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1986

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ABSTRACT

Interactive computer-based systems to support group decision making (group decision support systems or GDSS) have received increased attention from researchers and practitioners in recent years. Huber (1984) argues that as organizational environments become more turbulent and complex, decisions will be required to be made in less time and with greater information exchange within decision making groups. Thus, it is imperative that studies be undertaken to determine the types and characteristics of group decision tasks most appropriate for support by a GDSS and to determine the features of a GDSS that will support those tasks.

A number of prominent researchers in the field of group decision making (Shaw, 1973, 1981; Hackman and Morris, 1975; Fisher, 1974) agree that the decision task itself is probably the most important factor in determining group decision making effectiveness. The characteristics of group decision tasks are many and varied, but according to Shaw (1973) the level of difficulty/complexity of the decision is a fundamental factor in influencing the performance of the group. Some decisions are characterized by information that is clear, concise, easily communicable, and where relationships between important factors in the decision are easily understood. In short, these decisions require relatively little effort to make and are therefore called easy decisions. Decision tasks where the information to be considered in making the decision is incomplete, difficult to understand, and where complex relationships exist within the information available are called complex or difficult decisions. The role of decision task difficulty in the effective use of GDSS is considered in this study.

This research is an initial experimental study, exploratory in nature, that aims to get a first-level understanding of the impact of a computer-based DSS on group decision making. The group decision support system that is used in this study has only those features that specifically support group decision making (alternatives generation and communication, preference ranking and voting support). The reason for this approach is to start a program of research with a simple system in order to determine the particular impact of these features on, not only the outcomes of group decision making (such as decision quality), but on the process of group decision making as well.

A controlled 2 x 2 factorial experiment was used to compare the decisions made by groups which had GDSS support with those groups that had no GDSS support and those with a high difficulty task to those with a low difficulty task. Figure 1 shows the relationship among the main variables in the study.

The experimental task was a marketing business case in which the company was experiencing declining profits. Each group was asked to find the problem which was causing the declining profits. Difficulty was manipulated by modifying the data in the case.

The setting for this experiment was a decision room designed and set up to accommodate face-to-face group interaction. The GDSS treatment entailed the use of one computer terminal per group member so that the GDSS could be used to support group decision making. Each group member in the GDSS treatment also had the use of a pencil, paper, a hand calculator, and a blackboard. For the non GDSS treatment, the terminals were removed and the group used just pencils, paper, hand calculators, and a blackboard to assist in making the decision. The computer hardware consisted of a DEC VAX 11/780 timesharing system using the VMS operating system, and DEC VT-102 terminals. The terminals were connected to the VAX 11/780 using 2400 baud direct lines.

The GDSS called Decision Aid for Groups (DECAID) was designed, coded, and tested to make sure that it worked in the experimental setting. The approach to design was to implement the features, and then to refine the system through testing to make those features work as efficiently as possible. The GDSS software performed the basic functions of recording and storing and displaying alternatives that were entered by group members, aggregating and displaying preference rankings that had been entered for those alternatives, and recording votes (either publicly or anonymously) for the various alternatives generated. The system was easy to use and menu driven. Eighty four senior undergraduate business administration students participated in the study. These subjects had taken at least one course each in management science/decision analysis techniques, marketing, management theory/organizational behavior, and all had exposure to case analysis techniques. All subjects had been given training in the use of the GDSS.

Measures were taken of decision outcomes (decision quality, decision time, decision confidence, satisfaction with group process, and amount of GDSS usage), and decision process variables (number of issues considered, number of alternatives generated, and participation in the decision making). Decision quality was measured along two dimensions: (1) decision content -- how close did the group's decision come to that made by a panel of experts; and (2) decision reasoning -- how similar the group's reasoning in arriving at their decision was to the reasoning of the experts. Decision time was defined as the length of time it took the group to reach a consensus decision. Decision confidence and satisfaction with the group process were measured by individual responses to a post-

test questionnaire. The individual responses were then aggregated to give a group value. The amount of GDSS usage was measured by examining the computer logs that were kept during the GDSS sessions. Decision issues were defined as factors that were important in the analysis of the case. Decision alternatives were defined as those issues in the case that the group analyzed as being the possible major problems in the case and hence, possible solutions to the decision task. Participation was measured by counting the number of task related comments made by each individual group member. Issues, alternatives and participation were determined by analysis of the video and audio tapes that were made of the experimental sessions.

The major findings of the study are:

1. Decision quality is enhanced when decision making is supported by a GDSS, particularly for high dificulty tasks.

2. Decision time is not affected by use of a GDSS.

3. Confidence in the group decision and satisfaction with the decision making process are reduced when a GDSS is used, irrespective of task difficulty.

4. The number of alternatives considered is increased when a GDSS is used to support group decision making.

5. Participation in the group decision making process is unaffected by GDSS support or by decision task difficulty.

The paper concludes by suggesting directions for future research into GDSS. Work is needed to determine the effectiveness of additional features of a GDSS (such as other communication features, modeling features, etc.), to understand the impact of GDSS on the different phases of decision making, and to examine the effect of repeated use of a GDSS on the quality of group decision making.