TOP MANAGEMENT PROBLEM SOLVING AND INFORMATION SYSTEMS

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ABSTRACT

This paper presents the results of a exploratory study of problem solving by top management in a sample of firms.[1] The purpose of the research is to determine the nature of the information needed by top management and the role of computer-based system in suppling it. The paper classifies problems according to their nature and explores the information sources used to solve the problems. It is clear that computer-based information can aid in the solution of some of these top management problems, but probably through unconventional systems. The implications of the study for systems design are discussed.

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1. The author is indebted to Ian Mitroff who provided many helpful suggestions during this research and a generous contribution of time.

Many existing information systems are designed to process transactions or support the operations of an organization. With the exception of certain planning systems (Hamilton and Moses, 1974) and possibly a few decision support systems (Alter, 1977, 1980), top management seems to have been unaffected directly by information processing technology. If information systems are to help top managers deal with problems, the nature of their problems needs to be better understood.

To what extent are top management problems amenable to computer support? Are the information needs of senior management so diverse that only ad hoc analysis and an occasional decision support system will ever prove helpful? This study seeks to answer these questions by providing data on the major problems encountered by a group of top managers.

There have been relatively few studies of the types of problems faced by top managers or the information used to find and solve these problems. Mintzberg (1973) reported that managers favored oral methods of information gathering and communications. Keegan (1974) found that managers of international divisions of multinational firms tended to be highly nonsystematic in their search for external information.

Lyles and Mitroff (1980) conducted an exploratory study of the process of problem formulation in organizations. They found that 90% of managers' problems were ill-defined and that 80% of the managers were unaware of the problems before formal indicators signaled their existence. The authors concluded that problem formulation is a highly personal process which has affective, social and political features.

The study described in this paper was designed to learn more about the key problem facing top managers and the information that is brought to bear on these problems. What kind of information systems can be used to support top

managers in dealing with their most critical problems?

RESEARCH MODEL

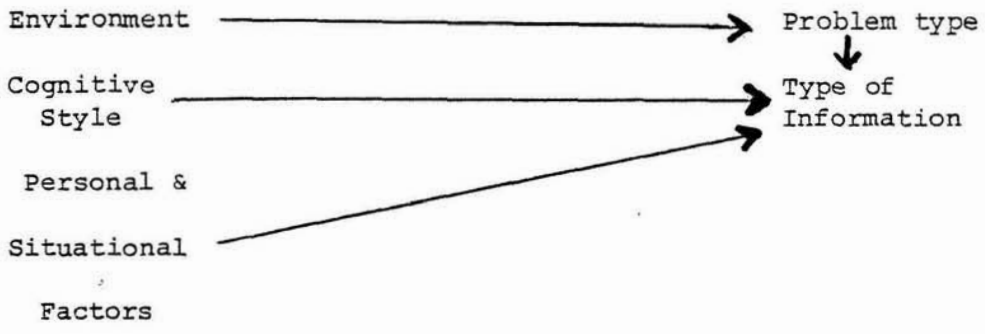
Most past research about top management is descriptive; there has been little model building or hypothesis testing. Figure 1 contains the research model that guided this study. It was predicted that the nature of the environment would determine the types of problems faced by an organization. For example, the brokerage industry faces a highly regulated environment which is heavily influenced by consumer psychology and general economic conditions.

The type of problem should influence the type of information used to identify and solve the problem (Gorry and Scott Morton, 1971). Problems related to raising capital will cause the top manager to turn to outsiders for information; investment bankers, legal counsel and others will provide information to solve this problem.

The type of information preferred by the executive is likely to be influenced by two factors in addition to problem type (Lucas, 1979). First, there has been considerable research on the importance of cognitive style of information selection. One simple breakdown of cognitive style is into analytic and heuristic. The analytic decision maker is one who develops a model and uses data to identify and solve problems. The heuristic decision maker is more likely to reason from intuition than data.

Personal and situational factors also influence the decision maker. The manager who came up through sales is more likely to find problems related to sale than is the chief executive with a financial background. The job of the designer, in trying to provide information to the decision maker is complicated; he or she must consider problem type, cognitive style and personal and situation factors.

HYPOTHESES



The Research Model
Figure 1

BACKGROUND

The individuals included in this study are members of top management: They were chosen from the board of directors for the New York University Management Game. The Game is a large simulation exercise in which 96 students compete each semester. There are four industries each having three companies with eight students on a company team. Each team reports to a board of directors whose members come from business and academia. The majority of the directors are from business, and only these individuals were included in the sample. A questionnaire was mailed to 71 directors and there were 33 usable replies.

