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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN FORMAL PLANNING AND SIMULATION TEAM PERFORMANCE UNDER CHANGING ENVIRONMENTAL CONDITIONS

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ABSTRACT

This paper examines the relationship between simulation team planning and performance under conditions of environmental uncertainty. Students in five sections of business policy participating in the Business Management Laboratory constituted the sample. Three separate environmental diversions were incorporated into the game. The results of the data analysis revealed that formal planning teams outperformed nonplanning teams on four different measures of performance. The results of this study combined with previous research tend to indicate that formal planning is an effective tool for guiding group decision making in simulation games.

INTRODUCTION

"Businesses which engage in formal long range strategic planning are more effective than those which do not." Similar statements can be found in most popular Business Policy/Strategic Management text books (see for example Thompson and Strickland, 1987; Wheelen and Hunger, 1986; Byars, 1987; Pearce and Robinson, 1985). Without commenting at this point about the accuracy of such a statement, it is clear that business policy writers consider formal long range planning to be an important organizational process that students need to understand.

Top-management or functionally integrated simulation games are often used within a Business Policy/Strategic Management course to provide students with some semblance of what is entailed in running a "real world" corporation. Within such games student teams are challenged to manage a simulated company. Decisions made by any one team affect the performance of its company and also impact the success of other companies. The objective of each team is to outperform the other teams on one or more measures of performance. Based on the touted value of formal long-range strategic planning presented in popular text books, it is logical to assume that simulation teams that engaged formal planning would exhibit better performance than those that did no formal planning.

This paper describes one element of an on going research effort aimed at exploring the effect that formal strategic planning has on the performance of student teams participating in a comprehensive business simulation game.

FORMAL PLANNING AND ORGANIZATIONAL PERFORMANCE

Organizational Research

A number of studies have attempted to relate organizational performance to firms classified as planners or nonplanners. The Stanford Research Institute ("Why companies," 197) examined 210 firms with exceptional growth rates in sales and earnings. These 210 firms were compared with 169 firms whose growth rates were significantly below average.

The study concluded that planners outperformed nonplanners. Karger and Malik (1975) and Malik and Karger (1975) studied firms in the chemical and drugs, electronics, and machinery industries. Those companies practicing strategic management were contrasted with those who didn't (planners with nonplanners). Both studies concluded that the formal planners outperformed the nonplanners on 9 out of 13 financial performance variables. Thune and Rouse (1970) paired 36 medium to large companies on the basis of industry, size, and growth rate. One member of each pair used formal planning and one did not. Over the seven years of the study, the formal planners significantly outperformed the informal planners in every area measured. Herold (1972, replicated the Thune and Rouse (1970) study and supported the original findings. Additionally, Herold found that formal planners had increased their performance margin over the informal planners since the original study was conducted.

A study by Ansoff, Avner, Brandenburg, Portner, and Radosevich (1970) employed a more complex methodology. This study reported that firms using operational and strategic planning perceived a more substantial accomplishment of their objectives than those firms in nonplanning categories. Formal planners significantly outperformed nonplanners on all the study's financial performance variables. Wood and LaForge (1979) surveyed a number of large banks with regard to formal planning and financial performance. The banks were classified as nonplanners, partial planners, and comprehensive planners. Wood and LaForge found that banks with comprehensive long-range plans performed significantly better than the partial planners, nonplanners, and a randomly selected control group.

The literature is not unanimous in its support of formal planning. A few studies have cast doubts on its value. Fulmer and Rue (1974) found no concrete formal relationship between formal planning and performance in a longitudinal study of 386 firms. The firms were categorized into four groups ranging from those using no planning to those developing formal objectives and three year plans. The groups were compared on 60 financial performance measures. The only consistent finding was that nonplanners outperformed planners in service industries. Kudla (1980) examined the relationship of formal planning to stockholders' returns. In a survey of 348 companies, Kudla found no performance differences among nonplanners, incomplete planners, and complete planners. In other studies by Kallman and Shapiro (1978) and Leontiades and Tezel (1980) no positive relationship appeared between planning and performance.

