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# HOLISTIC COGNITIVE STRATEGY IN A COMPUTER-BASED MARKETING-SIMULATION GAME: AN INVESTIGATION OF ATTITUDES TOWARDS THE DECISION-MAKING PROCESS

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## ABSTRACT

Past research investigating participant adaptability to game parameters in computer-based business simulation games has focused on the cognitions about specific decisions and the nature of the decisions actually made (e.g., actual price set) in order to determine the validity of this experiential approach to business education. The present study moves towards a holistic view of the decision-making process and examines whether participants develop a general understanding of their simulation environment. An experiment involving four simulation environments was undertaken to determine if students could grasp the overall nature of the environment in which they were competing. Self-reported attitude data was gathered from 389 single-player competitive companies that were randomly assigned to the four experimentally manipulated environments in a nine period competition. The results indicate that between-environment differences were obtained but not always in the direction expected.

## INTRODUCTION AND PAST RESEARCH

This study continues a recent stream of research pursuing a new concept of simulation participation validity predicated on the extent to which participants respond to a simulation environment that is manipulated in meaningful ways. Game administrators assume that active participation in the simulation provides game players with the opportunity to develop and improve their decision-making skills. Traditionally, game performance outcomes, such as earnings per share, return on investment, or sales, are used as measures of decision-making skill. The relationship between skill level and performance level is considered to be positive in nature. When a player outperforms the competition, it is assumed that the "winner" has made decisions that are more consistent with the game parameters than those made by other simulation participants. By making decisions that are more consistent with the environment defined by the game parameters, it is assumed that the game player has *learned* how best to adapt to the simulation environment.

Rather than simply measuring outcomes as evidence of learning, asking participants to articulate their understanding of the simulation environment is another way to measure their "learning". It is expected that this kind of learning would likely occur as a result of individual thinking and problem solving. Cognitive learning theory, as this is known, involves "problem solving" which enables individuals to gain some control over their environment. Unlike behavioral learning theory, cognitive learning theory advances the idea that learning involves the complex mental processing of information. Rather than emphasizing the importance of repetition or the association of rewards with a specific response, cognitive researchers stress the role of motivation and mental processes in producing a desired response (Schiffman and Kanuk 1987).

Learning theory would suggest that underlying the behavioral decisions made by a simulation participant (e.g., price setting, advertising expenditure level, sales force size, etc.) is a

learning process that leads to the determination of what types of decisions work and what types of decisions do not work in the simulation competition. For example, if a player concludes that low price is important to game success, the appropriate behavioral response is to set a low price. This would suggest consistent cognitive-behavioral decision-making.

Several studies have examined the ability of game participants to understand and adapt to a simulation environment that has been experimentally manipulated by the simulation administrator (Faria and Dickinson 1990; Faria, Whiteley and Dickinson 1990; and Whiteley, Faria and Dickinson 1990). In each of these studies, simulation participants were randomly assigned to "push" responsive or "pull" responsive marketplaces created by the simulation administrator. The results reported in these studies suggested that the participants' decisions only moderately reflected the nature of the marketplace environment that they were facing.

In two additional studies (Dickinson and Faria 1994 and Wellington and Faria 1997), simulation administrator artificially created companies were injected into the competition. Industries of five companies were created with four of the companies in each industry being made up of marketing students while the fifth company in each industry was a simulation administrator created company. In these studies, the decisions of the simulation administrator team were manipulated to ensure that the "artificial" team would lead the industry in earnings. The objective was to determine if the student teams would "learn" from the "artificial leader" and adapt to the marketplace correct strategies of the leader. Again, the results indicated that the decisions of the game participants, over time, only moderately conformed to the simulation marketplace environment.

While a number of studies have focused on the behavioral aspects of the decision-making process in a simulation competition (e.g., Dickinson, Faria and Whiteley 1988 and Faria, Dickinson and Whiteley 1991), research examining the cognitive decision-making process from the perspective identified here is relatively new (e.g., Whiteley, Dickinson and Faria 1992 and Wellington, Faria and Nulsen 1996). Furthermore, in the study by Wellington, Faria and Nulsen (1996), examining both the cognitive and behavioral domain, the results indicate that game players did not make "appropriate" behavioral decisions or express the correct cognitive conclusions associated with the nature of the simulation environment which they faced.

## PURPOSE OF STUDY

The results from past research suggest that game participants are only moderately successful at adapting to the simulation environments in which they are operating. The present study was designed to analyze the cognitive structures of the decision-making process of game players to determine, from a more holistic perspective, if they have *understood* the nature of the environment with which they had to contend. Past research has focused on the ability of students to ascertain their environments on a variable by variable basis. This study looks at the situation from a more holistic perspective. Perhaps it is too difficult for students to correctly ascertain their environment on a marketplace variable by variable basis but they may be able to draw an appropriate overall impression about the environment in which they are operating.

