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COGNITIVE AND BEHAVIORAL CONSISTENCY IN A COMPUTER-BASED MARKETING-SIMULATION-GAME ENVIRONMENT: AN EMPIRICAL INVESTIGATION OF 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 primarily on the nature of the decisions actually made (e.g., actual price set) in order to determine the validity of this experiential approach to management education and training. The present study moves back one step in the decision-making process and examines, as well, the cognitive nature of the decisions on which the behavioral responses were based (e.g., perceived importance of price to game success). A study of seven cognitive and seven behavioral measures obtained from 68 single-player competitive companies that were randomly assigned to two experimentally manipulated environments in a 10-period game was undertaken. The results indicate that between-environment differences were obtained but not always as expected.

INTRODUCTION AND PAST RESEARCH

Computer-based simulation games are extensively used in business programs as an active mode for learning (Faria 1 987). Over 95 percent of AACSB accredited business schools incorporate such games as part of their curricula (Faria 1 987), drawing from the over 200 such games available on the market (Horn and Cleaves 1980). As well, business firms make use of such simulations. Approximately 23 percent of all U.S. companies with over 1, 000 employees use simulation games in their training programs while an additional 11 percent have used them in the past (Faria 1 987).

Game administrators assume that active participation allows players 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.

Adapting to a simulation environment likely involves operant conditioning because participants learn to adjust their decision-making behaviors as a result of positive or negative consequences that are contingent on their previous decision-making. Operant conditioning applies to voluntary responses, which an organism performs willfully in order to produce a desired outcome. An organism operates on its environment in order to produce some desirable result, i.e., the *law of effect...* responses that are satisfying are more likely to be repeated, and those that are not satisfying are less likely to be repeated (Thorndike 1932).

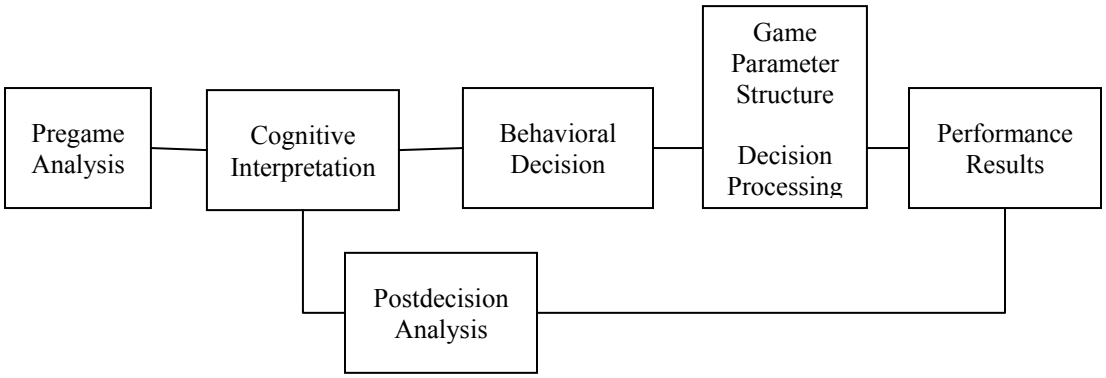
Thorndike's early research formed the foundation for the work of B.F. Skinner who furthered the study of operant conditioning by illustrating how behavior varied as a result of alterations in the environment (Feldman 1990). Skinner contends that learning takes place in an effort to control the environment, i.e., to obtain favorable outcomes. Control is gained by means of a heuristic process during which one behavior results in a more favorable response than other behaviors. The reward (more favorable response) reinforces the behavior. As such, reinforcement is *instrumental* in teaching subjects a specific behavior that gives them more control over the outcome (Schiffman 1987).

Not all learning takes place as a result of repeated heuristic activity, however. Much learning occurs as a result of individual thinking and problem solving. Cognitive learning theory, as this is known, suggests that the kind of learning most characteristic of human beings is "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 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 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 a 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. The nature of this relationship in a simulation game context is illustrated in Figure 1.