The inconsistency of results in regard to the formal planning-performance relationship does not become any clearer in the small business environment. In a summary of the literature concerning the positive impact of planning on small firm performance, Robinson and Pierce (1984) found limited supporting evidence. Contrary to the results of their review, these same two authors in a longitudinal study found that small banks did not financially benefit from formal strategic planning (Robinson and Pearce, 1983).

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The literature review of organizational research provides no consensus on the existence of a relationship between formal long range planning and organizational performance. These contradictory research results may be due to methodological incompatibility between studies. Agreement on the meaning of commonly used terms is a major problem. For example, what is formal planning? Also, how do you define organizational performance? Researchers interested in the strategic planning field are aware of these problems and attempting to find solutions (Robinson and Pearce, 1984; Pearce, Freeman, and Robinson, 1987).

Simulation Research

There appears to be a lack of both theoretical and empirical research aimed at evaluating the implications of integrating formal planning into a computer simulation. In a very thorough review of the simulation literature, Wolfe (1985) was unable to cite any research studies that examined the formal planning-performance relationship in a simulation gaming environment. In evaluating this category Wolfe concluded that little was known and basic research was still needed.

Responding to Wolfe's suggested need for empirical study, Curran and Hornaday (1987) attempted to evaluate the relationship between formal planning and organizational performance in a management simulation. In this study sixty, three member teams participated in a comprehensive total enterprise simulation game. Results of the research showed little difference between simulation teams that prepared a formal plan and those that did not.

The unexpected results of the Curran and Hornaday (1987) study prompted the authors to replicate their study (Hornaday and Curran, 1988). In the replication of the study, Hornaday and Curran (1988) increased the "scale factors" used in the simulation for setting the market potential for each of the products in each of the different marketing areas. The results of this research effort indicated that the formal planning teams outperformed nonplanning teams on all profitability measures. In comparing the results of the 1987 and 1988 studies, Hornaday and Curran (1988) concluded that the differences between the two studies could be attributed to the increased market potential available to the teams in the 1988 study which allowed more opportunity for the formal planning firms to excel.

Conclusion and Hypothesis

The results of the "real world" studies seem to contradict or at best lay open to question the suggested benefits of formal planning espoused in Business Policy text books. The organizational literature seems to offer no firm guidance on what might be expected in a simulation game and Wolfe (1985) was unable to find any simulation literature before 1985 which examined the planning-performance relationship. Studies by Curran and Hornaday (1987) and Hornaday and Curran (1988), however, have suggested that simulation teams that plan tend to outperform nonplanning teams in situations of high market potential. Thus, there is some initial evidence that formal planning may result in better organizational performance in simulation environments. Subsequent research under differing simulation conditions is needed to further substantiate the proposition.

The general purpose of the present paper is to extend the investigation of the relationship between formal planning

and the performance of student teams competing in a comprehensive business simulation game. It is generally suggested that one reason formal planning may lead to increased performance is that such planning helps firms anticipate environmental change and begin courses of action to prevent problems that could result from the changes. Therefore, it is the specific objective of this research study to examine the performance of formal planning and nonplanning simulation teams in a setting of environmental change. The specific hypothesis to be tested is the following:

Hypothesis: There is no difference in the performance of student simulation teams that develop formal long range strategic plans and those that do no formal planning when faced with conditions of environmental change.

METHOD

Simulation.

The simulation game used in this research study was The Business Management Laboratory (BML) developed by Jensen and Cherrington (1984). BML is a moderately complex (Wolfe, 1978) simulation of the stainless steel flatware industry. As used in this research, participants were free to make over 50 separate decisions each quarter of play. Because BML is limited to a maximum of eight firms per industry, each class section simulated two different industries. BML firms competed within an industry of four, five or six firms. Scale values relating to overall market potential were adjusted so that the general capacity within the different size industries was proportional to the number of teams. All of the adjustable parameters of the simulation were set to replicate the values used in the Hornaday and Curran (1988) study.

Sample.

