The Influence of Familiarity among Group Members and Extraversion on Verbal Interaction in Proximate GSS Sessions

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Abstract

Although Computer-Mediated Communication (CMC) is popular, past research shows that Face-to-Face (FTF) interaction is also important in CMC environments. The question is, what are the accelerators for FTF interaction in CMC scenarios? A literature review finds the accelerators of familiarity among group members and personality factors related to E/I (Extraversion/Introversion) important factors to consider in FTF interaction. The focus, therefore, of this study is on proximate Group Support System (GSS) environments that have both CMC and FTF interactions. The objective of the study is to reveal the impacts of familiarity among group members and E/I on verbal interaction in GSS sessions.

A proposed causal model, in which verbal and GSS interactions are mediators between the combinations of "group member's familiarity & E/I factors," and "meeting satisfaction & group cohesion," is tested. To examine the model, eight proximate GSS sessions are observed and data are gathered using questionnaires from 59 participants. The data are then analyzed using path analysis.

Results show that verbal and GSS interactions do not positively mediate between the combinations of "group member's familiarity & E/I factors," and "meeting satisfaction & group cohesion." This means that verbal interaction is independent from personal factors such as familiarity or E/I and, probably, meeting management factors are important to accelerate verbal interaction among participants. Implications of these findings are discussed within the context of virtual and/or asynchronous meetings.

1. Introduction

Although Computer-Mediated Communication (CMC) is getting popular, Face-to-Face (FTF) interaction is also important under CMC environments. For example, in recent CMC environments such as Knowledge Management or Virtual Teams, FTF interaction is essential for knowledge sharing and stimulating interaction through CMC [e.g., 3, 11].

However, there are few studies that focus on the role of FTF interactions under CMC conditions. In the few studies that can be found, results show that combining CMC with FTF is effective. For example, Ocker et al. [18, 19, 20] conducted some experimental studies to explore the effects of the combination of distributed Group Support Systems (GSS) and FTF. In one of the studies, she and her colleague compared the combined groups (using distributed GSS and FTF) with GSS only groups (using distributed GSS only) and FTF only groups [20]. Results show the combined groups are superior to the GSS groups or FTF groups in creativity of solution, quality of solution, and solution satisfaction.

Mukahi et al. [16] analyzed data gathered from CMC systems (e.g., e-mail, BBS) users to reveal the impact of CMC and FTF on actual organizations. Results show that using both CMC and FTF for discussion enhances job satisfaction more than using only one medium. Furthermore, Mukahi and Corbitt [15] observed actual proximate GSS sessions to find impacts of verbal interaction in GSS sessions. According to results, formal or informal verbal interaction during or before a session tends to enhance meeting satisfaction and group cohesion more than interaction through GSS. Thus, these studies underline the importance of FTF interactions in CMC environments.

The question is: what are the accelerators for FTF interaction. Smolensky et al. [24] suggest that social context variables (like familiarity among group members) and personality variables (like extraversion/introversion) have a positive influence on uninhibited behavior in CMC environments. Therefore, it is supposed that members' familiarity and the personality factors have an influence on verbal interaction in CMC environments.

For that reason, this study focuses on proximate GSS environments that have both CMC and FTF interactions. The purpose of the study is to reveal the impacts of familiarity among group members and E/I (Extraversion/Introversion) on verbal interaction and GSS sessions.

2. Backgrounds

2.1. Familiarity among group members

In social psychology research, Hogg [8] reviewed past
group cohesion studies and summarized that social interaction or members' proximity enhances group cohesion in general. Therefore, we may say that familiarity among group members is one important factor in research related to group meetings.

As for the GSS research field, there are some studies that focus on familiarity among group members or group history. Mennecke et al. [13] summarized past group development studies in GSS and non-GSS conditions, and proposed some opinions. One of their proposals argues "Overall satisfaction with the group's product and process will be greater for established group members when compared to ad hoc group members" (pp.558). One reason satisfaction is greater is because each group member can know other member's skills and abilities, and can also possess a sense of unity and confidence in the group. Based on the proposal, Mennecke et al. [12] conducted the experiment which compared established groups with ad hoc groups in GSS and non-GSS conditions in order to clarify the influence of group history on information sharing and user perception. The study found that established group members were more satisfied with both process and solution and had higher cohesion than ad hoc group members in both GSS and non-GSS conditions.