The sample is biased in favor of small businessmen and entrepreneurs. Approximately 48% of the respondents were shareholders in their firms and 32% were the founders of the company. As would be expected, the sales of the firms where the respondent is a founder were significantly lower than the annual sales of others firms represented in the sample. Some 55% of the sample were either the chairman or president of their firms.

The bias of the sample is toward managers with entrepreneurial and risk-taking approaches to management. There individuals in general do not have business school backgrounds and have not been exposed to quantitative techniques and computer models. This sample represents one extreme point on a continuum; these individuals are likely to be difficult to support with computer-based systems due to their orientation and the relatively small size of their firms.

While the sample is biased, the range of problems encountered by this group is still of interest. The problems may be typical of those confronted by the top management of many organizations. Even if the individual problems are biased, the generic classes into which these problems fall can provide

insights on top management information processing needs.

TYPES OF PROBLEMS

The questionnaire asked each respondent to describe his or her most recent important problem, the information used to find the problem and the information used to solve it.[2] Pounds (1964) has made an insightful distinction between the process of problem finding and problem solving. Often academic attention is focused on problem solving techniques, ignoring the difficulties of identifying and defining exactly the nature of the problem. Pounds suggests that frequently more time and effort are devoted to finding problems than to solving them.

The types of problems identified in this study fell into four broad classes. Table 1 presents examples of the problems cited by the top managers in the sample. In general, the managers specified the information used to identify the problem, but were able to respond with less regularity on the information used to solve the problem.

Market/Regulatory:

The first class includes marketing and regulatory problems which tend to arise from factors external to the firm. An example would be the need to expand a particular market, develop a new product or respond to a new government regulation. Some of these problems were quite far reaching, e.g., the move to negotiated brokerage commissions from the fixed fee system had a dramatic impact on the securities industry. Regulatory problems concerned government rule changes or changes in accounting standards.

The information used to identify problems focused on sales and

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[2]The questionnaire was unrelated to the respondent's role in the Management Game; it referred to their work environment.

competition. Solution information came from the same data, only it probably involved different analysis. For example a report of no revenue growth alerts the manager to a problem; analysis is required to determine that the reason for low growth is in marketing. Managers confronted with regulatory problems turned to individuals for advice on solutions, especially to attorneys and accountants. When compared with other types of problems, there was a significant difference in the source of information; data in this class tended to come from external as opposed to internal sources.

Organizational Structure:

The second class of problems is concerned with the structure of the organization. Several companies had been involved in mergers and acquisitions. There were problems in integrating new businesses, issues related to departmental structure and similar problems of how to structure or restructure the organization.

Indications of organizational structure problems came from feedback from within the organization or from clients; in general, the managers had feelings of organizational ineffectiveness. The source of information to solve the problem might come from a survey of the competition. What are other firms doing under similar circumstances? What are alternative organzational structures?

Personnel

Closely related to organization structure were problems related to personnel. Problems in this class dealt with individuals or work groups in the organizations. There were a number of changes in key management and an occasional conflict of interest. For example, one president was confronted with an employee who was starting a competing business while remaining as an employee. One respondent had lost a key manager in the organization, a person

PROBLEM TYPE	INFORMATION TO IDENTIFY/SOLVE PROBLEM
MARKET - REGULATORY PROBLEM	
Need to expand market	No revenue growth, P&L statement
Changing FDA requirements	Product seizures by government agency
Enter a new market	Market sales
Purchase subsidiary to circumvent union rules	Published union work rules
SEC rule changes	SEC report
ORGANIZATIONAL STRUCTURE	
Choose low growth component for divestiture	Accounting sales reports
Reorganization of a district to create conceptual planning group	Internal reports
Reorganization of production into project functional matrix	Client recommendations
Reorganization to minimize staff-line conflict in bank	Increase in loan losses, decrease in new loan activity
Integration of two firms that merged	Managers and written reports
New Matrix organization	Communications from other officers, weak performance
Aquisition of a business	Lack of sales increases, accounting and computer reports

MANAGEMENT PROBLEM
TABLE 1

PROBLEM TYPE	INFORMATION TO IDENTIFY/SOLVE PROBLEM
PERSONNEL	
Complete change of personnel	Sales figures, own feelings
Change in compensation scheme required by regulation	Employee morale, colleague reports
Change in senior management	Low profits, monthly financial reports
Retirement of chairman	Personal observations
Finding qualified personnel	Service and daily reports
Conflict of interest for senior manager	External source, vendors
Loss of senior personnel	Lack of any information
Loss of key VP due to accident	Not applicable
High sales force turnover	Computer analysis of field reports
FINANCIAL PROBLEMS	
Raise new capital	Market forecast, potential customers, sales force, R&D, directors
Losses hidden by subsidiary	Increase in loss rates from computer prepared profit statement
Sales decline leading to losses	Sales figures, computer analysis
Lack of control, thefts in subsidiary	External audit report
Near bankruptcy of client	Financial statements and SEC reports
Need for capital; go public or become acquired	Not applicable

MANAGEMENT PROBLEM
TABLE I (cont.)

who was difficult to replace, and the loss created an extra burden for the respondent.