Given this expectation, it would be appropriate to analyze the cognitive and behavioral decision structures of game players in order to determine the nature of the behavioral responses expected based on the identified cognitive structures.

FIGURE 1
A COGNITIVE-BEHAVIORAL PERSPECTIVE OF THE DECISION-MAKING PROCESS IN A BUSINESS SIMULATION GAME CONTEXT



While a number of studies have focused on the behavioral aspect of the decision-making process in simulation competitions (e.g., see Dickinson, Faria, and Whiteley 1988; Faria, Dickinson, and Whiteley 1991), research examining the cognitive decision-making process from the perspective identified here is relatively new (e.g., see Whiteley, Dickinson, and Faria 1992). Furthermore, in those studies examining the behavioral domain, the results indicate that game players do not seem to have made behavioral decisions which indicate that they had drawn correct cognitive conclusions about the nature of the simulation environment which they faced.

PURPOSE OF STUDY

The present study was designed to analyze the cognitive and behavioral structures of the decision-making process of game players to determine if they have understood the nature of the environment with which they had to contend. If the results indicate that the correct cognitive thought processes have occurred, then appropriate behavioral decisions are expected.

The simulation game entitled LAPTOP: A Marketing Simulation (Faria and Dickinson 1987) was used to investigate the focus of the study since this game allows the game administrator to determine the importance (i.e., weight) of each parameter of the competition. In particular, the parameters were set such that two theoretically meaningful experimental environments were created.

One of the experimental environments was designed to reward the use of a "pull" strategy while a second environment was designed to reward the use of a "push" strategy. Push and pull strategies are fundamental marketing concepts, which 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 (Evans and Berman 1993, Bovee and Thill 1992). In order to create an environment, which would reward the use of a pull strategy, the importance (i.e., weight) of each of the marketing pull strategy elements in the simulation competition was set to 10. A weighting of 10 represents the highest (most important) that can be given to a strategy element in the LAPTOP

competition. The marketing strategy elements weighted at this level were price, broadcast and print advertising, and consumer sales promotional activities. Further, within the pull environment, traditional push strategy marketing variables were weighted at 1 • the lowest importance weighting possible. The strategy variables weighted at a level of 1 included trade advertising, dealer cooperative advertising allowances, sales force size, incentives, and dealer promotions. 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.

METHODOLOGY

The simulation competition used for this research involved 68 undergraduate students enrolled in two sections of a one-semester principles of marketing course. The students were advised that the game was worth 25 percent of their final course grade. The performance measures of relative (i.e., compared to the direct competition) earnings per share and relative market share were equally weighted for the purpose of grade determination. In addition to analyzing the actual decisions made in the simulation competition, a questionnaire was administered to each simulation participant to obtain the cognitive or game environment evaluation data needed for this study.

The 68 simulation participants were randomly assigned to 14 industries, each consisting of 5 single-player companies. Seven of the industries (i.e., 35 companies) were randomly assigned to the "Push" environment and seven industries (i.e., 35 companies) were randomly assigned to the "Pull" environment. The participants were at no time informed about the nature of the environment to which they were assigned. [Two dummy companies were operated throughout the game in order to equalize the number of companies per industry. The data for these companies were not analyzed.]

The first two (quarterly) decisions were made during weeks 3 and 4 of the course and served as trial decisions 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 second 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 periods, 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 Real Periods 1, 4, and 8, the game participants were given a questionnaire to indicate their perception of the importance [very important (10) to very unimportant (1)] of each of the decision variables in their competitions for stimulating marketplace demand (see variables in Table 1).

This is the cognitive measure spoken of earlier.

