

A Study on the Impacts of Verbal Interaction in Proximate GSS Sessions

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Abstract

Although distributed Group Support Systems (GSS) are getting popular, there are still some limitations. One of the limitations is few substitutions for face-to-face (FTF) interaction (whether it is related to meeting content or not), so we may say that FTF interaction is one of the advantages of proximate types of GSS. However, there are few studies that focus only on the role of FTF interaction in proximate GSS sessions, so it is unclear what the real advantages may be. If we understand the role of FTF interaction better, we can understand how proximate GSS is important perhaps understand better the role of face to face interaction when compared to distributed GSS.

When data regarding face to face interaction was studied, many experimental studies separated FTF interaction from computer based interaction in GSS sessions. But, if people are gathered at same place under actual meeting conditions, it is assumed that they automatically talk about something. Therefore FTF interaction, especially verbal interaction in proximate GSS sessions, is an important issue to consider in actual GSS conditions.

The purpose of this study is to clarify impacts of verbal interaction in actual proximate GSS sessions. Eight proximate GSS sessions were observed and data were gathered using questionnaires from 59 participants. The relationship between meeting satisfaction, group cohesion and verbal interaction was analyzed.

Results show that, "oral participation in a discussion" and "informal chat during a session" tends to enhance meeting satisfaction and group cohesion more than "contribution using GSS". Therefore, we may say formal or informal verbal interactions in proximate GSS sessions play an important role and this role is one of the advantages of proximate GSS.

1. Introduction

Various kinds of studies about Group Support Systems (GSS) have been conducted during the last decade. The studies in the early days were focused on proximate types of GSS, but recent studies focus more on distributed types of GSS because of advanced network technologies. For

example, virtual teams or virtual communities are recent key words in those research fields. Distributed GSS is expected to remove the burden of business trips from workers and cut down on the travel budget.

Yet, distributed GSS have some limitations. One of the limitations is few substitutions for face-to-face (FTF) interaction among participants. There are many studies that examine some of the recent "substitution technology", like the use of nonverbal icons to express whether the participant is bored, happy, etc., or video conference systems using internet technologies. However, in such distributed conditions, it is difficult to meet and talk to someone by chance and have social interactions. Moreover, video and voice qualities of the video conference systems are still not so good, and/or high quality systems are expensive. At this point, the technologies are not sufficient so the FTF interaction is one of the advantages of proximate GSS.

At the same time, there are few studies that focus on only FTF interaction in proximate GSS sessions. If we understand the role of FTF interaction in same time same place GSS then we can understand how distributed GSS sessions are affected by "the loss" of real FTF interaction. Better understanding can also help us define substitutes for FTF interaction in distributed GSS situations by exploring alternatives such as "feeling" icons or instant messaging for chats.

The assumption is that, if people are gathered at the same place under actual meeting conditions, they automatically talk to other people at the meeting. By focusing on the role of this interaction, especially verbal interaction in proximate GSS sessions that is not related to meeting content, it is hoped that we can better understand the role that non-task specific FTF interaction has in GSS meetings. The purpose of this study is, therefore, to clarify impacts of verbal interaction in actual proximate GSS sessions.

2. Background

2.1. FTF interaction in GSS sessions

Some studies comparing proximate GSS with distributed GSS show the importance of FTF interaction in GSS sessions. For example, Jessup and Tansik [10]

conducted this kind of experiment and the result showed that proximate GSS enhanced overall satisfaction in the meeting. Raman et al. [21] reported in his experimental study that, in a preference task, proximate GSS have more positive impact on decision satisfaction and decision scheme satisfaction than distributed GSS. Burke and Chidambaram [2] compared proximate GSS with synchronous distributed GSS and asynchronous distributed GSS in their experiment. Results indicated that proximate GSS tended to have higher levels of communication effectiveness and communication interface than in distributed conditions. According to those studies, FTF interaction in GSS sessions is good for satisfaction of the meeting process or solution.

On the other hand, studies also suggest that distributed GSS support high levels of performance (e.g., [2, 10]). One of the reasons for this is that dispersed conditions keep anonymous conditions regarding each participant's stand on an issue or attitude, so participants contribute to meetings without feeling conformance pressure. Therefore we may say that both GSS and FTF interaction have advantages and disadvantages. The question remains, however, what happens when both channels of communication, FTF interaction and GSS using computers, are used. In this situation which medium is most effective with respect to group performance and process satisfaction?

