Determining Management Information Needs: A Comparison of Methods

By: Malcolm C. Munro and Gordon B. Davis

Abstract

This paper reports on a comparison of the decision analysis (top-down) and data analysis (bottom-up) methods for determining management information needs in the preparation of management-oriented information system applications. Information requirements were developed using the two alternative methods for four decisions in each of four small colleges. The information requirements obtained by the two methods were evaluated by the college executives as to value and other attributes. The results indicate:

1. The methods perform better in some functional areas (e.g., administrative) than in others (e.g., academic).
2. The type of decision, programmed or nonprogrammed, affected the value and attributes of information obtained. The decision analysis approach provided a higher valued set of information requirements for programmed decisions than data analysis; for relatively nonprogrammed decisions, both methods were about equal in providing information requirements. The value and attributes assigned to the information requirements were higher for programmed decisions than for nonprogrammed decisions.
3. Information analysis techniques cannot be considered apart from organizational contexts in which they are to be applied.

Keywords: Management information needs, information analysis techniques.
Categories: 2.4, 3.5
Determining MIS Needs

The advantages and disadvantages of the traditional data analysis method, and the new method suggested by Ackoff and Zani, were discussed in an article by Nolan [14]. In the form of an annotated bibliography, Nolan's collection of relevant literature included conceptual discussions, technical literature, reports of the application of the methods, but little empirical research. It is apparent that a rigorous comparison of the two methods in a real-world operating environment is needed to verify or challenge many of the assertions made. This paper reports the results of such a comparison.

A Discussion of the Top-Down/Bottom-Up Controversy

The traditional and the new approach are commonly referred to as the "bottom-up" and the "top-down" approach, respectively. These terms are useful to indicate the origin and the direction in which the information analysis is pursued within the organization. However, the terms do not adequately characterize the salient difference in the approaches. i.e., the analytical focus. Davis [7, p.409] has suggested the terms "data analysis" and "decision analysis" as more descriptive terms. In this paper, "data analysis" will be used in reference to the traditional or bottom-up approach, and "decision analysis" will be used in reference to the top-down approach.

The data analysis approach is characterized by its focus on the data at the operational level of the organization. The information analyst ascertains management information requirements by examining all reports, files, and other information sources which management currently draws upon for decision making. These sources are collected and discussed with the manager to determine relevance. The manager is also asked to state any additional information requirements. The resulting collection of data is analyzed from the standpoint of perceived need, and data for which there is no perceived need is eliminated. The set of data remaining after analysis is regarded as management's information requirements to be provided, if possible, by the new computerized application.

The data analysis approach is operational, almost by definition, but is criticized because it is "buffered" from linking information requirements to normative models of management decisions and linking management decisions to organizational objectives. Also, there is a question as to the ability of managers to accurately explicate their information needs [1].

The decision analysis approach is characterized by its focus on the decisions at the managerial level of the organization. For each management-oriented application, the method requires the definition of the critical decisions which are the responsibility of the management group. Once defined, each decision is thoroughly discussed with the responsible manager. Following the discussion, the decision is carefully analyzed and modeled, usually by a decision flowchart. The decision flowchart indicates the complete set of discrete steps which the decision maker should take to make the decision. Analysis of the steps in the decision determines the information required for decision making.

The decision analysis approach is supported by some who hold that decisions define the information requirements, and effective design is only possible if a model of the decision process is developed first. The decision analysis approach is criticized by others as being idealistic because it ignores the existing system and "leaves the system designer marooned by providing no operational implementation techniques" [14, p.1].

Previous Research

An extensive search of the literature indicates that very little empirical research has been done to compare the two information analysis methods. In fact, there was only one empirical study [11]. There are a few reports of the application of one or other of the methods, and there is a significant body of technical and conceptual literature describing the methods. This section discusses briefly the empirical research, applications reports, and the technical and conceptual literature.

The empirical research reported by Kennedy and Mahapatra described the testing of "a protocol for ascertaining and evaluating the information required to support the ill-structured problem solving typical of middle management" [11, p.2]. The protocol was a structured interview with managers based on an analysis of the resources and activities for which the management were responsible. The protocol can be viewed as a study of the management process and the role of the executive assistant.
method of decision analysis. The important finding was that the protocol or structured interview resulted in obtaining information with greater value than that obtained from an unguided conventional interview. This research suggests decision analysis is superior to data analysis for determining management information needs although the research did not actually compare the two methods.