Similarly, other researchers explored the relationship between group history and uninhibited communication. Dennis et al [5] compared established and ad hoc groups using GSS and found established groups made more uninhibited comments than did ad hoc groups. Orengo Castellá et al. [21] conducted an experiment to reveal the influence of familiarity among group members on uninhibited behavior through FTF, CMC and videoconference. Results show that members' familiarity significantly predicts mild uninhibited behavior regardless of the medium.

Therefore, based on these studies it appears that group members' familiarity is positively related to meeting satisfaction, group cohesion and uninhibited communication. Uninhibited communications are those interactions that are spontaneous among team members.

### 2.2. Extraversion/Introversion

The E/I factor is considered to be important to the study of the relationship between personality and communication. For instance, past psychological studies reported that extraverts tended to speak more often with longer comments [22] and to be more talkative [25] than introverts. Therefore, there is no reason not to expect that E/I has something to do with communication behavior in CMC environments.

Yellen et al. [26] examined how the E/I factor influenced outcomes in anonymous electronically-supported meetings and traditional FTF meetings. Results show that introverts are more satisfied with the electronically-supported meeting environment while introverts tend to make fewer comments than extraverts in both CMC and FTF conditions. Mukahi et al. [14] examined the influence of E/I and anonymity on idea generation in the electronic brainstorming systems. As for a result, introverts tended to generate more ideas in the anonymous condition than extraverts. Similarly, Balthazard et al. [1] investigated the effects of E/I on virtual team interaction and performance. Accordingly, high extravert groups tended to be more aggressive and constructive than introverts.

Although these studies show different tendencies, it is reasonable to expect that E/I is related to communication behavior in CMC environments.

### 2.3. Verbal interaction in proximate GSS meeting

There are few studies that focused on verbal interaction in proximate GSS conditions. Nunamaker et al. [17] observed actual proximate GSS sessions and reported that verbal interaction comprised only 3.4% of the GSS session's time. 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. Mukahi and Corbitt [15] observed actual proximate GSS sessions to clarify impacts of verbal interaction in GSS sessions. Results show that formal or informal verbal interaction during or before a session tends to enhance meeting satisfaction and group cohesion more than interaction through GSS. In spite of these studies, there are few clues to understand the role of verbal interaction in CMC settings. It is especially not clear which factors affect verbal interaction.

### 3. Hypotheses

Orengo Castellá et al. [21] conducted an experiment and results showed members’ familiarity significantly predicts mild uninhibited behavior regardless of the medium. Dennis et al. [5] reported, under GSS conditions, established groups made more uninhibited comments than ad hoc groups. According to those studies, it is expected that meeting participants can make more comments with familiar members through verbal interaction or GSS interaction. The first and second hypotheses are therefore:

- **H1**: Familiarity among group members enhances verbal interaction.
- **H2**: Familiarity among group members enhances interaction through GSS.

Mukahi and Corbitt [15] reported verbal interaction in
GSS was positively related to group meeting satisfaction and group cohesion, and GSS interaction was positively related to group cohesion. Mixing this result with hypotheses H1 and H2, it is supposed that verbal interaction or GSS interaction is one of the mediators between members' familiarity and both meeting satisfaction and group cohesion.

Actually, there are some studies that reported a positive relationship between members' familiarity and both meeting satisfaction and cohesion. For example Mennecke et al. [12] found that established group members were more satisfied with process and solution satisfaction, and had higher cohesion than ad hoc group members in both GSS and non-GSS conditions. Similarly, Hogg [8] generalized that social interaction or members' proximity enhances group cohesion. Therefore it is expected that familiarity among members enhances meeting satisfaction and group cohesion through verbal interaction or GSS interaction. Thus, additional hypotheses are:

- **H3:** Familiarity among group members enhances meeting satisfaction through verbal interaction.
- **H4:** Familiarity among group members enhances group cohesion through verbal interaction and GSS interaction.

