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Brainwriting in virtual legislative sessions

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ABSTRACT

Many studies have demonstrated the efficiency and effectiveness of using group support systems in large, face-to-face meetings known as legislative sessions. However, few have investigated how individual participants or sub-groups in different rooms linked via a computer network, forming a "virtual" group, may use the systems. An experiment using two sizes of virtual groups (8 and 16 participants) showed that participants were satisfied with the meeting process. In addition, there were no significant differences in five process and outcome variables between the two sizes of groups, indicating that an upper limit on the size of the virtual groups had not been reached.

INTRODUCTION

Group Support Systems (GSS) have been used to increase the efficiency and effectiveness of meetings requiring the sharing of ideas (Dennis, George, Jessup, Nunamaker, & Vogel, 1988). Groups of more than eight people in an electronic meeting have typically met at the same time in the same room (called a "synchronous legislative session") to exchange typed comments simultaneously and anonymously (Huber, 1984). However, not all potential participants may be able to attend such face-to-face (FTF) meetings (Gillenwater, Conlon, & Hwang, 1995; Jacob & Pirkul, 1989). At least one study (Aiken & Vanjani, 1997) has indicated that sub-groups distributed geographically may meet, forming a virtual legislative session. For example, four participants may type and view comments on their computers connected to a network in one room while five participants may type and view comments using the network in another room, forming a virtual group of nine members. The two rooms may be in the same building or in different cities, greatly reducing the time and inconvenience of travel to another site (Fellers & Moon, 1994; Romano, Nunamaker, Briggs, & Mittleman, 1999).

Groups split into two or more sub-groups in different locations may not function as effectively or efficiently as when all participants are in the same room (Smith & Vanecek, 1990). Group members may lose their sense of camaraderie or cohesion, and the meeting facilitator may lose control of the groups (Romano, Nunamaker, & Briggs, 1999). Additional voice or

teleconferencing links may be established to create a greater feeling of belonging to a group (Chapelle, Vogel, & Roberts, 1992; Hatcher, 1992; Jessup & Valacich, 1993), but many questions on how these groups may perform remain unanswered (Burke & Chidambaram, 1994).

The purpose of this paper is to investigate how well two sizes of virtual legislative sessions function. An experiment involving groups of eight and 16 people divided equally into two sub-groups discussed a topic using electronic gallery writing, one of many brainwriting techniques (VanGundy, 1981). In both sizes of groups, members were satisfied with the meeting technology, and there was no significant difference in five self-assessed process and outcome measures, showing that even larger numbers of participants may be able to meet in a virtual group.

GROUP SUPPORT SYSTEMS

Several methods have been proposed for classifying Group Support Systems, but perhaps the most common method is in terms of their provisions for group size, geographic dispersion, and time dispersion in a three-dimensional grid (DeSanctis & Gallupe, 1987; Nunamaker, Dennis, Valacich, Vogel, & George, 1991). The majority of GSS studies have concentrated on small or large FTF groups representing only two of the 12 possible GSS scenarios in the grid (Morrison & Liu Sheng, 1992). A few studies (Some described below) have investigated GSS groups in which participants work individually in separate locations (nominal groups), but only one study has looked at how well virtual groups function.

Nominal Group Research

Nominal groups involve participants who work individually at different locations and share their information later (Hiltz, Johnson, & Turoff, 1986; Van de Ven & Delbecq, 1971).

In one study (Valacich, George, Nunamaker, & Vogel, 1990), researchers found that nominal groups were more productive than FTF groups for both idea quantity and quality and more productive per person. Members of four-person nominal groups were the most productive and eight-person FTF groups were the least. The researchers attempted to explain this difference by the fact that more verbal interruptions may occur in FTF groups (laughing, talking about a written comment, etc.). There was no significant difference in satisfaction measures between the FTF and nominal groups.

In a second study (Dennis & Valacich, 1993) involving six- and 12-member nominal (non-communicating) and FTF (communicating) groups, researchers found that there were no differences in the six-member groups, but the 12-member FTF groups generated more ideas than did the 12-member nominal groups. These results were somewhat confirmed in a third study (Dennis & Valacich, 1994) in which researchers found that FTF groups generated more ideas with higher quality than did groups of physically-separated individuals or sub-groups which pooled their comments after the meeting. These latter results tend to contradict the earlier results.

Local Area Decision Network Research

Several studies have used local area decision networks (small groups of individuals geographically distributed, connected via a network) and computer-mediated conferences (large groups). Geographically-dispersed GSS groups may generate better solutions faster (Bui, Sivasankaran, Fijol, & Woodburg, 1987) than face-to-face groups because dispersed groups may focus more and be less distracted (Valacich, Nunamaker, & Vogel, 1994). Other studies have found that dispersed groups were less satisfied with the meeting process (Gallupe & McKeen, 1990; Straus, 1996; Valacich, George, Nunamaker, & Vogel, 1990). Many of these studies may not be directly comparable, however, because of differences in the size of the groups and differences in the software used (Cass, Heintz, & Kaiser, 1992).