An application of the decision analysis approach was reported by Kimmie [12] who tested and “validated” the approach by designing an information system for top management of the New York City Health and Hospitals Corporation. King and Cleland [13] also utilized a decision analysis approach in determining the information requirements for strategic planning in a police department. Taggart [17] took a different top-down approach to the information requirements determination problem. Instead of analyzing decisions, Taggart generated information requirements from a syntactical analysis of narratives describing management responsibilities.

Bushong [4] reported a data analysis approach in determining the information needs of the decision makers for a Dallas education agency. Other data analysis applications were described by Chadler and Nador [5] and Orden [15]. These latter studies were conventional in that they relied heavily on existing information flows to determine information requirements.

Conceptual discussions by Ackoff [1], Gorry and Scott Morton [10], and Zani [20] for the most part espouse the decision analysis approach. Ackoff cited what he perceived to be a number of erroneous assumptions that result in improperly designed systems and recommended decision analysis as part of the solution. Gorry and Scott Morton asserted that it is “essential that models be built of the decision process involved. Model development is fundamental because it is a prerequisite for the analysis of the value of information...” [10, p.31]. The most extensive discussion of the top-down concept was authored by William M. Zani in “Blueprint for MIS” [20]. Zani provided a detailed conceptual description of the top-down approach and emphasized its alleged advantages. Zani’s main point was that “an effective system, under normal conditions, can only be born of a carefully planned rational design that looks down from the top, the natural vantage point of the managers who will use it” [18, p.95].

Finally, there is an effort under way to provide a conceptual framework within which research on information analysis techniques may be conducted. Taggert and Tharp [18] and Turksen and Martin [19] have developed frameworks in which the decision analysis approach, or at least the adoption of a decision perspective, is implicit.

In general, it is apparent that a preponderance of the published opinions favor a decision analysis approach for determining information for unstructured decisions. The consensus seems to be that data analysis is appropriate only when the decision is well understood and the data well defined. It is also widely agreed that managers are not capable of responding adequately to a request to express their information needs.

The Hypotheses

This study examines the comparative effects from the application of the decision analysis and data analysis methods. In other words, the study seeks to identify which method is more effective in determining management information requirements. In the ideal situation, this question would be resolved by using some absolute measure of information value; in the actual situation, lacking such an absolute measure, a surrogate must be used. The study compares the two methods based on user perceptions of the value of the information obtained by each method. In either case, the question is ultimately one of opinion and perception, and it is the opinion and perception of the user of the information which is most important. Consequently, the first hypothesis tested by this study is expressed in the null case as follows:

1. Methods Hypothesis

   The perceived value of the information generated by the decision analysis method is not significantly different from that generated by the data analysis method.

The possibility exists that the above comparison may be too gross, i.e., that there are situations in which one method might be expected to perform better than the other. This possibility was implied by Dearden with his assertion that the lack of homogeneity of information among functional
Determining MIS Needs

areas dictates the use of different analytical techniques [8]. To investigate this issue, a second exploratory hypothesis without direct practical application was tested as follows:

2. Functional Areas Hypothesis

*The perceived value of information generated within one functional area is not significantly different from that generated within another functional area.*

Rejecting or failing to reject the above hypothesis would not indicate whether an analyst should select one method over the other for a given functional area. In order for such a selection to be considered, there would have to be some interaction between the technique employed and the use of it in a functional area. Hence, the following null hypothesis:

3. Functional Areas/Methods Interaction

*There is no significant interaction, in terms of the perceived value of information, between the information analysis methods used and the functional areas in which they are used.*

Just as the performance of the analytical methods might be expected to vary among functional areas, so too might their performances vary among decisions possessing greater and lesser degrees of structure. In other words, to use Simon's terminology [16], the extent to which a decision environment is "programmed" or "nonprogrammed" might influence the performance of the analytical methods.