Past psychological studies reported that extraverts tended to speak more often with longer comments [22] and to be more talkative [25] than introverts. Yellen et al. [26] reported extraverts tended to make more comments than introverts in both CMC and FTF conditions. Balthazard et al. [1] found that high extravert groups tended to be more aggressive and constructive than introverts in virtual teams using CMC. Therefore, it is supposed extraverts tend to have more verbal and GSS interaction in a GSS meeting. However, Yellen et al. [26] also reported introverts were found to be more satisfied with the electronically-supported meeting environment and Mukahi et al. [14] found that, in the anonymous electronic brainstorming, introverts tended to generate more ideas than extraverts. It is said that GSS keeps anonymous condition, so participants can express their opinion without feeling conformance pressure in the GSS condition [9]. For these reasons, introverts may feel more at ease to express their opinion through GSS than extraverts.

- **H5:** Extraverts tend to have more verbal interactions than introverts do.
- **H6:** Introverts tend to have more interactions through GSS than extraverts do.

As mentioned above, Mukahi and Corbitt [15] reported verbal interaction in GSS was positively related to group meeting satisfaction and group cohesion, and GSS interaction was positively related to group cohesion. Mixing this result with hypotheses H5 and H6, it is supposed that verbal interaction or GSS interaction is one of the mediators between E/I and both meeting satisfaction and group cohesion. Therefore, related hypotheses are:

- **H7:** Extraverts tend to be satisfied with a GSS meeting and show high group cohesion through much verbal interaction than introverts do.
- **H8:** Introverts tend to show high group cohesion through much GSS interaction than extraverts do.

4. Methodology

4.1. GSS sessions and samples

This study used data which were gathered in a previous study [15]. 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. Eight of those sessions are observed from February to April in 2002, and 59 available post-session questionnaires are collected from a total of 70 participants. In those sessions, idea generation and voting tools are 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. The detail of those sessions is shown in Ref. [15].

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 were able to chat before sessions while eating or drinking.

4.2. Measures

In this study, familiarity among members, E/I tendency, meeting satisfaction, group cohesion, verbal and GSS interaction, were measured using the questionnaire. All of the questions used seven point Likert scales and the questionnaire appears in the Appendix.

To measure familiarity among group members, participants are asked whether they have worked with many of other members before the session or not. To measure the E/I factor, the Big Five Inventory [10] is applied and eight questions which are related to E/I are chosen for inclusion in this study. This measure had a reliability (Cronbach's alpha) of 0.89.

Verbal interaction is measured by three questions: oral discussion, chatting during a session and chatting before a session. To measure interaction through GSS, contribution to meetings using GSS is also asked.

Meeting satisfaction is measured by the process satisfaction and solution satisfaction measures developed
by Green and Taber [6]. In both measures, three questions were selected from the original ones for this study according to Reinig's study [23] in order to reduce a load of answering. The process satisfaction had a reliability of 0.84 and the solution satisfaction had that of 0.85.

The Group cohesion measure is applied from the measure that Dennis developed [4] and consists of three questions. The measure had a reliability of 0.79.

4. 3. Analysis

To examine hypotheses H1 through H8, this study uses path analysis. According to those hypotheses, verbal and GSS interaction is a mediator between "members' familiarity and E/I" and "meeting satisfaction and group cohesion." Then, a causal model is set according to the hypotheses and the measures explained above. Members' familiarity and E/I are divided into causes in the model. Discussion during a session, chatting during a session, chatting before a session and GSS interaction are divided into first level of effects, and process satisfaction, solution satisfaction and group cohesion are used as second level effects. The path analysis analyzes all paths between the causes and the first level effects, between the first level and the second level effects, and between the causes and the second level effects. The model is shown as Figure 1. In addition, simple correlation analysis between each variable is also conducted. For this analysis, Amos 4.0 and SPSS are used.

5. Results

Figure 2 shows the significant paths computed by path analysis and Table 1 shows the results of the correlation analysis. The path from familiarity among group members to chatting before a session is significant while the paths from the familiarity to oral discussion during a session and chatting before during a session are not significant. Therefore, hypothesis 1 is partially supported. The path from the familiarity to GSS interaction is significant, so H2 is supported.

