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THE DEVICE BUSINESS: A MANAGEMENT SIMULATION FOR STRATEGY FORMULATION

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ABSTRACT

THE DEVICE BUSINESS, an interactive simulation used to teach strategy formulation in business policy courses, is described in this paper. Attention is then turned to the use of the simulation as a mechanism for studying factors involved in strategic decision making and planning. Results of tests of hypotheses related to variables such as confidence in plans, performance and effort are reported.

INTRODUCTION

Planning is generally considered a requisite to purposeful organizational action. Therefore it is urged upon managers at all levels in all kinds of organizations. Indeed, a formal organization exists to accomplish defined purposes however vaguely characterized, and this seems to imply that there must be some formulation of goals and of means to accomplish them. The formulation of and means may be taken as a definition of planning.

Planning is concerned with movement from the present state of affairs to certain desired future states. Since the future is always to some extent uncertain and information about the present state is usually incomplete, planning requires making assumptions about the organization and its environment both in the present and in the future. Uncertain environmental trends and developments need to be predicted. Cause and effect relationships should be hypothesized. The longer the planning horizon, the more uncertainty with which the planner must deal; hence, the larger the role of assumptions. The extreme case is strategic or long-range planning.

Regardless of whether formal models are used or planning is done on a largely intuitive basis, planners inevitably find themselves thinking in some detail about their planning assumptions as they enumerate possible goals and formulate means. A common sequence of thought begins with a goal or desired end. The planner imagines or in some other way generates possible action sequences that may lead to the goal. Then through some evaluation scheme s/he selects a particular action sequence to be implemented. However, the thinking that goes into planning is often more complex than this pattern. For example, considerable data collection and analysis may go into the formulation of goals themselves in order to ascertain what is both a feasible and acceptable future state. Much has been written on the question of whether planners can, should or do, seek to maximize some value function or whether they simply satisfice (Cyert & March 1966). It is generally accepted that they satisfice because the cognitive demands of attempting to maximize exceed the bounds of limited human rationality.

In the particular realm of strategic planning for business organizations, some suggest that successful strategists answer a sequence of questions that successively narrow the field of possible strategies.

The sequence begins with an assessment of opportunities that lie in the environment: What might we do? There follows a consideration of internal resources and capabilities; What can we do? Thence, to questions of values and societal expectations: What do we want to do? What should we do? Finally, the decision as to broad strategy: What will we do? This sequence yields a conception of organizational purpose thus providing guidance for the formulation of specific goals and policies. The process is likely to be laborious and time-consuming, and more iterative than linear. Organizational purpose, once defined, is expected to be relatively slow changing. On the other hand specific goals, policies and plans are expected to require continuing review and modification over time.

The complex job of combining information, values and assumptions about present states, future states and cause-effect relationships in order to generate and evaluate possible action sequences seems to yield comprehensive, mental moving pictures, aptly characterized as scenarios. Planners are sometimes observed or urged to develop various scenarios based on alternative sets of assumptions (Armstrong, 1978).

This paper describes THE DEVICE BUSINESS, a new simulation designed for pedagogical purposes in the area of strategy formulation. Furthermore, it reports some of the findings from two distinct approaches to strategic long-term planning used by student participants of THE DEVICE BUSINESS. Our research is based on the assumption that as one engages in the mental processes of planning, one strategic plan is developed in more and more detail while alternative plans come to be ignored or dismissed. As this occurs, the assumptions that give rise to the focal scenario come to be treated, more or less, as fact. The planner begins to forget that they are not certainties, but have originated merely as possibilities. Even though they may have been adopted as operating assumptions because they appeared more feasible than competing assumptions, the process of assuming them to be valid while exploring the implications of various action sequences blurs the distinction between possibility and fact, between probability and certainty.

There are at least two non-mutually exclusive psychological bases for this hypothesis. The first is found in recent work with respect to the accuracy of human memory. What one reports to be a memory may not correspond to an actual experience at all, but simply to a previous embellishment of a memory, or an imagination of what might have been, or an account of an event by some other person. Thus, what we remember may never have happened. The event seems real to us, even though it may have originated in our imagination or in someone else's account.

The development of a plan in the process of planning involves imagining the implications of a set of assumptions combined with possible actions. It should not be surprising, therefore, that if a planner begins to perceive the assumptions as remembered facts.

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A second basis for the phenomenon hypothesized here emerges from psychological theory and research on cognitive dissonance (Festinger, 1957). Dissonance theory asserts that taking an action or making a public statement that is in conflict with one's private beliefs produces cognitive dissonance. Furthermore, one is motivated to reduce the dissonance, and that the reduction of dissonance is likely to be accomplished by changing one's private beliefs in the direction of one's public statements.