Virtual Legislative Session Research

In one study (Aiken & Vanjani, 1997), virtual GSS groups of eight split into two sub-groups of four people each were compared to FTF GSS groups of eight people each. Results showed that participants in virtual groups were more satisfied with the meeting and generated significantly more unique, quality comments than did the FTF group members. In addition, the virtual group members thought the comments were more anonymous and thought the participation was more equal than did the FTF group members. There was no significant difference in perceptions of comment satisfaction and group membership satisfaction, however. From these results, the authors concluded that virtual group meetings held great promise because they do not require the significant disruption of traveling long distances for electronic meetings in the same room.

Although the research on the benefits of geographically-dispersed individuals meeting together via a GSS is mixed, one could expect that several dispersed groups meeting together may enjoy benefits somewhere between those found in FTF groups and dispersed-individual groups. That is, dispersed multi-group meetings may have some of the advantages of meeting FTF (e.g., a feeling of working as a group) and some of the advantages of dispersed-individual meetings (e.g., more focus on the task).

Virtual legislative meetings may experience some of the disadvantages of each technique, also. For example, controlling geographically-distributed groups can be difficult (Romano, Nunamaker, Briggs, & Vogel, 1998). An additional voice or message facility may need to be added for the facilitator to coordinate the meetings. As more participants and more sub-groups are added, an automated facilitator may decrease some of the administrative burden by starting and stopping programs, saving output, and communicating with participants (Aiken & Vanjani, 1998).

Hypotheses

A prior study demonstrated that virtual legislative sessions may be superior to synchronous legislative sessions, but only one virtual group size (two sub-groups of four people each) was used. Larger virtual legislative sessions may experience even more benefits.

Based upon theory and prior research, the following hypotheses were developed concerning the differences between two sizes of virtual legislative session groups:

H₁: *There is no difference in the perception of anonymity between small and large virtual groups.* Although comments generated in most electronic meetings are generally considered anonymous, group members may be seated close enough together to view each other's terminals. In both sizes of groups, some members are in the same room.

H₂: *There is no difference in system satisfaction between small and large virtual groups.* Both types of groups will use the same GSS software and hardware. The only difference is the number of people communicating through the system.

H₃: *There is no difference in comment quality between small and large virtual groups.* The number of people in the group should not affect the quality of the ideas generated.

H₄: *There is no difference in group membership satisfaction between small and large virtual groups.* The number of people in the group should not affect group membership satisfaction.

H₅: *There is no difference in participation between small and large virtual groups.* Participants in each size of group will be able to submit ideas freely with no encumbrances (other than individual typing speed).

EXPERIMENT

Subjects

A total of 32 undergraduate business students took part in the experiment for extra credit and were randomly assigned to two groups of eight and one group of 16. The lower size of eight subjects in a group was chosen because earlier research has indicated that this size may be just above the break-even point for GSS meeting success, and eight is the minimum number necessary to be classified as a virtual legislative session (Aiken, Krosp, Shirani, & Martin, 1994). Each group was divided equally between two electronic meeting rooms but linked through a shared local area network, forming virtual legislative sessions. Although the number of subjects in the experiment was somewhat low, the statistical power of the sample was considered adequate for $\alpha = 0.05$ (power = 0.54) and $\alpha = 0.10$ (power = 0.68).

Task

The subjects were asked to contribute suggestions for the solution of the parking problem on campus, a problem which has been the focus of other GSS experimental groups (Gallupe, Dennis, Cooper, Valacich, Bastuanutti, & Nunamaker, 1992; Nunamaker, Dennis, Valacich, & Vogel, 1991). The students had a significant stake in the problem, but they did not have ultimate decision-making authority for the problem, thus possibly limiting the external validity of the

experiment. However, many studies have shown that GSS experiments involving students facing similar tasks replicate findings of GSS field experiments involving businesses and other organizations (Nunamaker, Vogel, Heminger, Martz, Grohowski, and McGoff, 1989).

Treatments

Subjects were assigned to two sizes of virtual legislative sessions (eight and 16). Each group used idea generation software based upon the gallery brainwriting technique (VanGundy, 1981). However, nearly all other GSS idea generation software used in experimental studies is based upon the individual poolwriting technique. While there are significant differences between these two techniques (participants may be more satisfied with gallery brainwriting), we do not believe the choice of software confounds the study (Aiken, Vanjani, & Paolillo, 1997).

Measures

A post-session questionnaire was given to the subjects after the GSS meetings (Appendix 1). Subjects were asked to rate their satisfaction with their group, their proposed solutions, and the meeting process. They also were asked about their perceptions of anonymity and participation.