To investigate this issue, an exploratory hypothesis was tested as follows:

4. Decision Types Hypothesis

*The perceived value of information generated from analysis of a programmed decision is not significantly different from that generated from analysis of a nonprogrammed decision.*

Rejecting or failing to reject the above hypothesis would indicate whether an analyst should select one analysis method over the other for a given decision type. Again, in order for such a selection to be considered, there would have to be some interaction between the analysis method employed and the decision type. Hence, the following null hypothesis:

5. Decision Types/Methods Interaction Hypothesis

*There is no significant interaction, in terms of the perceived value of information, between the information analysis methods used and the decision types in which they are used.*

Prior Expectations for Research

Some of the results of the research are not in accord with what should have been expected based on published opinion. Therefore, it is useful to describe the prior expectations for the results of the research.

The prior expectations regarding the "decision types" hypothesis are portrayed in Figure 1. Figure 1 is based on Simon's assertion that programmed and nonprogrammed decisions "are not really distinct types, but a continuum, with highly programmed decisions at one end of that continuum and highly unprogrammed decisions at the other end" [16, p. 5]. In general, Figure 1 indicates the expectation that decision analysis and data analysis will both perform better on programmed decisions than they will on nonprogrammed decisions.

One can reason that the decision analysis approach will perform better on a programmed decision than it would on a nonprogrammed decision because nonprogrammed decisions typically lack the structure of programmed decisions [16, p. 5]. This lack of structure would appear to complicate the construction of an adequate model of the decision, an activity which is the essence of the decision analysis approach.

Similarly, data analysis might perform better on a programmed decision than it would on a nonprogrammed decision. The usefulness of the data analysis approach seems tied to the presence of data to be analyzed. Typically, more defined and more highly structured information is available for routine decisions than for non-routine decisions.

---

1. The spread on the graph between the expected performance of decision analysis and data analysis has no scientific basis and does not represent a judgment of the magnitude of an expected difference in performance between the two methods.
Determining MIS Needs

With respect to Figure 1, there are a number of other expectations which are indicated. Figure 1 indicates that though both approaches intuitively appear to be more useful for programmed decisions than for nonprogrammed decisions, there is an expectation that for highly programmed decisions (which are by definition well-understood, routine, repetitive and highly structured) neither approach would generate information perceived to be of significantly greater value than that generated by the other. In other words, the information needed for the highly programmed decision is already so well defined that an examination of the structure of the decision, decision analysis, would probably fail to reveal information of benefit not currently in use. By contrast, highly nonprogrammed decisions may be so lacking in structure and so completely novel that neither approach would provide any information of value.

Because of these expectations, decisions for this research were not selected from either extreme end of the continuum. Rather, relatively programmed and relatively nonprogrammed decisions were selected. This was done to increase the probability of a successful comparison. Also, the highly programmed are of less interest, because in most organizations the information for them likely already exists, and the highly nonprogrammed are of less interest because the information for them may never be found.

The expectation that decision analysis might perform better than data analysis over the entire continuum, as indicated in Figure 1, is somewhat more speculative. As mentioned before, if decisions are programmed, there was an expectation that there would be little chance of significantly better information being uncovered by analysis of the decision than by data analysis. On the other hand, if a decision is nonprogrammed, it is likely that little useful information exists, but it may be beneficial to determine the steps in the decision. Even though it may be difficult to determine the appropriate decision steps, the effort of doing decision analysis is likely to provide insight or some kind of a "model," and hence define useful information. Thus, decision analysis might be expected to perform better than data analysis as decisions become less and less programmed. Testing the two "decision types" hypotheses will, hopefully, shed some light on these latter issues.
Determining MIS Needs

The Research Method

A field experiment was conducted in four small private colleges to test the hypotheses. Colleges were utilized as the experimental site to realize certain advantages present by virtue of concurrent and related research.

An identical set of four different decision situations was analyzed in each of the four colleges, the set consisting of a programmed decision and a nonprogrammed decision from the academic and administrative functional areas. The decisions are shown in Table 1.