Although oral discussion and chatting during a session have a positive influence on process satisfaction, solution satisfaction and group cohesion, they do not have significant relationships with members' familiarity. Therefore they are not mediators between members' familiarity and both meeting satisfaction and group cohesion. Chatting before a session has a negative influence on process satisfaction, so chatting before a session negatively mediates between familiarity and process satisfaction. For that reason, hypothesis H3 is rejected. GSS interaction does not show significant influence on group cohesion, so it does not mediate between familiarity and cohesion. Therefore, hypothesis H4 is rejected.

The paths from E/I to all verbal interaction variables are not significant, so hypothesis H5 is rejected. Between E/I and GSS interaction, extraverts tend to have more interaction using GSS. This tendency is opposite from hypothesis H6, so H6 is also rejected. In the end, these results do not find the mediator between E/I and both meeting satisfaction and group cohesion, so hypotheses H7 and H8 are rejected.

6. Discussion

As for verbal interaction, only one of three variables, chatting before a session, is related to familiarity among members. This result means that if a group member knows others at the meeting, familiarity accelerates chatting before a session. However, the familiarity does not have an influence on the outcomes of a GSS session such as verbal interaction during a session, meeting satisfaction and group cohesion. On the contrary, members' familiarity negatively affects process satisfaction through chatting before a session. This negative causal relationship is brought by members' familiarity, because simple correlation analysis didn't find a significant negative relationship between chatting before a session and process satisfaction although path analysis showed the significant relationship. The reason may result from a negative influence of proximate condition. Hogg [8] reported that if people were forced to be in a proximate condition, their cohesiveness worked negatively. It is possible that, some of participants of this study didn’t want to attend the meeting and their chatting with familiar members before the meeting made them hold some negative attitudes toward the meeting. In the end, they may complain about the meeting process.

Although most of the hypotheses were rejected, this study's result gives some useful insights. One result shows that verbal interaction is not a mediator between "familiarity among members and E/I" and "meeting satisfaction and group cohesion." This means verbal interaction is independent from personal factors and, probably, meeting management factors are important to control verbal interaction. As far as we observed GSS sessions for this study, chatting before or during a session are brought about by the relaxed atmosphere which was produced by a food and drink corner and the facilitator's skill in GSS meeting management. In addition, the facilitator's skill also had influenced oral discussion during a session. If a GSS meeting facilitator wants participants to have verbal interaction to produce meeting satisfaction or high group cohesiveness, the facilitator can create situations in which participants are encouraged to interact verbally.

This discussion can be applied to distributed conditions such as distributed GSS or Virtual Teams. It is difficult for the people in the distributed condition to have FTF interaction. Managers should understand the importance of FTF interaction and try to produce the chance people can
chat and discuss things orally. As mentioned first part of this paper, it is said that FTF interaction is important for knowledge sharing and stimulating interaction through CMC. In addition, this study revealed FTF interaction is important for meeting satisfaction and group cohesion and organizations have opportunities to increase both by managing FTF conditions. Since chatting before the meeting does not yield positive results in all cases, it may be more important to allow free use of Instant Messaging tools even during audio or video conferencing so that team members can simulate face to face interaction.

The results of the correlation analysis do not reveal a significant relationship between familiarity among members and meeting satisfaction, and we see a weak but significant relationship between familiarity and group cohesion. These results contradict some past studies that reported familiarity enhances meeting satisfaction and cohesion. The contradiction may be related to task characteristics. One of the historical studies comparing established group with ad hoc group in FTF condition reported that established groups perform better than ad hoc groups under high-conflict conditions [7]. At the same time, the meetings that were observed for this study mainly used idea generation and voting tools, indicating a not so high-conflict condition. If more complexity conditions had been observed, the result might have been different. (There could have been more conflict in some of the conditions than appeared on the surface, however, since conflict and task measures were not gathered.)

All hypotheses related to E/I, hypotheses H5 to H8, were rejected. When we observed past studies carefully, we can find two different tendencies. The first tendency is that introverts tend to prefer anonymous GSS meeting, and the second one is that extroverts tend to make more comments regardless of the medium. Even in one study, we can see both tendencies. For example, Yellen et al. study [26] shows that introverts are more satisfied with GSS meeting environment while extraverts tend to make more comments than introverts in both CMC and FTF condition. Therefore, it is supposed that there are other mediators between E/I and GSS environment.