The Marketing Management Simulation (Faria and Dickinson 1996) was used for this study because this simulation allows the game administrator to determine the importance (i.e., weight) of each parameter of the competition and to make the competition either competitor responsive or environment responsive. In particular, the game parameters were set such that four theoretically meaningful experimental

environments were created.

The four experimental conditions created consisted of "push" and "pull" markets and competitor or environment responsive markets. Push and pull strategies are fundamental marketing concepts that are taught to all students of marketing and are described in all basic marketing textbooks. The focus of a "pull" strategy is consumer demand stimulation while the focus of a "push" strategy is the enlistment of channel cooperation in moving a product through the distribution system toward the consumer (see Lamb, Hair and McDaniel 1996 and Semenik and Bamossy 1996).

A "competitor" responsive situation is one in which the performance of each team is based solely on their strategies in relation to the strategies of the other simulation companies. In contrast, an "environment" responsive competition is one in which the performance of each simulation team is based on the closeness of the team's strategy to a preset "ideal" established by the simulation administrator.

In order to create an environment that would reward the use of a pull strategy, the importance (i.e., weight) of each of the marketing pull strategy elements in the competition were set to 10. A weighting of 10 represents the highest (most important) that can be given to a strategy element in The Marketing Management Simulation. Further, within the pull environment, traditional push strategy marketing variables were weighted at 1, the lowest importance weighting possible. A default weighting of *5* was assigned to strategy elements that were neither of a push nor pull nature.

In order to create an environment which would reward the use of a push strategy, the importance values of 10 and 1 were assigned in a manner opposite to that used in the pull environment. The default value assignments were the same in both environments.

The Marketing Management Simulation further allows the simulation administrator to create a competitor or environment responsive competition. A weighting of 1 (on the competitor versus environment parameter) makes each team's simulation performance almost totally responsive to the strategies of other teams while a weighting of 10 makes the simulation performance almost totally responsive to the fit of each team's decision strategy with the game parameters selected. For "competitor" responsive industries, this parameter was set at 1, while it was set at 10 for "environment" responsive industries.

## METHODOLOGY

The subjects for this study were 430 students in a Principles of Marketing course. The students were advised that the simulation competition was worth 20 percent of their final course grade. In addition to analyzing the actual decisions made in the simulation competition, a questionnaire was administered to each simulation participant four times during the competition to obtain the holistic cognitive perception data needed for this study.

The 430 simulation participants were randomly assigned to 86 industries, each industry consisting of *5* single-player companies. Only 389 of the original 430 participants that began the competition completed it. A total of 105 companies (21 industries) were assigned to each of the "pull-competitor", "push-competitor" and "pull-environment" conditions while 115 companies (23 industries) were assigned to the "push-environment" condition. The participants were not informed about the nature of the environment to which they were assigned.

Some students withdrew from the course after the competition began. When this happened, dummy companies were created to keep each industry operating with five companies. At the end of the simulation there were 41 such companies. The data for these companies were not analyzed.

The first decision in the competition was made during the third week of the course. The first decision served as a trial decision so as to provide the participants with the opportunity to become familiar with the technical aspects of the game and to try various strategies without risk. At the completion of the trial period, a new competition was restarted. The marketplace environment was unchanged in the new start-up and competitors in each industry remained the same. The knowledge acquired during the trial period, therefore, was relevant to the new game. The new game consisted of eight decisions (Real Periods 1 to 8), executed over a period of 9 weeks.

Prior to receiving their results for the trial and real periods 3, *5* and 7, the game participants were given a questionnaire to complete in order to indicate their agreement [strongly disagree (7)] with a set of specific statements about their decision strategy related to their marketplace environment (e.g., My marketing strategy can best be described as a "push" strategy). Twenty-seven such statements seeking to determine if the game participants understood their simulation environment, and to identify the corresponding strategies that were put into place, were included on the questionnaire. These were the holistic cognitive measures spoken of earlier.

## HYPOTHESES

The general hypothesis for this study is that, if marketing strategy formulation in a simulated environment is an internally valid experience, then the holistic cognitive perceptions of the simulation participants should be consistent with the environment with which they must contend. Thus, the holistic cognitive perceptions of the game participants should vary as a function of the environment in which a company/participant operates. As learning occurs as a result of experience, it would be expected that the holistic cognitive perceptions of participants in differing environments would be the same at the outset of the simulation and, as the simulation progresses and learning occurs, they would diverge. Although a nine period competition was executed, it was decided that analyzing the data for two periods (one at the beginning and one at the end) would adequately serve the purpose *of* identifying changes in holistic cognitive perceptions across the four competitive environments created. This leads to the following specific hypotheses.