Each of the decision situations was analyzed to obtain a statement of information requirements, a concise narrative description of the information determined by the analysis method as being of value to the decision maker in that situation. The data analysis method was used on two of the decision situations at each institution; the decision analysis was applied to the other two. Each cell in Table 2 represents a specific decision situation for which a particular decision maker was responsible. Reading down the columns in Table 2, the pattern of analysis was such that each functional area decision type was analyzed twice by each of the two analytical methods.

Applying the decision analysis method

The objective when using the decision analysis method is to formulate and analyze a model of the decision being made. The analyst works carefully with the decision maker to help him specify the procedure, set of steps, activities, tasks, etc., which the decision maker must complete to reach a solution to the problem. The analyst notes, in a concise fashion, each step identified. The analyst also makes note of each item of information utilized at each step in the decision.

When the discussion is completed, the analyst carefully flowcharts the decision process using the notes taken during the discussion as a guide. All steps, branches, and flows are flowcharted so that some resolution of the problem would occur regardless of the decision conditions if the flowchart was followed.

When the entire flowchart is completed and each step carefully labeled, the analyst analyzes the flowchart and attempts to specify what information is required at each step. The information specified is also compared with the information actually used. The final statement of information requirements consists of the information elements which are required at each step in the model.

Applying the data analysis method

The objective when using the data analysis method is to inventory the decision maker's current information flow and to record the decision maker's suggestions for improvement. The analyst asks the decision maker to specify: (1) what information he currently uses in making the decision; and (2) what information he needs, but

<table>
<thead>
<tr>
<th>Table 1. Decision Situations Analyzed for Information Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decision Type</strong></td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Programmed</td>
</tr>
<tr>
<td>Nonprogrammed</td>
</tr>
</tbody>
</table>
Table 2. Pattern of Analysis of Decisions

<table>
<thead>
<tr>
<th>Decision Types</th>
<th>FA-1 (Academic)</th>
<th>FA-2 (Administrative)</th>
<th>FA: Functional Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P NP</td>
<td>P NP</td>
<td></td>
</tr>
<tr>
<td>College A</td>
<td>T B</td>
<td>B T</td>
<td>P: Programmed</td>
</tr>
<tr>
<td>College B</td>
<td></td>
<td>B T</td>
<td>NP: Nonprogrammed</td>
</tr>
<tr>
<td>College C</td>
<td>T B</td>
<td>B T</td>
<td>T: Decision Analysis</td>
</tr>
<tr>
<td>College D</td>
<td>B T</td>
<td>T B</td>
<td>B: Data Analysis Method</td>
</tr>
</tbody>
</table>

does not currently receive. Whenever possible, the analyst is directed to the source of the information. Such information sources are recorded and, if necessary, copies of the source documents are obtained.

When all sources of information are recorded, the information is analyzed. Redundant information, and information for which there is no perceived need, is eliminated. The remaining information constitutes the statement of information requirements for the decision.

Determining the Value of the Information from the Two Methods

The value of the information to the decision maker was used to compare the two analytical methods. In this study, a semantic differential technique was used to measure and analyze the perceived value of the statements of information requirements for each decision selected. A semantic differential is a set of bi-polar adjective pairs which elicit an evaluation of a concept on a variety of attributes by a respondent. The instrument selected for use was developed, validated, and reported in a doctoral dissertation by C. A. Gallagher [9]. It was specifically developed as a "practical means for measuring and analyzing the value of information to the management of an organization" [9, p. 38]. Figure 2 is an example of a three-item, semantic differential.

![Semantic Differential](image)

By scaling the response from +3 to -3, a numerical total can be obtained, averaged, and used as an indicator of the value of the information in question. Hence, if the score total for the above three-item differential was seven, the information would be said to have a value of 2.33 (7 ÷ 3).

The semantic differential used in this study consists of thirty pairs of bi-polar adjectives. Fifteen word-pairs measure attributes or characteristics of the information, such as complete, orderly, concise (to be referred to as the Attribute Scale). The remaining fifteen word-pairs measure information value using words such as applicable, meaningful,
Determining MIS Needs

important (to be referred to as the Value Scale). Note that the Attribute Scale is also a measure of information "value" in that attributes such as completeness, orderliness, etc., affect information value.