The conflict of interest situation and similar personnel difficulties were most often solved through conversations with others. A personnel problem with groups such as the high turnover of a sales force could be identified through a sales information system which provided reports on turnover. For the personnel category significantly more data came from external rather than internal sources.

Financial Problems:

The last class of problems was financial in nature. A bank with loans to a customer who was near bankruptcy fell into this class as did firms that were trying to obtain additional capital. With a preponderance of small firms in the sample, it is not surprising that financial problems were important. Several of the firms had to raise more capital and they needed information on the stock and bond markets, and other financial data. To help raise capital, the managers turned to legal counsel and to investment bankers. Another type of financial problem dealt with losses. A pending loss might not be found until there was an audit report.

ANALYSIS

The questionnaire contained items relating to the type of environment faced by the respondent, the cognitive style of the decision maker and personal and situational factors, as well as the data described above on problem type and information utilized to identify and solve the problem. Also, following Lyles and Mitroff (1980) the problems reported were classified according to their level of ambiguity.

The responses were coded and scales were formed by averaging together

highly correlated items. The variables were used to test the research model in Figure 1. Unfortunately the number of significant findings is small; barely beyond what might be expected based on chance alone. There is little or no support for the major predictions derived from Figure 1 that environment influences problem type and that the information needed to identify and solve problems is a function of problem type, cognitive style and personal and situation variables.

The analysis did suggest that respondents who were founders of their organizations had significantly more problems in the marketing/regulatory and personnel classes than did other managers. Ill defined problems were associated with firms in a more technological environment and with managers having longer service in their firms and a higher level of education.

The number of significant findings is rather modest considering the large number of variables and the success of several past studies. There are two explanations for the lack of findings from the statistical analysis. First, the problems of the non-random sample and the missing data combined with a small sample size may be responsible. Also, due to the bias in the sample toward small business, executives may be dealing with a wider ranger of problem than managers in a large firm. However, an alternative explanation is that problems at the top management level may be sufficiently varied and unstructured that statistical analysis and hypothesis testing are very difficult.

It is also possible that personal style variables not included in the data are significant, especially given the large number of owner/managers of small businesses. These individuals are relatively unconstrained by bureaucracy and formal business approaches; they tend to be entrepreneurs and risk takers. Without the benefit of MBA education or the rules of a large corporation, one can speculate that these managers develop individualized, creative solutions to

problems. These executives also confront a wide range of problems. Certainly, further research is needed, especially with a variety of firms and managers.

INFORMATION SYSTEMS

Due to the ill-structured nature of the problems, little in the way of formal computer-based information systems were identified in the responses. Some use of the computer was evident, particularly in sales analysis for new product decisions, for the analysis of sales force turnover and for financial information, for example, to identify declining sales. The use of computer systems was almost totally confined to problem finding; the systems provided raw data which the decision maker used to locate the problem.

For solving problems, information tends to come from individuals either internal or external to the organization. The solution requires consultation with different types of individuals who can render advice or generate ideas for solution. For some of the problems, however, it appears that more formal computer support would be possible. Ad hoc decision support systems to support data analysis and answer what-if questions could clearly help with some of the problem solutions. Modeling and simulation combined with information retrieval and data base capabilities could be of assistance in problem solution. However it will be difficult to design a system with data relevant to the wide diversity of problems faced by these managers.

CONCLUSIONS

Top management faces a variety of problems; for this biased sample, four classes appeared including marketing/regulatory, organizational structure, personal, and financial. The problems tended to be ill structured and were not

always easy to identify or solve. Solutions often required radical and creative ideas and involved strategic choices. The role of computer-based information systems was modest, mostly for problem finding. A key task for the information systems designer is to find a way to support managers in their need for information to develop solutions to problems and to predict decision consequences.

An equally important task for research is to develop a better understanding of the information processing and decision making activities of managers at all levels of the organization. From an implementation standpoint, most of the systems used by top managers will be voluntary; the manager will not be forced to use the system as a clerk often must use a transactions processing system. Under these circumstances, the design task becomes far more difficult because the manager must feel the system provides assistance and must be sufficiently motivated to interact with it. The designer and the manager must identify the information needs of the decisions faced by the manager and to determine the extent to which computer-based systems can contribute to providing this information. It is likely that creative solutions and novel systems will result from these efforts if they are successful.

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