TABLE 1
PERCEIVED (COGNITIVE) IMPORTANCE OF VARIABLES ON DEMAND BY GAME ENVIRONMENT

		Environment				
		R1 – Push (n = 33) Pull (n = 34)				
		R4 – Push (n = 33) Pull (n = 32)				
		R8 – Push (n = 31) Pull (n = 31)				
Decision Variable	Period	X	SD	X	SD	F-value
H3a Low Price	R1	50.65	8.13	49.45	11.62	.20
	R4	49.48	10.2	50.53	9.93	.17
	R8	49.94	9.8	50.06	10.36	.00
H3b High Broadcast Advertising Expenditure	R1	50.35	8.91	49.65	11.08	.08
	R4	50.64	8.09	49.33	11.75	.27
	R8	50.53	9.29	49.47	10.80	.17
H3c High Print Advertising Expenditure	R1	49.77	10.05	50.22	10.10	.03
	R4	51.05	9.81	48.92	10.24	.75
	R8	49.79	10.44	50.22	9.71	.03
H3d High Trade Advertising Expenditure	R1	50.98	9.02	49.05	10.91	.62
	R4	53.31	9.55	46.77	9.54	7.22 **
	R8	52.57	10.35	47.43	9.01	4.31 **
H3e High Co-op Advertising Allowance Percent	R1	49.39	8.99	50.59	10.99	.23
	R4	52.62	8.98	47.29	10.40	4.91 **
	R8	52.66	8.78	47.35	10.57	4.63 **
H3f High Sales Force Size	R1	49.74	9.76	50.25	10.37	.04
	R4	50.45	9.30	49.53	10.81	.13
	R8	51.21	9.51	48.79	10.48	.90
H3g High Product Quality	R1	50.86	8.2	49.17	11.55	.47
	R4	48.69	10.11	51.35	9.86	1.15
	R8	48.16	10.76	51.84	8.99	2.14

MANOVA RESULTS	Round 1	Round 4	Round 8
Pillia's Value	.04234	.15399	.17876
Degree's of Freedom	59	60	60
Exact F	.37267	1.48211	1.67915
Significance	.915	.192	.134

Notes
* marginal significance at < .10
** significant at < .05

HYPOTHESES

The general hypothesis for this study is that, if marketing strategy formulation in a simulated environment is an internally valid experience, then the cognitive and behavioral decisions of the simulation participants should be consistent with the environment with which they must contend. Thus, the cognitive and behavioral decisions should vary as a function of the environment in which a company/participant operates. Since learning occurs as a result of experience, it would be expected that the cognitions

and behavior of the simulation participants

in differing environments would be the same at the outset of the simulation and, as the simulation progresses and learning occurs, the cognitions and behavior would diverge. Although a 10-period game was executed, it was decided that analyzing the data for Real Periods 1, 4, and 8 would adequately serve the purpose of identifying changes in cognitions and behavior between the push and pull groups. This leads to the following eight hypotheses.

For the present study, the specific *cognitive* expectations are as follows:

H1: There will be no difference in cognitive expectations between push and pull participants in the first period of the simulation.

H2: As the simulation progresses into period 4 and period 8, there will be a significant difference in cognitive expectations between push and pull participants.

H3: As the simulation progresses into period 4 and period 8, push participants will perceive trade advertising (H3d), cooperative advertising (H3e), and the number of salespeople (H3f) as more important for demand stimulation than will pull participants. Pull participants will perceive broadcast advertising (H3b), print advertising (H3c), and low prices (H3a) as more important for demand stimulation than will push participants. Both push and pull participants will have the same perception of the impact of research and development (H3g) on demand.

Similarly, in the present study, the specific *behavioral* expectations are as follows:

H4: There will be no difference in actual decision-making behavior between push and pull participants in the first period of the simulation.

H5: As the simulation progresses into period 4 and period 8, there will be a significant difference in actual decision-making behavior between push and pull participants.

H6: As the simulation progresses into period 4 and 8, push participants will have higher prices (H6a), spend more on trade advertising (H6d), have higher cooperative advertising levels (H6e), and more salespeople (H6f) than pull participants. Pull participants will spend more on broadcast advertising (H6b) and print advertising (H6c) than push participants, and push and pull participants will spend the same amount on research and development (H6g).

