanity of simulation was also positively associated with the teamwork based learning (b=0.58, t =5.75 and p < 0.001), and with leadership based learning dimension (b=0.82, t=8.93 and p < 0.001). These outcomes support for hypothesis H1a.. However, different to our expectation, the perceived level of sanity of simulation was not significantly related with group multidimensional performance (b= -0.09, t=-0.21) and hence hypothesis H1b was not supported.

The test results for the effect of negotiation and conflict during simulation are mentioned in

Table-03. The analysis shows that there is partial support for hypothesis H3a. Negotiation and conflict during simulation is positively associated with the teamwork based learning (b=0.19, t =1.97 and p <0.05) and leadership based learning (b=0.21, t=2.01 and p< 0.05). However, there was no significant relationship between negotiation & conflict during simulation and Analytical based learning. However, as per our expectation, the perceived level of negotiation and conflict during simulation was significantly related with group multidimensional performance (b= 0.49, t=2.12 and p<0.05 ) and hence hypothesis H2b was supported.

The test results for the effect of ease of using the simulation are also mentioned in Table-03. Ease of using the simulation was positively associated with analytical based learning (b=0.21, t=2.01 and p< 0.05). There was no significant association between ease of using the simulation and the teamwork based learning. Also, there was no significant association between ease of using the simulation and the leadership based learning.However, as per our expectation, the perceived level of ease of using the simulation was significantly related with group multidimensional performance (b= 0.81, t=3.98 and p<0.01 ) and hence hypothesis H3b was supported.

**Conclusion and Implications**

This research presents an empirical study of some key dynamics that define the effectiveness of business simulations. Research proposed and tested a model of some of the antecedents of effective simulations use(ease of use, realism and sanity of the simulation and The perceived level of Negotiation and Conflict during Simulation).. These precursors were then associated them to perception individual learning and group performance.

Research found a positive link between perception of individual learning and sanity of the simulation. This implies that even simulations(by definition) is perceptions of reality, it is significant that paricipants must be able to visualize the reality in a simulation. However, the research was not able to find any significant effect of sanity of simulation on team performance. It is possible that individuals would perform well even when their sanity of simulation is low. The reverse may also apply, where teams perform low but sanity of simulation is high.The role of simulator admistrator plays a vital role in such case. The game administrators can sensibly define and clarify the objectives of the simulation to users before and during the debriefing sessions after each quarter. For example, during the debriefing sessions , the administrator can relate with the best scores and clarify the doubts of the participants with low score. He can detail the rationale for getting low scores, learing from this low score and tipcs to make strategy for next quarter.Research also establishes partial support for the hypothesis that the ease of using the simulation would be positively related with learning. Ease of use was positively associated with the analytical based learning, but not with other dimensions. Analysis of management situation in any particular condition (in any domain area of management) is considered to be the most important characteristics of a manager. Also, Analytics based learning constitutes 66.96 percent of the variance. Ease of using the simulation also had a positive effect on team performance. It endorses that the physical architecture of a simulation can affect performance. Also research revealed that negotiation and conflict during simulation was positively associated with teamwork based learning, leadership based learning and with team performance. These findings are re

confirming with the literature, stating that conflict has a favorable effect on team performance (Jehn et.al, 1999).

There are significant learning's from this research for management education. First, instructors must judiciously study the features of any simulation before selection of a particular simulation. The study has given indication that both the sanity and user interface or physical architecture of the simulation is vital features to consider. There should be ease for putting decisions into the simulation as well as read the outputs from the simulation. Simulation reflecting real life situations will add more value to the overall learning. Simulations that use products/services(Computer industry rather than a nano-tech based firm) that are easy for users to relate with along with customization of actors used in the research will enhance learning and performance. The link between negotiation & conflict during simulation and learning implies that instructors role is very crucial in by constructively guiding and facilitating the participants on the profits of strong and vigorous debates of subject matter before making their judgments and in the debriefing sessions. Also instructor can facilitate the healthy discussion by pro-actively facilitating in constructing a balanced team according to the personality types of participants.

**Limitation of Research**

There are certain restrictions to the generalizability of our outcomes. First, the research captures perceptions at a specific cross sectional time. As the study is cross-sectional, we cannot conclude of causation. Second, although the research measures the overall cumulative performance of each participating teams though balance scorecard approach, it would be even more stimulating to see the periodic (e.g. weekly) performances of the groups and understand how this affects team dynamics eventually. This will necessitate the analysis of a dynamic model that was unable to do because of time limitations. Third, the generalizability of this outcomes may be restricted to specific simulations used in this research. Lastly, Insertion of team characteristics and role of instructor may give a broader understanding of the precursors of real simulation use in B-school education. Nonetheless, the results from this research represent an important contribution to premise, broadening the research of perceived learning to the perspective of simulations and opening a path for further research in this field.

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