7. Conclusion

Although this study gives some interesting insights, there are some limitations and therefore there is room for changes in future studies. First, as mentioned above, more complicated conditions involving conflict resolution and negotiation should be observed. Second, this study observed short-term GSS sessions. Although the factors this study analyzed (i.e. familiarity among members, meeting satisfaction and group cohesion) are related to long term group development processes, this study observed only short-term GSS sessions. There are some longitudinal studies that give insights to understand the impacts of members' familiarity. For instance, Chidambaram et al. [2] had experimented to understand group development issues under GSS conditions. The study reported that, in late stages of meeting sessions, the GSS group displayed more productive conflict management and higher group cohesiveness than the FTF group. If longer sessions had been observed for this study, results may have been different. Third, the sample size is a little small to analyze a causal relationship and discuss the relationship in detail. It is possible that many hypotheses were rejected because of small sample size. Forth, we have to consider some important variables for GSS studies such as group size, task performance and so on.

In spite of those limitations, this study shows the importance of verbal interaction and the necessity of managing verbal interaction under proximate GSS conditions. In addition, this study brought some clues for future studies combining GSS or CMC with FTF. It is expected that future studies will reveal the roll of FTF interaction in Internet generation more clearly. Especially, since many hypotheses are rejected in this study, the research model should be rebuilt and examined in future studies. As more and more teams operate virtually, the role of FTF interaction in electronic meetings is more important to understand as teams explore substitutes for verbal interaction. For example, the role of instant messaging, intranet chats and email may be substitutes for verbal interaction in virtual team situations. If verbal interactions are not necessary for process and solution satisfaction then this is good news for virtual team management.

References


FAM: Familiarity among group members  E/I: Extravert/Introvert
ODDS: Oral discussion during a session  CDS: Chatting during a session
CBS: Chatting before a session  GSS: Interaction through GSS
PS: Process satisfaction  SS: Solution satisfaction
GC: Group cohesion

**Figure 1. Model for path analysis.**

**Figure 2. Result of path analysis.**
Table 1. Result of correlation analysis.

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<th>FAM</th>
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*: p<0.10  **: p<0.05  ***: p<0.01

Appendix

Verbal interaction and using GSS

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

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Moderately disagree</th>
<th>Slightly disagree</th>
<th>Neutral</th>
<th>Slightly agree</th>
<th>Moderately agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

I orally participated in a discussion during this session.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

I chatted with other members during this session.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

I chatted with other members during a break or before this session.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

I could contribute my opinions to the system during this session.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Familiarity among group members and Extraversion/Introversion

I have worked with many of these people before this session.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

I see myself as someone who:

is talkative

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

is reserved

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

is full of energy

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

generates a lot of enthusiasm

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

tends to be quiet

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

has an assertive personality

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

is sometimes shy, inhibited

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

is outgoing, sociable

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
**Process satisfaction**

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

<table>
<thead>
<tr>
<th>Very inefficient</th>
<th>Neutral</th>
<th>Very efficient</th>
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<tr>
<td>1</td>
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<td>3</td>
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<table>
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<tr>
<th>Very uncoordinated</th>
<th>Neutral</th>
<th>Very coordinated</th>
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<tr>
<th>Very dissatisfying</th>
<th>Neutral</th>
<th>Very satisfying</th>
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**Solution satisfaction**

To what extent do the final results reflect your input?

<table>
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<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Very great extent</th>
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<td>1</td>
<td>2</td>
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To what extent do you feel committed to the group results?

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<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Very great extent</th>
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To what extent are you confident that the group results are correct?

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<th>Not at all</th>
<th>Neutral</th>
<th>Very great extent</th>
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**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?

<table>
<thead>
<tr>
<th>Not helpful at all</th>
<th>Neutral</th>
<th>Very helpful</th>
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Considering the people with whom you worked in this session, to what extent do you trust the member of this session?

<table>
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<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Very great extent</th>
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Considering the people with whom you worked in this session, to what extent do you look forward to being with this group?

<table>
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<tr>
<th>Not at all</th>
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<th>Very great extent</th>
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