The expectation throughout the simulation is that there will be a relationship between the actual simulation decision behavior and the participants' cognitions regarding which variables are important. This leads to the final two hypotheses:

H7: Throughout the simulation competition there will be a relationship between the set of seven cognitive variables and the set of seven behavioral variables for both push and pull participants.

H8: Throughout the simulation competition there will be a relationship between cognitions and actual behavior for both push and pull participants for each pair of cognitions and behaviors (prices, broadcast advertising, print advertising, trade advertising, co-op advertising, salesforce size and product research and development).

In order to test these hypotheses, the perceptual and decision-making data had to be transformed in order to make scale free comparisons between the cognitive and behavioral variables. The data were standardized and transformed into T-scores (mean of 50 and standard deviation of 10) as suggested by Glass and Hopkins
(1984).

Hypotheses Hi and H2 were tested using SPSS MANOVA analysis to compare the overall cognitions of the push and pull groups as measured by the self reported demand influencing importance weightings for the seven push-pull decision variables (pricing, broadcast advertising, print advertising, trade advertising, co-operative advertising, product research and development and salesforce size) in periods one, four and eight. H3a through H3g were tested by looking at the univariate F-test results for each of the seven variables, which are produced by the MANOVA program.

Hypotheses H4 and H5 were tested using SPSS MANOVA analysis to compare the behavior of push and pull groups as measured by actual participant decision-making for the seven variables in periods one, four and eight. H6a through H6g were again tested by looking at the univariate F-test results for each of the seven variables produced by the MAN OVA program.

H7 was tested using canonical correlation between the seven cognitive variables and the seven behavioral variables for periods one, four and eight. H8 was tested using correlation analysis between the seven pairs of cognitive and behavioral measures for the whole sample

and then by the push and pull strategy participants individually for periods one, four and eight.

RESULTS

The results of the cognitive data analyses are presented in Table i while the results of the behavioral analyses are shown in Table 2. The results of the combined analyses of cognitive and behavioral variables are shown in Tables 3 and 4.

TABLE 1
PERCEIVED (COGNITIVE) IMPORTANCE OF VARIABLES ON DEMAND BY GAME ENVIRONMENT

		Environment				
		Push (n = 33)		Pull (n = 35)		
Decision Variable	Period	X	SD	X	SD	F-value
H6a Low Price	R1	50.70	8.79	49.33	11.11	.31
	R4	53.03	11.60	47.14	7.29	6.35 **
	R8	52.39	11.29	47.74	8.14	3.82 *
H6b High Broadcast Advertising Expenditure	R1	49.68	10.03	50.29	10.10	.06
	R4	50.80	10.25	49.25	9.84	.40
	R8	52.08	11.74	48.04	7.69	2.85 *
H6c High Print Advertising Expenditure	R1	48.47	2.63	51.44	13.64	1.51
	R4	50.67	9.83	49.37	10.26	.29
	R8	52.23	11.51	47.90	7.93	3.30 *
H6d High Trade Advertising Expenditure	R1	49.53	8.45	51.44	13.64	1.51
	R4	52.81	11.64	47.35	7.39	5.40 **
	R8	53.66	12.64	46.55	4.63	9.68 **
H6e High Co-op Advertising Allowance Percent	R1	50.16	9.21	49.85	10.82	.02
	R4	51.69	10.76	48.41	9.09	1.84
	R8	50.46	10.07	49.56	10.06	.17
H6f High Sales Force Size	R1	52.19	10.58	47.93	9.10	3.17 *
	R4	51.55	11.34	48.54	8.46	1.56
	R8	52.52	12.39	47.63	6.37	4.26 **
H6g High Product Quality	R1	49.31	9.88	50.65	10.21	.30
	R4	50.22	11.23	49.79	8.41	.33
	R8	50.32	12.32	49.70	7.36	.36

MANOVA RESULTS	Round 1	Round 4	Round 8
Pillia's Value	.11249	.28483	.25289
Degree's of Freedom	60	60	60
Exact F	1.08645	3.41374	2.90135
Significance	.383	.004**	.011**

Notes: * marginal significance at < .10

** significant at < .05

The MANOVA results shown at the bottom of Table 1 support the acceptance of Hi. In period one there were no differences in overall cognitions between the push and pull groups. H2, however, is not supported, as there were no significant differences in overall participant cognitions between the push and pull groups in either periods 4 or 8.