The respondents completing the evaluation using the semantic differential instrument were the college administrators responsible for each decision selected. After all analyses were completed and all statements of information requirements were prepared, each respondent was asked to examine carefully the four different narrative statements of information requirements generated from the four analyses of the decision type for which he was responsible. Each respondent completed a semantic differential form for each of these four statements of information requirements, thereby indicating his perception of the value of that information for making the specified decision. Thus, for example, the administrator in College A who was responsible for the programmed decision in the academic functional area evaluated not only the statement of information requirements generated from analysis of that College A, but also evaluated the statements of information requirements generated from analysis of that same decision in Colleges B, C and D.

Comments on an Analysis of the Responses

Prior to testing of the hypotheses, an informal analysis of the responses (evaluations) by the sixteen decision makers was conducted to investigate two possible problems:

(a) the possibility that differences in decision environments among colleges would prevent valid evaluations of the information descriptions;

(b) the possibility that decision makers would give a higher evaluation to the information description developed from analysis of their own decision situation, than they would to information descriptions developed in other colleges.

Since these problems were anticipated at the beginning of the study, certain precautions were taken in the experimental procedure.

With respect to problem (a), significant evaluation difficulties would presumably manifest themselves by producing evaluations which are random and inconsistent. Confusion of the decision makers should have resulted in a set of evaluations which have no pattern or regularity. In fact, the analysis of responses indicated a high degree of consistency and uniformity in the response. Across all decision types, decision makers regularly accorded particular information descriptions the highest evaluations. This is convincing evidence that decision makers were either not faced with the aforementioned evaluation difficulties, or that they demonstrated an ability to overcome such difficulties. The consensus reached on the evaluations of each of the decision situations clearly indicated the absence of such influence on the data.

With respect to problem (b), only one of the sixteen decision makers appeared to have given his information description the highest rating where such rating was unsupported by other decision makers. This would seem to be convincing evidence of either a lack of bias in evaluation or an inability to discern the information description developed at one's own college.

Results and Implications

The data were analyzed using analysis of variance. The experimental design is a completely confounded three-way interaction in two replications of a $2 \times 2 \times 2$ factorial in blocks of size four. The analysis of variance was conducted on both the value and attribute data. The results of the analysis are indicated in Table 3.

Table 3 indicates that the Methods Hypothesis was not rejected. In other words, the performance of decision analysis and data analysis was not significantly different. Failure to reject this exploratory hypothesis is of less practical concern than are the results of the tests of the other hypotheses which involve the context in which the techniques are to be employed.

Rejection of the null Functional Areas Hypothesis indicates that the performance of the methods do in fact differ in different functional areas. The data indicated that both techniques were more effective in the administrative functional area than in the academic functional area. The absence of any significant functional area information analysis method interaction, however, resulted in a failure
Table 3. Report of the Status of Each Hypothesis

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Status</th>
<th>F Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Methods Hypothesis</td>
<td>Not rejected (Not different)</td>
<td>.16</td>
</tr>
<tr>
<td>2. The Functional Area Hypothesis</td>
<td>Rejected at .86 level (Significantly different)</td>
<td>.44</td>
</tr>
<tr>
<td>3. The Functional Areas/Methods Interaction Hypothesis</td>
<td>Not rejected (No significant interaction)</td>
<td>.55</td>
</tr>
<tr>
<td>4. The Decision Types (P-NP) Hypothesis</td>
<td>Rejected at .91 (Significantly different)</td>
<td>.67</td>
</tr>
<tr>
<td>5. The Decision Types/Methods Interaction Hypothesis</td>
<td>Rejected at .83 level (Significant interaction)</td>
<td>.83</td>
</tr>
</tbody>
</table>

Determining MIS Needs

to reject the Functional Area/Methods Interaction Hypothesis. In other words, the functional area is not important in deciding which techniques to use.

An examination of the means (not shown) resulted in a rejection of the Decision Types Hypothesis. This analysis showed that both techniques were more effective on the nonprogrammed decisions than on the programmed decisions. The Decision Types/Methods Interaction Hypothesis was also rejected. The performance results of data analysis on programmed decisions was quite low relative to the performance results of either decision analysis or data analysis on nonprogrammed decisions. However, the decision analysis performance differed little from programmed to nonprogrammed decisions. This would indicate that decision analysis should be used on programmed decisions, as opposed to using data analysis, and that either approach may be used with equal results on nonprogrammed decisions.