H1: There will be no difference in cognitive perceptions between pull-competitor, push-competitor, pull-environment and push-environment participants in the trial period of the competition for the combined group of decision variables.

H2: As the simulation progresses into real period 7, there will be a significant difference in holistic cognitive perceptions between pull-competitor, push-competitor, pull-environment and push-environment participants for the combined group of decision variables.

H3: In period 7, pull industry participants will report greater agreement with using a pull strategy than push industry participants.

H4: In period 7, push industry participants will report greater agreement with using a push strategy than will pull industry participants.

H5: In period 7, competitor industry participants will report greater agreement with the goal of differentiating their company from their competitors than will environment industry participants.

H6: In period 7, environment industry participants will report greater agreement with ignoring competitors actions than will competitor industry participants.

H7: In period 7, environment industry participants will report greater agreement with looking for an optimum marketplace strategy than will competitor industry participants.

H8: In period 7, environment industry participants will report greater agreement with believing that the simulation model significantly affects their performance.

H9: From the beginning of the competition to the end, pull industry participants will move more towards the use of pull strategies while push industry participants will report more movement towards the use of push strategies.

H10: From the beginning of the competition to the end, competitor industry participants will report greater agreement with the goal of differentiating their company while environment participants will report less agreement.

H 11: From the beginning of the competition to the end, environment industry participants will report greater agreement with ignoring competitors, while competitor industry participants will report less agreement.

H12: From the beginning of the competition to the end, environment industry participants will report greater agreement with looking for an optimum decision variable, while competitor industry participants will report less agreement.

Hypotheses Hi and H2 were tested using SPSS MANOVA analysis to compare the overall perceptions of the pull-competitor, push-competitor, pull-environment and push-environment groups as measured by the six self reported strategy variables (pull, push, ignore competitors, affected by the simulation model, finding the optimum, and competitive differentiation). Hypotheses H3 through H8 were tested by looking at separate ANOVA F-test results for each of the six variables. Hypotheses H9 through H12 were tested using SPSS T-Test analysis to compare the differences within the groups from the beginning of the competition to the end.

## RESULTS

The results of the MANOVA analyses for Hl and H2 are presented in Table 1. The results of the ANOVA analysis for H3 through H8 are reported in Table 2 while the results of the T-Test analysis for H9 to H12 are reported in Table 3.

The MANOVA results shown at the bottom of Table 1 support the acceptance of both Hl and H2. At the start of the competition there were no differences in overall holistic cognitive perceptions between the pull-competitor, push-competitor, pull-environment and push-environment groups. H2 is also supported as there were significant differences in overall participant holistic cognitive perceptions across the four distinct industry groups by the end of the simulation competition.

The ANOVA results presented in Table 2 would result in the rejection of H3 through H8. The T-Test results in Table 3 would suggest the rejection of H9 and Hl1 while only partial support can be found for H10 and H12.

## DISCUSSION AND CONCLUSIONS

The results from this study are mixed at best. The acceptance of H2 indicates that there were significant differences in holistic cognitive perceptions between the pull-competitor, push-competitor, pull-environment and push-environment groups by the end of the competition. This finding can be taken as evidence to support the contention that game

participants in different structural environments understood that they were different. However, when the specific strategy variables were examined for the push and pull industries and competitor and environment industries, the findings indicated that the participants did not understand the specific nature of the marketplace environment in which they were competing.

While there was evidence that the simulation competitors perceived the environments in which they were operating to be different, the participants didn't correctly put push or pull strategies into place. While participants in environment sensitive industries did come to understand that they did not have to react to their competitors, they were not able to recognize the corresponding appropriate environ mental responses. Further, participants in competitor responsive industries did not seem to fully understand the importance of responding to competitor strategies.

A further mixed result was found with regard to H12. While participants in competitor responsive industries came to understand that there were no "ideal" strategies, this view was shared by participants in environment responsive industries. In the environment responsive industries there was, of course, an ideal strategy.

The results from this research are very similar to the results reported in earlier studies. It would appear that introductory marketing students cannot correctly perceive the nature of their simulation environment. While they are able to perceive that there are differences in the environment, and while they will often adopt different marketing strategies, their perceptions and strategies are often incorrect.

In conclusion, this study provides further evidence, to add to that of the previous reported research, that simulation players have great difficulty understanding the environments in which they compete.

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Tables available upon request.