Some researchers focused on a condition combining GSS with FTF and showed the combined condition was effective. For example, Ocker et al. [17, 18, 19] conducted some experimental studies to explore the effects of the combination of distributed GSS and FTF. In one of the studies, she and her colleague compared the combined group (using distributed GSS and FTF) with GSS group (using distributed GSS only) and a FTF only group [17]. Results showed the combined group was superior to the GSS group or FTF group in creativity of solution, quality of solution, and solution satisfaction. In another study, she compared the combined group with the GSS group and clarified that the combined group was superior to the GSS group in group cohesion, process satisfaction, and solution satisfaction [18]. Ngwenya and Keim [16] also conducted an experiment on a combined condition (distributed GSS and FTF) compared to FTF only. As a result, the combined condition produced a shorter time for decision making and better decision quality than FTF alone. In addition, Mukahi et al. [14] analyzed data gathered from CMC (Computer Mediated Communication) systems (e.g., e-mail, BBS) users to clarify the impact of CMC and FTF on actual organizations. Results showed that using both CMC and FTF for discussion enhances job satisfaction more than using only one medium. Even though those studies used distributed GSS or CMC systems, they suggest that FTF

interaction has an important role in GSS sessions and using both media is effective.

But, in those studies, it is not clear which kind of FTF interaction participants had and how participants exchange information in proximate conditions, so the role of FTF interaction needs to be clarified. In some experimental studies, media which facilitators and participants can use are limited to control the experimental conditions. In these studies meeting participants can't choose a medium according to the situation (e.g., [11, 24]). But, in actual conditions, facilitators choose a medium according to meeting context, so participants may be able to have oral discussion naturally, as well as using computers to express ideas. Therefore, actual GSS sessions are better for observing how participants naturally have FTF interaction and for clarifying the real role of FTF interaction in a GSS supported meeting.

2.2. Verbal interaction in actual GSS session

In actual conditions of proximate GSS sessions, it is assumed that participants have some verbal interaction. FTF interaction is divided into two parts: verbal interaction and nonverbal interaction, but past experimental studies compared with distributed GSS and proximate GSS didn't clarify the roles of verbal and nonverbal interaction.

Past studies approached FTF interaction generally from two different theories: Media Richness Theory (MRT) [4] and Social Presence Theory [23]. MRT focuses on human behavior toward media choice and characterizes media's richness according to four factors: feedback immediacy, cue transmission capacity, use of natural language and personal focus. MRT explains FTF is a rich medium and fit for reduction of equivocality. SPT focuses on social presence and explains that FTF interaction enhances social presence because of multiple communication channels. Many of the past studies treating FTF and GSS explain the FTF impacts based on those theories: for example, FTF is good at feedback, FTF can transmit various cues, or FTF produces social presence. But those studies did not clarify which kind of FTF interaction is related to which results.

Nunamaker et al. [15] observed actual proximate GSS sessions and reported that verbal interaction comprised only 3.4% of the GSS sessions. Even though the amount is small, the study also reported that participants thought that FTF discussion of the ideas guided by a facilitator was one of the important factors for success of an idea generation process. Furthermore, the authors reported that participants exchanged three kinds of verbal messages: task-oriented messages, technology-oriented

messages and social-oriented messages. Therefore, it is expected that participants have informal chats as well as express their opinions related to the topic in a session. Probably, participants also have some informal interaction before a meeting, during coffee breaks, or between activities in longer meetings, giving participants many chances to talk under the proximity conditions. Therefore supporting several kinds of verbal interaction (i.e., verbal discussion, informal chats in a session, before a session or between session activities) is one of the characteristics of FTF interaction during proximate GSS sessions.

3. Hypotheses

Meeting satisfaction in GSS sessions is one of the popular measures in this research field. According to the past studies mentioned above, proximate GSS groups enhance overall satisfaction [10], decision satisfaction, decision scheme satisfaction [21], communication effectiveness and communication interface [2] when compared to distributed GSS groups. In addition, the combined group (using distributed GSS and FTF) was superior to the GSS group or FTF group in solution satisfaction [17], and the combined group was superior to the GSS group in process satisfaction and solution satisfaction [18]. However, it is not clear which kind of FTF interaction, verbal or nonverbal, is related to those results. Michailidis and Rada [12] clarified that voice-based communication modes (FTF and phone) support positive interdependence among workers who play different roles, and the modes are valuable for organizing work. Therefore, it is expected that verbal interaction enhances group communication and supports meeting satisfaction. Then it is hypothesized that:

H1 Verbal interaction in GSS session enhances meeting satisfaction.