Results Differ from Expectations

Some of the findings with respect to the performance of decision analysis and data analysis over the programmed/nonprogrammed decision continuum (see Figure 3) are at odds with the previously indicated expectations. The expectations (see Figure 1) were that both techniques would perform better on programmed decisions as compared to nonprogrammed decisions. Instead, the performance of decision analysis varied little between decision types and data analysis actually performed less effectively on programmed decisions than it did on nonprogrammed decisions. Further, it was expected that decision analysis would perform somewhat better than data analysis on nonprogrammed decisions. Instead, decision analysis was more effective than data analysis on programmed decisions, but both were about equal in performance on nonprogrammed decisions.

There are at least three explanations which might account, in some measure, for the above departures of results from expectations:

1) the decision types were not accurately labeled;
2) the expectations were faulty; and,
3) in practice, the techniques are very similar.

Each of these possibilities is discussed below.

Results Differ from Expectations
Determining MIS Needs

**Decision types not accurately labeled**

The findings might be partially explained in the event that the decisions in the experiment, labeled as "relatively nonprogrammed" were, in fact, somewhat less nonprogrammed than labeled. In terms of Figure 3, this might mean that the decisions analyzed are located nearer to the middle of the graph, as opposed to being located to the right of the middle. If this were the case, one would expect the two approaches to exhibit more similar performances on nonprogrammed decisions, which is precisely what occurred. Unfortunately, there is no objective way to accurately measure the extent to which a decision is programmable. It was a matter of judgement that the decisions selected exhibited the necessary degree of programmability.

**Expectations were faulty**

It may be that a decision might have to be very nonprogrammed before the performance of either method drops off. In the discussions with the decision makers, even for the relatively nonprogrammed decisions, decision makers seemed capable of indicating a variety of information needs and of articulating some form of decision procedure. This would seem to suggest that perhaps performance decreases only when quite complex, very nonprogrammable decisions are encountered.

**No difference in practice between methods**

The researchers observed, for the entire set of decisions, that use of the two techniques seemed to result in similar interviews. In fact, it often seemed impossible to discuss information needs (data analysis) without discussing decision procedures (decision analysis) and vice versa. It became evident that many of the steps in the decision procedure were actually the acquisition and analysis of particular items of information. The only manner in which the techniques seemed to differ was in the analytical stage following the interview. While data analysis involved an analysis of the data, decision analysis involved the modeling (flowcharting) of the decision procedure with a view to improving it. However, the

---

**Figure 3. A Comparison of Expected and Actual Performance of Decision Analysis and Data Analysis Over the Programmed-Nonprogrammed Decision Continuum**
normative modeling activity frequently conformed fairly closely with the actual decision procedure. Hence, great improvements or changes to the decision makers' information requirements were difficult to generate.

Conclusions
The fundamental conclusion which emerges from this research is that the effectiveness of information analysis techniques is affected by the organizational context (functional area and decision type) to which they are applied. This conclusion, arrived at empirically, is a confirmation of certain statements in the literature; it contradicts some intuitive expectations and assertions by authorities. The conclusion is a departure from implicit assumptions by practicing information analysts that data analysis can be applied with equal effectiveness regardless of the organizational context.

To improve the effectiveness of information analysis techniques in determining management information requirements, the findings in this study suggest the following:

1. Information analysis techniques cannot be considered apart from organizational

2. Functional areas in organizations consist of different activities and such activities

3. Characteristics of decisions, such as the extent to which a decision is routine or non-routine, structured or unstructured, simple or complex, should be considered in selecting a technique for determining information requirements for that decision. The results of this study with respect to the above are at once clear and confusing. They are clear in that there is a definite indication that decision types affect the performance of the techniques. The results are confusing in that they are contrary to expectations and permit only limited conclusions with respect to the selection of one analytical technique over another for a particular decision type.

Further research must be completed before the above suggestions can be transformed into operationally-acceptable practice. An intimidating collection of issues remain to be resolved.

