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ABSTRACT

RATIONALE AND PURPOSE OF THE STUDY

The empirical research examining group decision support systems suggests that many of the hopes for GDSS can be realized. For example, Lewis (1982) and, more recently, Gallupe (1985) both found that groups supported by a GDSS made higher quality decisions than groups without GDSS support. Applegate (1986) and Steeb and Johnston (1981) have demonstrated the viability of GDSS in live planning situations. Positive effects of a GDSS on groups have also been reported by Gray et al. (1981), Turoff and Hiltz (1982), and Siegel et al. (1986). Computer support has been shown to foster a democratic approach to the decision process, with more equality of participation among members (Siegel et al. 1986), to improve satisfaction with the decision process (Applegate 1986), and to result in a greater shift away from initial individual preferences (Siegel et al. 1986).

These intended effects of the technology have been demonstrated for a limited number of task types. To date, positive effects of GDSS have been observed for idea generation (Applegate 1986; Lewis 1982), problem finding (Gallupe 1985), intellective choice (i.e., selection of a "correct" answer among a given set of alternatives) (Hiltz and Turoff 1982), and planning tasks (Applegate 1986; Steeb and Johnston 1981). In two of these studies, group members were dispersed and interacted with one another via a communication network (Hiltz and Turoff 1982; Siegel et al. 1986), while in the other studies group members met in a face-to-face (i.e., conference room) setting. In all cases, each member had direct interaction with the GDSS, and in most of the studies the performance of the group was compared to an objective measure of decision quality.

Of course, many organizational meetings occur without prior or post knowledge of the "correct" outcome of a group meeting. For this reason, the current study aimed to build on the available knowledge of GDSS impacts by examining the usefulness of the technology in situations where a group must resolve competing personal preferences and maximize agreement on a solution to a problem. In such situations, achieving high decision quality is *not* the primary goal of the group meeting. The theory of GDSS would argue that the technology should be as useful in achieving consensus as in identifying correct solutions. In either situation, the GDSS should foster more even participation in the decision and a more systematic, or structured, group decision process (DeSanctis and Gallupe 1987; Huber 1984a).

For the most part GDSS research is being conducted in laboratory settings where the organizational context and other factors can be controlled so that the impact of the technology on group outcomes can be carefully assessed. The current study aimed to build on the available GDSS research by systematically comparing groups supported with a GDSS with groups that had either no support whatsoever ("baseline" groups) or a paper-and-pencil ("manual") support system, that contained the same decision structure as the GDSS (cf. Lewis 1982). The purpose of having two control groups was to determine whether increments or

decrements in outcomes were due to the GDSS or simply due to imposing a problem-solving structure on the group. Three major hypotheses were investigated:

HYPOTHESES

H1. The degree of post-meeting consensus will vary as a function of the type of support given to the group.

H1a. Post-meeting consensus will be higher in the GDSS groups than in the manual support or baseline groups, controlling for initial level of conflict.

H1b. Post-meeting consensus will be higher in manual support groups than in the baseline groups, controlling for initial level of conflict.

H2. The equality of influence will vary as a function of the type of support given to the group.

H2a. Influence will be more even in the GDSS groups than in the manual support groups.

H2b. Influence will be more even in the manual support groups than in the baseline groups.

H3. Attitudes toward the group process will be different in the GDSS groups than in the manual system and baseline groups.

METHOD

Forty-four three-person and 38 four-person groups participated in the study. Group size in this study was similar to that in previous research (Lewis 1982; Gallupe 1985; Siegel et al. 1986).

The groups were made up of undergraduate and graduate students enrolled in introductory MIS classes. Many of the students were employed full-time in business settings, and most were working at least part-time. On average, the participants were 24 years of age with slightly more than two-and-a-half years of work experience in a business or related setting. All of the groups were "live" groups in that they were actively working together as teams on class assignments. In this way, the initial socialization that occurs early in group formation could be avoided during the data collection.