Group cohesion is also one of the factors measured in GSS sessions. Group cohesion is related to maintaining organizations, so this measure is important for actual meeting conditions in actual organizations. One study comparing a proximate GSS group with a distributed GSS group showed that the proximate group had higher group cohesion than the distributed group [1]. Furthermore, the combined (distributed GSS and FTF) group was superior to the distributed GSS group in group cohesion [18]. Hogg [9] reviewed past group cohesion studies and summarized that, in generally, verbal interaction enhances group cohesion. Therefore, it is possible that verbal interaction deepens impressions of

other participants and enhances group cohesion. Then it is hypothesized that:

H2 Verbal interaction in GSS sessions enhances group cohesion.

4. Methodology

4.1. GSS sessions and samples

Actual proximate GSS sessions are observed and data are gathered using post-session questionnaires from session participants. The GSS used is GroupSystems deployed in a public university in the USA and participants sit at a U-shaped table. In the university, some professors, departments, offices or institutes use the GSS for decision making, problem solving or problem identification. Eight of those sessions are observed from February to April in 2002, and 59 available post-session questionnaires are collected from the participants. In those sessions, idea generation and voting tools were mainly used. The session length ranged from 30 minutes to 2 hours and the number of participants in each session ranged from 4 to 15. Table 1 shows details of each session.

During those sessions, although the facilitator sometimes asked questions of the group, the facilitator never forced participants to reply. Furthermore, at the entrance of the GSS room, a food and drink corner was set, so participants could chat before sessions while eating or drinking. Because of those conditions, verbal interactions in this study were really spontaneous.

4.2. Measures

In this study, the relationship between meeting satisfaction, group cohesion and verbal interaction are analyzed to test the hypotheses. All of the questions for the questionnaire used seven point Likert scales and the questionnaire appears in the Appendix.

Verbal interaction is measured by three questions: oral discussion, chatting during a session and chatting before a session. Contribution to meetings using GSS was also added to those questions so that verbal interaction can be compared with interaction through GSS.

Meeting satisfaction is measured by process satisfaction and solution satisfaction which was developed by Green and Taber [8] because those measures have been applied in many studies (e.g., [18, 19, 22]). Originally, each measure consists of five questions, but Reinig [22] reported that two of the questions in solution satisfaction had low reliability and he omitted the two questions in his analysis. He also showed which

questions of process satisfaction had strong correlation with the process satisfaction factor that has been calculated by factor analysis. Therefore, in both measures, three questions were selected from the original ones for this study according to Reinig's study in order to reduce a load of answering. The process satisfaction had a reliability (Cronbach's alpha) of 0.84 and the solution satisfaction had that of 0.85.

The Group cohesion measure was applied from the measure that Dennis developed [5] and consists of three questions. The measure had a reliability of 0.79.

5. Results

Table 2 shows the amount of informal verbal interaction at the meeting and the FTF interaction associated with using GSS. According to the result, over 50% of the participants had some verbal interaction. This means that many participants have the interaction as well as typing their opinion on computers in actual proximate GSS sessions. The relationships between meeting satisfaction, group cohesion and verbal interaction (or GSS interaction) are analyzed applying correlation analysis and the results are shown in Table 3.

The results show that oral discussion is positively related to solution satisfaction, and chatting during a session is positively correlated with process and solution satisfaction. On the other hand, chatting before a session or the contribution of using GSS is not associated with either satisfaction variable. According to this result, we may say that formal verbal interaction or informal verbal interaction during a session tend to enhance meeting satisfaction. Therefore, hypothesis H1 is supported, especially, when interaction during the session is compared with the contribution using GSS. Those verbal interactions are related to meeting satisfaction, so verbal interaction is more important than using GSS alone for meeting satisfaction.

Oral discussion, chatting during the session and chatting before a session correlate positively with group cohesion. Therefore, hypothesis H2 is supported. Contribution using GSS also tend to enhance group cohesion, however, compared with oral discussion, the impact is weaker. Accordingly, participating in oral discussions has a stronger impact on group cohesion than participating in discussion using computers in GSS.