Students in five sections of business policy at a mid-sized Southeastern university constituted the sample. The first author taught two of the sections; the second author the remaining three. The authors grouped the participants into 46 teams. Based on research by Wolfe and Chacko (1983), as many students as possible were placed in three member teams. (Because of attrition and uneven distribution of students, two teams ended up with four members and two teams completed the simulation with two members.) Whenever possible, each team was constituted so that a competitive balance was achieved in terms of functional expertise. A total of 14 decisions were made during the course of the simulation (Wolfe, 1985). Four practice decisions were completed for familiarization with BML. Following these trials, a new start up position was created and ten graded decisions were made over a ten week period. The BML team score counted for 20% of each student's course grade. All participating teams realized that their grade on the simulation was going to be based on their performance in the areas of profitability, liquidity, and leverage.

Planning.

In two of the sections (one section taught by each author) all teams wrote a formal long-range plan before the start of the ten graded decisions. The plan covered the entire ten quarter time frame of the simulation. Contents of the plan included a section outlining the overall goals to be accomplished during the decision cycles and a formal statement of the

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strategies that were to lead to the accomplishment of the overall goals. A breakdown of the specific functional policies to be utilized by the company was also presented. The final requirement for each planning team was to provide a pro forma income statement and cash flow estimate covering all ten quarters of the simulation.

Three of the sections had no formal planning requirement. These sections, through the course of normal discussion of the simulation exercise, were told that they should consider what strategy they were going to use. However, they were never asked to describe or present this strategy in any written or oral format.

Environmental Changes.

In order to determine how the simulation teams would respond to changing environmental conditions, three separate diversions which were not part of the physical BML program were incorporated into the game. All changes were initially introduced after the third decision of the real cycle. These environmental factors were presented to the student teams in the form of news releases. These messages were printed on transparency film and shown to the class by each instructor without comment. Though each of the environmental factors is described separately, the news releases were intermixed so that the students needed to consider the potential impact of all three environmental issues on their decision making from the fourth decision to the end of the simulation.

The first environmental factor that the students had to contend with was a "war in the straits." This military action was important because all raw materials passed through the "straits" on their way to the United States. Four separate news releases related to the war were shown in class over a period of three weeks. The information provided indicated (1) the initial start of fighting, (2) the concern of commodities traders for increased raw materials prices if the "straits" were closed, (3) an intensification of fighting in the "straits", and (4) the bombing of the "straits" thus closing it to all shipping for the duration of the simulation. The closing of the "straits" forced the simulation teams to buy their raw materials from a secondary source of supply at double the normal price.

The second environmental issue that the simulation teams had to face was an expiring labor contract in one of their manufacturing plants. The series of news releases accompanying the labor situation indicated that (1) the union promised tough bargaining and chances for an industry strike were "ripe," (2) industry negotiations opened, and (3) negotiations between management and the union had broken off and the union was going to strike. At this point two things happened. First, the teams were told that their unionized plant would be closed down for at least one quarter. (The strike could last longer than one quarter if the firms were unable to negotiate a settlement with the union.) Second, each group was handed a copy of the terms of the "old" union contract, the new union demands, and a scheduled time to meet with the union representative to try and negotiate a settlement to the strike. The simulation teams then met with the Administrator who acted on behalf of the union. At the negotiation session, new contract terms were decided upon and none of the teams experienced a strike of more than one quarter. The new terms settled upon during the negotiations were then translated into cost changes (i.e. increased labor costs, administrative charges, etc.) which the firms then had to live with for the remainder of the simulation.

The final environmental issue dealt with a political action group's attempt to force the Environmental Protection Agency (EPA) to get tough on emissions from the simulation industry's manufacturing plants. The four news releases used in this scenario indicated that (1) a political action group had formed to condemn the industry's disregard for protection of the air and water around manufacturing plants, (2) EPA vowed to clean up the industry, (3) industry lobbyists tried to mitigate the effects of unannounced plant inspections planned by EPA, and (4) industry lobbyists were successful in getting the EPA to drop their "crusade" against the industry. This particular set of news releases was shown over a five week period of time. Therefore, even though the threat was finally negated, students had to contemplate the possible expense involved with either purchasing new environmental protection equipment or incurring EPA leveled fines for about half of the simulation.