While overall participant cognitions are not significantly different, the univariate F-tests for H3a through H3g do shown differences for two of the decision variables. The push groups did perceive trade advertising and cooperative advertising to be more important for demand stimulation than the pull groups, which supports H3d and H3e. However, there were no significant differences in the perceptions of the importance for any of the remaining push and pull variables. As such, hypotheses H3a, H3b, H3c and H3f are rejected. As expected, there was no difference in the perceptions of the importance of research and development and H3g is accepted.

The MANOVA results shown at the bottom of Table 2 support the acceptance of both H4 and H5. In period one there were no differences in the behavioral actions (i.e., actual decisions) of the push and pull participants thus supporting H4. H5 is also supported, as there were significant differences in the overall decision-making strategy between the push and pull groups in each of periods 4 and 8.

The univariate F-tests for H6a through H6g show that there are significant differences for two of the decision variables in simulation period 4 and on five of the decision variables in period 8. The push groups had higher prices and spent more than the pull groups on trade advertising in both periods 4 and 8 and, by period 8, had a higher sales force size thus supporting H6a, H6d and H6f. There were no differences in the behavioral decision-making between the push and pull groups on cooperative advertising, though, and H6e is rejected. It was expected that there would be differences between the push and pull groups on broadcast advertising and print advertising and this was found to be the case. However, the differences were not in the expected direction, the push groups spent more on print and broadcast advertising than the pull groups, and H6b and H6c are rejected. As expected, there was no difference in behavioral decisions for research and development and H6g is accepted.

The results shown in Table 3 indicate that in period 1 there was no relationship between cognitions and behavior for either the push or pull participants. However, by period 8 there was a significant relationship between the cognitions and behavior undertaken (canonical correlation of .85i for push and .883 for pull participants). As such, H7 is accepted.

The results shown in Table 4 indicate that by period 8 for the push respondents there was a significant correlation between cognitions and behavior for all of the variables except product quality. As for the pull respondents, there was a significant correlation in period 8 between behavior and cognitions on three variables (price, trade advertising and co-operative advertising). As such, there is partial support for H8.

DISCUSSION AND CONCLUSION

The results from this study are mixed. The evidence indicates that there was no significant difference in

TABLE 3
CANONICAL CORRELATION BETWEEN COGNITIVE AND BEHAVIORAL VARIABLES MULTIVARIATE SIGNIFICANCE TESTS

COMBINED PUSH AND PULL	H7 Round 1	H7 Round 4	H7 Round 8
Root 1 Eigenvalue	.370	1.051	1.282
Percent of Variance	43.758	48.327	37.393
Canonical Correlation	.519	.716	.750
N	67	65	62
Pillia's Value	.68859	1.33083	1.92489
Degree's of Freedom	49	49	49
Approximate F	.91958	1.91153	2.92588
Significance	.630	.000 **	.000 **
PUSH	**H7 Round 1**	**H7 Round 4**	**H7 Round 8**
Root 1 Eigenvalue	1.635	3.873	2.623
Percent of Variance	49.847	56.291	39.679
Canonical Correlation	.788	.891	.851
N	33	33	31
Pillia's Value	1.67277	2.52347	2.62081
Degree's of Freedom	49	49	49
Approximate F	1.12144	2.01326	1.96639
Significance	.292	.001 **	.001 **
PULL	**H7 Round 1**	**H7 Round 4**	**H7 Round8**
Root 1 Eigenvalue	.616	2.297	3.547
Percent of Variance	42.113	56.303	48.117
Canonical Correlation	.617	.835	.883
	34	32	31
Pillia's Value	1.05395	1.89245	2.56456
Degree's of Freedom	49	49	49
Approximate F	.65836	1.27035	1.89979
Significance	.957	.135	.002 **