6. Discussion

Compared with contributions using GSS, verbal interaction is related to meeting satisfaction, so verbal interaction is more important than using GSS alone for meeting satisfaction. We shouldn't overestimate,

however, the effect of verbal interaction. It is said that speaking during meetings identifies each person's opinion or attitude, so participants feel conformance pressure in oral discussions [10]. On the other hand, participants feel less pressure in the anonymous condition which GSS can produce, so they can contribute to the meeting because of the anonymous condition. For that reason, meeting performance increases. Actually, some research reported that distributed GSS that produce stronger anonymous conditions bring higher performance than proximate GSS, even though they decrease meeting satisfaction or group cohesion (e.g., [2, 10]). Therefore, verbal interaction in GSS sessions may make the anonymous effects and the performance weaker, suggesting that it is important to pay attention to the performance as well as meeting satisfaction or group cohesion.

However, conditions which participants weren't forced to say their opinion orally during those sessions may have more positive impact. Because of the conditions, if participants felt some pressure, they could avoid saying something and express themselves using GSS to escape the pressure. The conditions also may make group cohesion work positively. While Hogg [9] concluded that verbal interaction enhances group cohesion, he also mentioned that if people are forced to be in a proximate condition, their cohesiveness works negatively. However, the participants who expressed opinions orally did so voluntarily, indicating that high group cohesion is associated with positive attitudes.

Furthermore, verbal interaction, especially informal verbal interaction is one of the advantages of proximate GSS. In this study, informal verbal interaction during a session enhances meeting satisfaction and group cohesion, and the interaction before a session enhances group cohesion. The informal interaction does not identify who typed what opinions, so the interaction can enhance the satisfaction or the cohesion without conformance pressure.

As far as we observed in these sessions, informal interaction brings with it a relaxed atmosphere. In those sessions, many participants chatted with the person sitting in the next seat when they were waiting for the next task. In those sessions, a food and drink corner was set, so participants also could chat before sessions while eating or drinking. As a result many of the participants had verbal interaction by chance. They seemed to be relaxed because of the atmosphere of the setting and the interaction produced. It is difficult to produce this kind of atmosphere in distributed GSS. One of the important subjects for distributed GSS is how distributed GSS support informal verbal interaction and generate a "relaxed atmosphere".

While informal interaction doesn't directly relate to tasks, it may enhance group task performance. Informal interaction enhances group cohesion and group cohesion is positively related to performance [7]. Therefore, it is possible that the informal interaction enhances performance through group cohesion. At the same time, oral discussion in GSS sessions may make performance weaker because of conformance pressure. However, the discussion enhances group cohesion, and the cohesion may enhance performance, so this positive impact may compensate for the negative impact of conformance pressure.

Using GSS also positively correlates with group cohesion, so not only verbal interaction but also GSS are effective in group cohesion. Chindambaram et al. [3] reported in longitudinal GSS experiments that group cohesion in GSS sessions tended to increase according to time spent. If these sessions in this study were longer, the GSS impact on the cohesion might be stronger. Furthermore, the cohesion given impact from using GSS may enhance performance, so this process may accelerate the performance from anonymous conditions.

In the end, verbal interaction and interaction through GSS, both have advantages and disadvantages, so moderate amounts of verbal interaction should be allowed in GSS sessions. In addition, we shouldn't force participants to say something orally to prevent oral interaction from having negative impacts. When we plan a GSS meeting, we should consider which setting, distributed or proximate, is best for the meeting purpose. In addition, in a proximate GSS session, the meeting coordinator or facilitator should understand the characteristics of verbal interaction and control the verbal interaction according to the meeting purposes or the meeting context.

7. Conclusion

This study suggests that verbal interaction enhances meeting satisfaction and group cohesion, and that verbal interaction plays an important role in proximate GSS sessions. However for future studies, there are some limitations in this study. First, this study didn't analyze the direct relationship between verbal interaction and task performance. Perceptions of verbal interaction and meeting satisfaction were measured using questionnaires, so it is unknown which types of interactions are related to which kinds of performance. More precise measures should be applied future.

Second, group history or member familiarity is an important concept [5, 11, 20]. It is said that group history or familiarity among group members is related to group cohesion [11]. This study did not identify how familiar

participants were with each other and it was assumed that familiarity was random. It was clear that at each meeting some participants knew each other well, while others were meeting for the first time. It is assumed that participants can chat easily if they know well each other. Therefore, the familiarity might cause verbal interaction, and the verbal interaction might enhance meeting satisfaction or group cohesion. In other words, the verbal interaction might be a mediator between familiarity and meeting satisfaction and/or group cohesion.