When applied to planning, the theory seems to imply that having invested a great deal into formulating a plan, one must account to one's self for having done so. If one does not believe the resulting plan to be sound, valuable, practical, or realistic, then one will experience cognitive dissonance. Dissonance is high 'if one does not believe the plan to be sound and will be reduced to the extent to which the planner does believe it to be sound. This supplies a motivation to believe in the plan and the operating assumptions upon which it is based.

Thus, it is hypothesized that planners will tend to believe in their plans; and that the strength of their belief will be a function of the amount of effort they have put into the plans. The finer the detail in which they plan, the more effort it is likely to require. The more effort they put into planning, the more they will believe in the plan and its underlying assumptions.

THE DEVICE BUSINESS

Objectives

The simulation provides a context for a course which focuses on a variety of management functions, skills, and techniques: (1) Reading and interpreting financial statements and other financial and management accounting reports. (2) Integrative decision analysis and planning, in which tradeoffs in allocation of scarce resources between competing needs must be made. (3) Working productively in task-oriented groups in which effective planning and decision making is rewarded and haphazard or inconsistent planning and decision making is penalized in ways analogous to the real world of business.

Environment

Each firm operates within an industry of three or four other student-managed firms. At the beginning of play each student team takes over a clone of an ongoing company. Thus all firms have, at the outset, identical operating histories, products, market shares, production capacities, labor pools sales forces, and capital structures. The firms are managed through a set of decisions covering five functional areas: POM, marketing/sales, human resources, inventory/distribution, and finance. There is a 40-decision version, in which the 48 contiguous states are divided into three marketing regions and certain decisions are made on a region by-region basis; and a 30-decision version, in which the states are divided into two regions.

The firms' decisions are made for a succession of six-month operating periods, with five or six-page reports distributed to each firm each period. The reports consist of the following items:

- Three-period decision history
- Income statement for the period

- Balance sheet as of the end of the period
- Source/use of working capital statement
- Analysis of working capital changes
- Statement of changes in equity
- Analysis of inventory, production and cost of goods sold
- Various liquidity, inventory and receivables ratios
- Unit inventory report
- Marketing information (e.g., estimated market shares, etc.)
- Economic forecast for next three periods
- Summary income statements, balance sheets And auditor's opinions for all firms in the industry
- Market prices of each firm's common and preferred stock and current yield of each firm's debentures
- Information concerning any of a number of exogenous events controlled by game administrator or events generated by the particular decision of a firm (e.g., strike threat, OSHA inspection, etc.)

The simulation was formulated to represent a plausible manufacturing- marketing firm scenario, hut not to model a particular real-world organization. Its two products, standard devices and premium devices, face a downward-sloping price demand curve, may be differentiated through expenditures on product development, may be marketed successfully through promotion, must be sold through company salesmen, and face a product life cycle that is to some extent controllable by the game administrator.

The firm operates in a simulated economy, driven by a sequence of gross national product and consumer price level parameters, expressed as indices and specified by the game administrator. Thus, a variety of scenarios is possible, including economic stability, cyclical growth or decline, and others--coupled with stable, rising or declining prices. These two variables, in turn, drive interest rates, which, in turn, influence the firms' costs of capital.

Overview of the Role Play

Students are supplied with participant manuals and expected to read them in advance of the first class meeting. The game administrator takes approximately two hours at the beginning to explain the simulation and the rules of the game. Typically, the administrator specifies that the goal of each firm should be to enhance the wealth of its shareholders as measured by the ending price of its common stock.

Teams are composed of four or five persons and receive the latest periods operating reports, on the basis of which the teams are to make decisions for the next six-month period of operation. If personal computers are available to the teams, they may submit their decisions in the form of electronic files; otherwise, their decisions are entered and submitted on forms provided by the game administrator.

In quarter or semester courses, play proceeds at a rate of one period per week. For short, intensive courses or seminars approximately one period per half-day is feasible. The decision time for the first period requires a minimum of three hours; subsequent periods require successively less time as the participants become familiar with the decision variables, the operating environment, the functional relationships in the model and each other.

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System Requirements

The simulation is programmed on Quattro Pro and utilizes a set of four linked spreadsheets. It requires at least two megabytes of RAM and will run reasonably quickly on a PC of 12 megahertz or faster. The reports may be printed in one copy and photocopied for each team member, or printed in multiple copies.