Notes. * marginal significance at < .10
** Significant at < .05

TABLE 4
CORRELATION BETWEEN COGNITIVE AND BEHAVIORAL BARIABLE PAIRS

H8 All Respondents

	Round 1 n	Round 1 Correlation	Round 4 n	Round 4 Correlation	Round 8 n	Round 8 Correlation
Low Price	67	.0266	65	-.5249 **	62	-.5707 **
Broadcast	67	-.0004	65	.1344	62	.2742 **
Print Advertising	67	-.1384	65	.2850 **	62	.2703 **
Trade Advertising	67	-.0434	65	.4310 **	62	.4507 **
Co-op Advertising	67	.0437	65	.0911	62	.4485 **
Sales Force Size	67	-.0117	65	.1870	62	.3765 **
Product Quality	67	-.0872	65		62	.1189

H8 Push Respondents

	Round 1 n	Round 1 Correlation	Round 4 n	Round 4 Correlation	Round 8 n	Round 8 Correlation
Low Price	33	.2096	33	-.6612 **	31	-.6648 **
Broadcast	33	.1164	33	.3159 *	31	.3488 *
Print Advertising	33	-.1194	33	.4962 **	31	.4200 **
Trade Advertising	33	.2162	33	.5223 **	31	.4599 **
Co-op Advertising	33	.1591	33	.2396	31	.3570 **
Sales Force Size	33	-.0835	33	.1526	31	.4529 **
Product Quality	33	.1851	33	.2647	31	.1879

H8 All Respondents

	Round 1 n	Round 1 Correlation	Round 4 n	Round 4 Correlation	Round 8 n	Round 8 Correlation
Low Price	34	-.0762	32	-.3514 **	31	-.4934 **
Broadcast	34	-.0874	32	.0015	31	.1906
Print Advertising	34	-.1824	32	.0836	31	.0733
Trade Advertising	34	-.1886	32	.1737	31	.3217 *
Co-op Advertising	34	-.0333	32	.5256 **	31	.5203 **
Sales Force Size	34	.0808	32	.0108	31	.2679
Product Quality	34	-.2610	32	.1023	31	-.0023

* Significance < .10
** Significance < .05

cognitions between push and pull participants in any of the three decision periods measured (see Table 1) but there were significant differences in decision-making behavior (see Table 2). This latter finding can be taken as evidence to support the contention that game participants understood the structural nature of the environment with which they had to contend and that push and pull participants developed and used different strategies. This would support, to a degree, the internal validity of the simulation exercise.

When there was evidence that the structural nature of the simulation environment was understood, the behavioral decisions were, for the most part, consistent with participant cognitions. There was also evidence that the process of adaptive learning was occurring as the game progressed as more of the expected findings were realized during the later stages of the simulation. As well, while cognitive and behavioral differences were not significantly different in several decision-making areas, the direction of change in the participants' decisions was as expected.

With respect to actual behavior, the push participants seemed to adapt to their environment better than the pull participants. There is, in fact, no evidence (other than on the pricing variable) to indicate that the pull participants cognitively understood their environment. Yet, in many cases, their behavioral decisions moved in the right direction.

The study undertaken, in retrospect, possessed a couple of important limitations which need to be addressed in future research. The finding that cognitions between push and pull participants were not always as expected could have been caused by measurement error. Cognitions, in this study, were measured by asking respondents to provide independent importance evaluations on the impact of each decision variable on demand stimulation. What might have been a more appropriate measure would be to ask respondents to estimate the relative influence of each variable in light of recognition that all the variables act together.