THE GDSS

The GDSS, called "Computer Assisted Meeting" (CAM), was designed, coded, and tested by a research team at the University of Minnesota. The system is described in DeSanctis and Dickson (1987) and is being used for several related studies of group DSS (Poole and DeSanctis 1987; Watson 1987; Zigurs 1987). Basically, the system incorporates a rational problem-solving agenda (Dewey 1910). The software is similar to that used by Lewis (1982) and Gallupe (1985) in that it performs the basic functions of recording, storing, and displaying problem definitions, criteria for evaluating solutions, alternative solutions, and a final group decision. Group members can enter relative weights for solution criteria, and the system will aggregate and display average group weightings. In addition, the system will cumulate and display ratings, rankings, and votes associated with one or more alternative solutions to a problem. These features have been identified as appropriate for supporting the communication needs of groups (Huber 1984b; DeSanctis and Gallupe 1987; Joyner and Tunstall 1970).

Experimental Task and Procedure

The research task required subjects to allocate a given sum of money among six competing projects that have requested funds from a philanthropic foundation. Conflict arises because the team members have varying preference structures that result in different allocation patterns. The projects that subjects can

fund are based upon the personality components scheme described by Spranger (1928), who asserts that there are six basic interests or motives in personality: theoretical, economic, aesthetic, social, political, and religious. The six projects that can be funded correspond to Spranger's six personality traits. Correlation analysis based on the 300 experimental subjects was used to check that the amount allocated to a project by an individual was highly correlated with that person's values as measured by the Study of Values instrument (Allport et al. 1970). The strengths of the task are twofold. First, it produces conflict in a group. Second, the source of the conflict is identifiable; it is based upon different preference structures arising from varying personality traits. The task and its validation are further described in Watson (1987).

The experimental procedure was as follows:

1. Subjects listened to a standard introductory script read by the administrator of the experiment, and then read a background statement.

2. Subjects completed a consent form, a background questionnaire, and the Study of Values instrument.

3. Subjects individually allocated funds to the six projects requesting support from the philanthropic trust (these measures were used to calculate pre-meeting consensus). Subjects also allocated funds to five other sets of six projects each in order to give them practice and to help stabilize their reasoning processes.

4. Groups allocated funds to the six projects requesting support from the philanthropic trust.

5. Subjects completed a post-meeting questionnaire for measuring an individual's perception of the group's decision-making process, and individually allocated funds to the six projects requesting support from the philanthropic trust (these were used to calculate post-meeting consensus).

6. The administrator conducted a debriefing of the subjects.

During section step 4 of the experiment, the group decision-making phase, teams were given one of the three treatments discussed previously. In the case of the manual groups, subjects were provided with a eleven-page handout outlining the same agenda that was on the GDSS. Each page of the handout explained an agenda item, giving details on how to accomplish the item parallel to those in the submenus of the GDSS. Manual groups were given a flip chart to display ideas publicly. Every effort was made to ensure that manual groups had the same structural aids as the GDSS groups, the only difference being that the manual groups operated without computer support. GDSS groups were provided with a 20-minute training session on use of the system, manual groups were also trained in how to use the meeting structure. Baseline groups were given no structure, flip chart, or training. They were told to operate with their own resources.

FINDINGS

This investigation identified some intended and unintended effects of using a decision support system for groups. Overall, the results on consensus and equality of influence for the GDSS and manual conditions tended to be similar, showing different patterns than the results for the baseline condition. As intended, the presence of a suggested structure for the group meeting improved the degree of post-meeting consensus. Also, in contrast to the baseline and manual system group meetings, users of the GDSS reported more input into the group's solution and were less likely to perceive that there was a leader in the group. The relationship between pre-meeting and post-meeting consensus was similar in GDSS and manual groups, but post-meeting consensus was not significantly higher in the GDSS groups than in the baseline or manual groups. Although the structure provided in the GDSS and manual conditions reduced the variance across groups on their equality of influence, use of the GDSS did not result in more equal influence of group members on the final solution. The most surprising unintended effect was that GDSS

users, compared to the other experimental groups, perceived the issues discussed in the group meeting to be more trivial and the group's problem solving process to be less understandable.

Other observations of the study were that use of the GDSS tended to reduce face-to-face interpersonal communication in the group; use of the GDSS presented a challenge to the groups, thus making their meeting task more difficult than groups without the GDSS; and groups using the GDSS appeared to become very procedure-oriented, rather than issue-oriented, in their discussions. In the future, GDSS research should press further to sort out what Kiesler calls "intended technological effects" (faster processing, fewer errors, more equal participation), "unintended social effects" (heightened conflict), and "transient effects" (effects that will diminish with group experience with the system) of the technology on groups.

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