METHODS

An exploratory study was conducted with two MBA business policy classes during the Winter Quarter 1990 to gain insight into the nature of planning and to test our assumptions. Each student was randomly assigned to one of fourteen groups. Each group engaged in a team enterprise of operating a simulated manufacturing company. The students managed their company by making a set of 40 decisions covering marketing, personnel, purchasing and distribution, manufacturing operations, and finance. Each successive set of 40 decisions became the basis of six months of simulated operation, which yielded production, distribution, sales, personnel and financial results. Team decisions were submitted to the instructor who entered the data into the computer simulation program which then provided resulting changes for all teams in market shares as well as other factors mentioned earlier.

Early in the quarter each team was randomly assigned to one of two conditions. Under Condition I each team was asked to formulate a written detailed strategic plan, which included objectives with respect to period-by-period projections of common stock price, target percentage returns on sales, assets, and equity. In Condition II students were not required to do a strategic plan, but rather were required to write scenarios about six industry or firm outcomes derived by students who had played the simulation in previous quarters.

After completion of this assignment, each student was asked answer a questionnaire related to a variety of dimensions surrounding their simulation experience, including time spent, attitudes and perceptions about their experience, and strengths and weaknesses of the pedagogical structure and format of the course. In addition, the students were asked questions about their experience, probability estimates of success of their performance, and their confidence in reaching each of the defined goals. Team performance was evaluated by comparing their results with the results of other teams within the same industry. Market and economic conditions were the same for all teams in all industries. Rank analyses were performed for all fourteen teams.

After several periods of play of the simulation students completed a second questionnaire that requested post responses to questions similar to those asked on the first questionnaire. It was anticipated that their results in terms of firm performance the interim (the period between questionnaires) would not perfectly match their expectations, and this would motivate them to change their final projections.

Several statistical methods were used to analyze the data and make decisions related to our assumptions and hypotheses. Some of the statistical techniques included correlation and regression analysis, t tests for significant differences, and factor analysis. Since our investigation was too broad in scope to discuss all of the findings, the results reported in this paper will be limited to only a few of our hypotheses.

RESULTS

The assumption that those students in Condition I would initially express more confidence in their projections than those students in Condition II was supported by the findings of this study. Analysis was performed to discover whether membership in-groups under Condition I or II leads to more extreme goals, but no a priori hypothesis was made. By comparing the extent to which teams' final performance figures approach their projections, it was found that planners appear to more accurately forecast their final performance level; however, the results were not statistically significant. Note that the large number of uncontrolled variables impacting performance and the relatively small number of firms made it unlikely that any effect, even if present, would be detected.

The hypotheses tested and the statistical analysis that support these conclusions are;

1. Ho: There is no difference in confidence in their plans between planners and developers of scenarios [Confidence is measured by projected rank in terms of final performance].

Conclusions: Planners have more confidence in their plans made than to developers of scenarios.

Evidence: T test						
	n	MEAN	SD	SEPARATE	POOLED	PROB
Scenario	30	2.083	1.3	-3.331	3.272	.002S
Planners	21	3.167	1.1			.002P

2. Ho: The success of the project does not depend on the amount of confidence in plans.

Conclusions: A significant relationship exists between the amount of confidence in plans and performance level. The more confidence expressed in plans, the higher the final performance rank.

Evidence: Pearson Product Moment Correlation			
r = .607	SEE = 1.040	COEFF. = .030	P = .000

3. Ho: There is no difference in the level of final performance between planners and developers of scenarios.

Conclusions: Developers of scenarios performed statistically significantly better than planners.

Evidence: T test						
	n	MEAN	SD	SEPARATE	POOLED	PROB
Scenario	30	2.276	1.1	-2.475	-2.407	.016s
Planners	21	3.028	1.4			.019p

4. Ho: There is no difference in the amount of time spent on the simulation between of planners and developers of scenarios.

Conclusions: At the .05 level of significance, planners spent more time on the project than did developers of scenarios.

Evidence: T test						
	n	MEAN	SD	SEPARATE	POOLED	PROB
Scenario	30	25.77	28.8	-2.045	-2.082	.046s
Planners	21	39.81	25.06			.042p

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DISCUSSION

5. Ho: There is no difference between planners and developers of scenarios in terms of forecasting accuracy of final performance

Conclusions: Do not reject Ho.

Evidence: T test

	n	MEAN	SD	SEPARATE	POOLED	PROB
Scenario	30	1.400	1.589	1.638	1.511	.108s
Planners	21	0.810	0.982			.137p

6. Ho: There is no difference in confidence towards plans between planners and scenarios.

Conclusions: Fail to Reject Ho: Planners have no more confidence in their plans made than do scenarios.