With respect to actual behavior, and also a likely confound for cognitions, was the influence of the "pricing" variable. Making one environment price sensitive (the pull environment) while making the second environment less price sensitive (the push environment) meant that far greater revenues and profits could be earned in the push environment. Consequently, having more revenues and profits, the push firms spent more in all areas of demand creation than their pull counterparts whose revenues and profits were constrained by severe price competition. This critical difference was identified

by both push and pull respondents and was likely what drove the competition and confounded the ability (and perhaps desire) of pull participants to understand and explore the impact of the other decision variables. In future research, the price variable should be kept neutral.

In conclusion, this study provides some evidence of consistency between cognitions and simulation decision-making. However, a future study which deals with the two key limitations identified here needs to be undertaken to shed clearer light on this issue.

REFERENCES

Benjamin, L.T., Jr. (1988) A History of Teaching Machine *American Psychologist, 43,* 703-712

Biskin, B. H. (4 1980) Multivariate Analysis in Experimental Counseling Research *The Counseling Psychologist, 8,* 69-72.

_____ (4 1983) Multivariate Analysis in Experimental Leisure Research *Journal of Leisure Research, 15,* 344-358.

Bovee, Courtland L. and Thill, John V. (1992) *Marketing.* New York, NY: McGraw-Hill.

Cole, M. and Scribnerr, 5. (1974). *Culture and Thought: A Psychological Introduction* New York, NY: Wiley, p. 170.

Dickinson, John R., Faria, A. J., and Whiteley, T Richard (1988) The Responsiveness of Players' Strategies to the Simulation Environment *Proceedings of the 1988 Annual Meeting of the Decision Sciences Institute, 19,* 765-767.

Evans, Joel R. and Berman, Barry (1993) *Marketing* 6th ed., New York, NY: MacMillan.

Faria, A. J. (2 1987) A Survey of the Use of Business Games in Academia and Business. *Simulation & Games, 18,* 207-225

Faria, A. J., and Dickinson, John R. (1987) *Laptop: A Marketing Simulation.* Burr Ridge, IL.: Richard D. Irwin Inc.

Faria, A. J., Dickinson, John R., and Whiteley, T Richard (1991) A Temporal Analysis of Simulation-Team Adaptive Behavior. *Proceedings of the 1991 Western Multiconference of the Society for Computer Simulation,* 65-74.

Feldman, R.S. (1990) *Understanding Psychology* 2 Ed., McGraw-Hill Publishing Co., pp. 157; 158; 167

Hassett, J., and Dukes, S. (1986) The New Employee Trainer; A Floppy Disk. *Psychology Today* September 20, 30-34

Horn, R. E., and Cleaves, A. (1980). *The Guide to Simulations/Games for Education and Training* Beverly Hills, CA: Sage.

Hunt Shelby D. (i 99i). *Modern Marketing Theory: Critical Issues in Philosophy.* Cincinnati, Ohio: SouthWestern Publishing Co.

Kuhn, Thomas S. (1977) *The Essential Tension.* Chicago: The University of Chicago Press.

Kuhn, Thomas S. (1970) *The Structure of Scientific Revolutions* Chicago: The University of Chicago Press.

Pollack, A. (1987) More Human than Ever, the Computer is Learning to Learn. *New York Times,* pp. C-i, C-6, September 15.

Schiffman, L.G., Kanuk, L.L. (1987) *Consumer Behavior* Third Ed. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., pp. 240-241; 246.

Skinner, B. F. (1986) Programmed Instruction Revisited. *Phi Delta Kappan, 68,* i 03-i i 0.

Thorndike, E.L. (1932) *The Fundamentals of Learning* New York: Teachers College.

Whiteley, T. Rick, Dickinson, John A., and Faria, A. J. (1992). A Cognitive Approach to the Measurement of Simulation-Game Participant Adaptability to Game Parameters *Proceedings of the Ninth International Conference on Technology and Education, 9,* (Vol. 2), 684-686.