Suggestions for Further Research

The following are some areas in which research or investigation may be conducted to increase our understanding of the information analysis problem.

1. The motivation for this study was that information analysis techniques are different and that we should discover something about those differences to facilitate a more informed selection of techniques. However, only a single facet of the differences was examined — that of the effectiveness of a technique for determining management information requirements. This facet is perhaps the most important dimension; but other factors, in some circumstances — say, where techniques perform equally well — might well be used to influence the selection of the most appropriate technique. Consider the following questions regarding other factors which might be important in a selection decision:

a) What other benefits flow from the use of the particular technique?

b) Is the cost, in terms of time, to the analyst and the decision maker comparable under both techniques?

c) Does one approach result in an improved decision procedure and/or a better understanding of the decision procedure for both the analyst and the decision maker?

d) Are there manager-related psychological satisfactions or dissatisfactions derived from the use of a particular approach?

e) Are there analyst-related psychological satisfactions or dissatisfactions resulting from the prolonged use of one approach?

f) What training is appropriate?

2. This study examined differences between two functional areas in small colleges. Research should be established in
Determining MIS Needs

industrial settings, and all major functional areas should be studied for information analysis-related problems. This should be done in recognition of the fact that the bulk of information analysis activity occurs in industry. Specifically, some effort should be made to determine not only whether different analytical techniques are required for different functional areas, but also whether the characteristics of information in different functional areas are such that different types of conceptual skills are required by the analyst between and within certain functional areas.

3. This study examined two decision types characterized as relatively programmed and relatively nonprogrammed. Further research in this area should begin with the development of a reliable method for accurately classifying any given decision as programmed or nonprogrammed. Decisions from various points on the programmed/nonprogrammed decision continuum should then be analyzed by the decision analysis and data analysis techniques to determine how the techniques perform over the continuum. Further, research should explore other aspects of decisions, other than degree of programmability, which influence the performance of the technique.

4. Some research should be conducted to determine not only what kinds of general and basic intellectual skills should be present in any analyst, but also it should be determined what sorts of conceptual skills are required in different analysis situations. It appears that a different set of conceptual skills might be required in different functional areas, etc. In fact, it appears that many of the questions which relate to matching the correct information analysis techniques with a given situation also relate to a similar matching of analyst skills.

5. Research should also be conducted to determine the effect of differences in the managerial style and intellectual makeup of the decision maker for whom the information is being provided upon the kinds and manner of presentation of information provided. It is counterproductive if an information analysis technique recommends the presentation of information in a particular style, mode, or format if the decision maker's characteristics, some of which he may not be aware of, are such that he will be more effective using information presented in some other way. Research in the area is already underway at the University of Minnesota's Management Information Systems Research Center. Also, J. L. McKenney and colleagues at Harvard Business School are conducting research in this area and the terms "cognitive style" and "human information processing" are in use to represent the focus of this research.

References

Determining MIS Needs

Systems: An Approach and Case Study." Ph.D.

Management Information Systems: An Information
Analysis Approach," Management Science, Vol. 22. No. 3

Information Systems Design," Data Base (Winter, 1971),
pp. 1-10.

[15] Orden, Alex. "Information Structure Modeling of
Organizations," Information Processing 71, North-


Management Information Requirements Analysis," Ph.D.


Systems: A Conceptual Framework," University of
Toronto, Department of Industrial Engineering Working


About the Authors

Malcolm C. Munro is Associate Professor and
Chairman of Management Science and
Information Systems at the University of Calgary,
Calgary, Alberta, Canada. He received his B. Comm. (Honors) at the University of
Saskatchewan, M.S. and Ph.D. in Management
Information Systems at the University of
Minnesota. Dr. Munro has had seven years
experience in industry. His special research interest is the investigation and development of
information analysis techniques.

Gordon B. Davis is Professor of Management
Information Systems and Accounting at the
University of Minnesota. He received his B.A. at
Idaho State, M.B.A. and Ph.D. in Business
Administration at Stanford University. Author of
numerous books and articles on management
information systems, data processing, and
auditing, his major fields of interest are analysis
and design of management information systems,
control and audit of computer-based information
processing, and cost/value of information. Dr.
Davis is also a Certified Public Accountant.