Evidence: T test

	n	MEAN	SD	SEPARATE	POOLED	PROB
Scenario	30	17.79	14.8	-1.897	-1.851	.063s
Planners	21	26.40	18.5			.070p

A significant difference in the predicted direction in expressed confidence between the two conditions may be interpreted as supporting the hypothesis that detailed planning induces more confidence than developing scenario as preparation for the simulation. However, this sheds little light on whether such confidence is well founded. Either individual who spend more time and effort come up with "better plans or they are simply more confident.

A significant difference in the amount of time spent may be tentatively interpreted as supporting the hunch that detailed planning may lead to more involvement in the project thereby improving final performance.

The discovery of a significant difference in the extent to which the teams' final figures approached their projections would have been provocative. It was found that Condition I firms came closer to their projections, suggesting that the planning effort was more useful and that their confidence was well-founded. On the other hand, given that Condition II firms did not come closer to their projections, the over-confidence notion was not supported. However, the interpretations of these findings are made in light of the fact that the associated null hypothesis could not be rejected due to the lack of statistical significance at the .05 level.

The implications of our results should be of considerable interest to individuals in all organizations engaged in strategic planning. There is a view that success depends in part upon the extent to which one believes in one's goals and plans. This may be considered an heroic interpretation. The hero is one who is undaunted in the face of opposition and who succeeds because the perseverance borne of self-confidence and determination.

In a complex and uncertain world, however, danger lies along the path of over-confidence. If one treats mere probabilities as certainties, one may not be vigilant for disconfirming information.

A person who dismisses the possibility that his/her operating assumptions are wrong will be particularly vulnerable. The planner may become insensitive to danger signals and warning signs and thus unlikely to take timely corrective action, to change course, or when appropriate, abandon a plan. If over-confidence in a course of action is the result of detailed planning and the mental effort it requires, one is faced with the proposition that if planning is good, there can be too much of a good thing!

Consider this idea in the context of entrepreneurship. Entrepreneurs are required by potential financial backers to plan in intricate detail and to make financial projections far into the future. Having put forth great effort to produce detailed plans and projections which they are forced to defend, are they likely to over-buy their own assumptions and wind up so sufficiently overconfident that they are prepared to rush in where they ought to fear to tread?

SUMMARY

This paper has reported some of the differences found between two approaches for participating in a management simulation, THE DEVICE BUSINESS. It was found that the two conditions described in this paper produced significant differences in a number of areas related to confidence, performance and expended effort. Caution should be used when making inferences. Subsequent studies should investigate the reasons for these differences so that the unique benefits from each approach may be maximized in future use.

THE DEVICE BUSINESS is an interactive simulation, suitable for use in courses at the undergraduate and masters level. It has also been used successfully in capstone courses that have as their primary aim to provide students near graduation with an opportunity to integrate knowledge and skills learned throughout the curriculum. In contrast, it has been used successfully with second quarter MBA students without previous formal business education, thereby providing both motivation and opportunity to understand the generation and use of financial and managerial accounting reports. It has been used in short (two or three-day) executive education courses, both as a capstone following a variety of functional courses, and as a stand-alone experience.

There are numerous business simulations on the market. Many of them feature well-defined products. This simulation, in contrast, features products only abstractly defined, e.g., devices. This largely avoids the issue of whether the demand characteristics are "realistic," and allows participants to conceptualize the product themselves, and gives the simulation broad application.

THE DEVICE BUSINESS features a relatively large set of decisions, incorporates a variety of forms of capital in the capital structure (common and preferred stock, short term loans, long term debentures, etc.), and provides participants with unusually rich reports. It enables the instructor to program the economy in terms of GNP and CPI and introduce a maximum of 12 exogenous events over the several periods of play. Thus, the experience can be varied within broad parameters from course to course.

Because the simulation is formulated on a spreadsheet, it is relatively easy to change and debug. Formats may be easily modified; functional relationships can be changed. However, experience has suggested that a certain amount of conservatism is prudent, because it is easy to generate new program bugs in the process of modification.

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REFERENCES

- Armstrong, J.S. (1978), Long Range Forecasting: From Crystal Ball to Computer. New York: John Wiley and Sons, Inc.
- Cyert, R.M. & March, J.G. (1963), A Behavioral Theory of the Firm. Englewood Cliffs, N.J.: Prentice Hall.
- Festinger, L.A. (1957).Theory of Cognitive Dissonance. New York: Harper.