Performance Measures.

At the completion of the 10 simulated quarters eight financial performance measures were calculated for each team. These eight measures were (1) total earnings, (2) average stock price, (3) average earnings per share, (4) average return on investment, (5) average debt/equity ratio, (6) total forced loans, (7) ending plant capacity, and (8) ending total assets. Of these measures only number six may need some explanation. Total forced loans represent automatic loans which are given to a team when they encounter a cash shortage due to improper budgeting.

RESULTS

The hypothesis under consideration stated that there is no difference between the performance of formal planners and nonplanners when faced with changing environmental conditions. This hypothesis was tested by using analysis of variance and the results are shown in Table 1. Planning teams achieved significantly higher total earnings, stock prices, earnings per share, and returns on investment than did nonplanning teams. Though the relationship is not significant, the planning teams were also found to have larger firms in terms of total assets. In reviewing the remaining evaluation criteria, none of the relationships reached statistical significance. However, it is interesting to note that there is a suggestion in the pattern of results that nonplanning firms had much less control over their financial structures (higher debt/equity ratios, higher totals in the forced loan category, and some unnecessary plant and equipment).

DISCUSSION

The results of the data analysis indicate that planning firms clearly outpaced the nonplanners when faced with uncertain environmental conditions (the research hypothesis was rejected). The planning teams superiority was evident in total earnings, average stock price, average earnings per share, and return on investment. These results tend to be in line with the "reel world" research studies conducted by Karger and Malik (1975), Malik and Krager (1975), Thune and I-louse (1970), Herold (1972), Wood and LaForge (1979), and Robinson and Pierce (1984). The findings of this research effort are also consistent with the results of the Hornaday and Curran (1988) study which was

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conducted in a simulation game environment.

If the results of the present study are combined with the observations of the Curran and Hornaday (1987) and Hornaday and Curran (1988) studies, a picture of the relationship between formal planning and simulation team performance begins to emerge. Curran and Hornaday (1987) found no significant difference between formal planners and nonplanners in a simulation environment. The formal planners, however, did do a superior job on cash flow management. After reviewing these results, the restrictiveness of the market potential was hypothesized as a possible explanation for the findings. A second study (Hornaday and Curran, 1988), which expanded market potential thus giving better managed firms an opportunity to excel, found that formal planners significantly outperformed nonplanners. Since the present research study utilized the same simulation game and parameters as the Hornaday and Curran (1988) study, the results can be taken as support for the contention that formal planners do significantly outperform nonplanners and that such results are replicable across different samples. The present study also seems to indicate that the superiority of the formal planning teams holds even when uncertainty is introduced into the simulation through changing environmental conditions.

Overall, it appears that in periods of weak economic conditions (low market potential), well managed firms which are unable to reach their profitability goals will settle for getting the most out of whatever revenues they can attract. In short, they will concentrate on cash flow (Curran and Hornaday, 1987). When times are good (high market potential), however, well managed firms will produce superior profitability both under stable environmental conditions (Hornaday and Curran, 1988) or under changing environmental conditions (the present study). All three studies, therefore, seem to showcase formal planning as an effective tool to guide management decision making.

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TABLE I
Analysis of Variance

Detailed BNL Plan versus No Plan Teams

Criteria	Mean		F	p.
	Plan n=21	No Plan n=25		
Total Earnings (\$ 000s)	406	747	6.813	.012*
Average Stock Price	2.52	7.09	5.300	.026*
Average Earnings per Share	.70	.45	4.884	.032*
Average Return on Investment	.14	.08	6.639	.013*
Average Debt/Equity Ratio	1.28	2.79	0.516	.476
Total Forced Loans (\$ 000s)	173	703	1.510	.226
End Plant Capacity (Hours 000s)	17.0	17.5	0.174	.678
End Total Assets (\$ 000s)	1209	1108	1.769	.190

* Probability of no difference < .05.

** Probability of no difference < .01.