The ideas generated by each group were analyzed. In addition to the number of ray comments counted, the number of quality comments (defined here as simply comments related to the topic), and the number of unique, quality comments were counted (as determined by two reviewers). Inter-rater reliability was high (Cronbach $\alpha = 0.93$) indicating substantial agreement in the analysis.

Experimental Results

Table 1 shows questionnaire results. Overall and in each size of group, participants reported that comments were relatively anonymous, they were satisfied with the meeting process, were satisfied with their group membership, and believed participation was equal in the groups. They were neutral about the quality of ideas generated, however.

An analysis of variance was conducted on the two group sizes, and the results are shown in Table 2. There was no significant difference ($\alpha = 0.05$) in the self-assessed measures between the two sizes of groups. Therefore, the hypotheses are not rejected. However, at $\alpha = 0.10$, the large group thought the comments were a little less anonymous and were more satisfied with the meeting process. The larger group may have thought there was less anonymity because there were more people meeting face-to-face in the two rooms and a greater chance of looking at another's terminal. More people meeting together may also have enhanced the feeling of working as a group and thus increased the satisfaction with the meeting process.

In addition, the large groups generated significantly more ($\alpha = 0.05$) raw comments (6.19 vs. 2.77), more quality comments (5.88 vs. 1.60), and more unique, quality comments (5.06 vs.

1.38) per person. This was an unanticipated benefit. Larger groups may experience more synergy and participants may be able to build upon others' ideas easier.

Table 1. Questionnaire Summary (see the questionnaire in Appendix 1)

Group Type Variable:	All Mean	N-32 Std. Dev.	Small Mean	N=16 STd. Dev.	Large Mean	N=16 Std. Dev.
1. Anonymous Comments	1.61**	0.84	1.35**	0.51	1.88**	1.02
2. Process satisfaction	4.22**	0.75	4.00**	0.72	4.44**	0.73
3. Idea satisfaction	3.23	1.47	2.89	1.31	3.56	1.59
4. Group satisfaction	3.98**	1.10	4.08**	0.80	3.88**	1.36
5. Group participation	4.02**	0.87	4.04**	0.72	4.00**	1.03

(**significantly different from 4.00 at $\alpha = 0.05$)

Table 2. Analysis of Variance Between Small and Large Virtual Groups (see the questionnaire in the Appendix)

(N = 32, d.f. = 1, 30)

Variable:	F	Pr > F
1. Anonymous comments	3.36	0.077
2. Process satisfaction	3.00	0.094
3. Idea satisfaction	1.68	0.204
4. Group satisfaction	0.27	0.605
5. Group participation	0.01	0.906

Table 3 shows a Pearson correlation analysis of the data. Participants who were most satisfied with their comments were also more satisfied with their group membership and the meeting process. Although less significant, the analysis confirms the finding that there were differences in opinion on anonymity and meeting process satisfaction between the two sizes of groups.

Table 3. Pearson Correlation Analysis (Correlation/p-value)

	ANON	PROC	COM	MEM	PART
GP	0.31749 0.0766	0.30157 0.0935	0.23060 0.2042	-0.09512 0.6046	-0.02177 0.9058
ANON		0.02434 0.8948	-0.02193 0.9052	-0.08162 0.6570	-0.006911 0.9700
PROC			0.43105 0.0138	0.33147 0.0638	0.15244 0.4049
COM				0.45002 0.0098	0.32718 0.0676
MEM					0.20495 0.2605

CONCLUSIONS

This study supports earlier research which showed that virtual legislative session meetings in which members are separated into sub-groups at different locations may be just as effective and efficient as synchronous legislative session meetings in which all members are face-to-face. That is, virtual group members were satisfied with the meeting process and thought there was fairly equal participation among the members.

Using two sizes of virtual groups (eight and 16), there were not significant differences in the participants' perceptions of comment anonymity, meeting process satisfaction, idea satisfaction, group membership satisfaction, and member participation. However, the larger virtual group generated more unique, quality ideas per person than did the smaller group. These results indicate that an upper limit on the number of participants in a virtual meeting has not been reached. Indeed, the larger group may be even more productive.

The results indicate that there may be few disadvantages and several advantages for these geographically-dispersed sub-groups meeting together. If there is no significant difference between face-to-face and non-face-to-face groups, more meetings may be held remotely, bringing larger groups and more expertise to a problem.

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APPENDIX

Experimental Questionnaire

Please answer the following questions by circling your response:

1. Do you believe the comments were anonymous? ANON

1 2 3 4 5

Very anonymous Not anonymous

2. How do you feel about the procedure you used for this meeting? PROC

1 2 3 4 5

Very dissatisfied Very satisfied

3. How do you feel about the comments your group proposed? COM

1 2 3 4 5

Very dissatisfied Very satisfied

4. How do you feel about being a member of this group? MEM

1 2 3 4 5

Very dissatisfied Very satisfied

5. Rate the level of participation in your group? PART

1 2 3 4 5

Very unequal Very equal