Third, participant personality, especially introvert or extrovert is important. Some studies reported introverts tend to prefer anonymous condition and contribute to meetings in the condition [13, 25]. Therefore, it is assumed that introverts tend to avoid verbal interaction and prefer to type their opinions on GSS.

Fourth, this study's results might be influenced by factors such as task type or group size because we observed different kinds of actual GSS sessions. To confirm the results, future studies controlling those factors are expected.

Despite these limitations, this study gives suggestions for future GSS research. We can conclude from this study that verbal communication is important in GSS sessions for people, so the coexistence of verbal communication and computer-mediated communication is an ideal communication environment. It also suggests that some medium for chatting informally may be important in distributed GSS, especially if group cohesion and meeting satisfaction are desired.

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Table 1. Details of each session for this study

Session No.	Purpose	Tools	Participant types	*1	*2	*3
1	Problem identification	Idea generation Voting	Faculty	10	10	2:00
2	Problem identification	Idea generation Voting	Faculty	12	10	2:00
3	Problem identification	Idea generation Voting	Faculty	11	6	1:40
4	Problem solving	Idea generation Voting	Community Faculty	15	10	2:00
5	Problem solving	Idea generation Voting	Community Faculty	11	9	2:00
6	Problem solving	Idea generation Voting	Community Faculty	15	10	2:00
7	Selection	Voting	Faculty	4	1	0:45
8	Selection	Voting	Faculty	4	3	0:30

*1: The number of participants

*2: The number of available sample

*3: Time in hours

Table 2. The number of the responses to amount of verbal interaction and using GSS

	Strongly disagree or moderately disagree		Slightly disagree, neutral or slightly agree		Strongly agree or moderately agree	
Oral discussion	9	(15.3)	18	(30.5)	32	(54.2)
Chatting during a session	3	(5.1)	19	(32.2)	37	(62.7)
Chatting before a session	7	(11.9)	14	(23.7)	38	(64.4)
Contribution using GSS	1	(1.7)	10	(16.9)	48	(81.4)

(): % Percent of the total responses by row.

Table 3. Result of correlation analysis

	Process satisfaction		Solution satisfaction		Group cohesion	
Oral discussion	0.253		0.348	**	0.412	**
Chatting during a session	0.397	**	0.372	**	0.281	*
Chatting before a session	-0.012		0.182		0.266	*
Contribution using GSS	0.191		0.245		0.263	*

* : p<0.05 ** : p<0.01

Appendix

Process satisfaction

How would you describe this session's problem solving process?

very inefficient			neutral			very efficient
1	2	3	4	5	6	7
very uncoordinated			neutral			very coordinated
1	2	3	4	5	6	7
very dissatisfying			neutral			very satisfying
1	2	3	4	5	6	7

Solution satisfaction

To what extent do the final results reflect your input?

not at all			neutral			very great extent
1	2	3	4	5	6	7

To what extent do you feel committed to the group results?

not at all			neutral			very great extent
1	2	3	4	5	6	7

To what extent are you confident that the group results are correct?

not at all			neutral			very great extent
1	2	3	4	5	6	7

Group cohesion

Considering the people with whom you worked in this session, to what extent are the people in this session helpful to you in getting the job done?

not helpful at all			neutral			very helpful
1	2	3	4	5	6	7

Considering the people with whom you worked in this session, to what extent do you trust the member of this session?

not at all			neutral			very great extent
1	2	3	4	5	6	7

Considering the people with whom you worked in this session, to what extent do you look forward to being with this group?

not at all			neutral			very great extent
1	2	3	4	5	6	7

Verbal interaction and using GSS

Using the scale described below, indicate the degree of agreement with each of the following statements:

Strongly disagree	Moderately disagree	slightly disagree	neutral	slightly agree	moderately agree	strongly agree
1	2	3	4	5	6	7

I orally participated in a discussion during this session.

1	2	3	4	5	6	7
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I chatted with other members during this session.

1	2	3	4	5	6	7
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I chatted with other members during a break or before this session.

1	2	3	4	5	6	7
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I could contribute my opinions to the system during this session.

1	2	3	4	5	6	7
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