

동시적 텍스트 기반 매체를 이용한 집단의사결정에 관한 질적 연구

박상혁* · 조남재**

Qualitative Study on Group Decision Making with Synchronous Text Communication Medium

Sanghyuk Park* · Namjae Cho**

Abstract

This study identifies communication patterns of groups using synchronous text communication medium for their group decision-making, and examines how these patterns are associated with creative solutions to problems. Our research suggests that certain communication behavior of groups, when appropriately organized, can be of help in enhancing creative production of outcomes. A qualitative study was conducted on communication patterns based on an analysis of text-based electronic conversation protocols. Specifically this research tried to overcome existing studies on electronic groups by focusing on interactive process of communication among participants.

The major study conclusions are : (1) The production of creative outcome may depend on the process or sequence of discussion among group members with synchronous text communication medium. That is, proper interactive responses and appropriate control of the discussion process are essential to obtain a high level of performance. (2) It is important to make discuss rules based on meta-cognitive and interactive protocols in the early stage. Explicit rules relating to internal group processes as well as communication medium use are even more important to groups with electronic communication medium than face-to-face groups.

Keywords : Group decision-making, Synchronous text communication, and Content analysis

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* 진주산업대학교 전자상거래학과 전임강사(spark@jinju.ac.kr)

** 한양대학교 경영학부 부교수(njcho@hanyang.ac.kr)

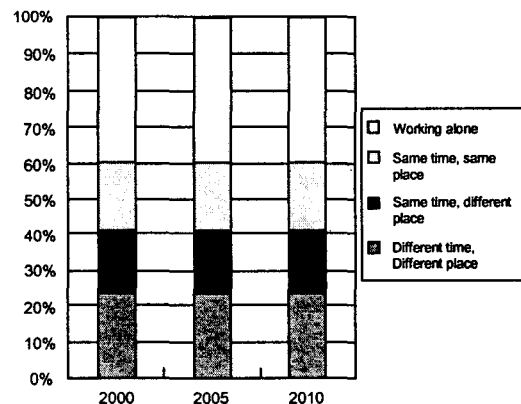
1. Introduction

Communication technologies provide opportunities to improve collaborative work in organizations. Groups that work and coordinate their activities using communication technologies continue to increase. This form of work is considered as an emergent organizational form or a new channel of inter-organizational marketing communication. Members of groups rely heavily or entirely on communication technologies as a medium of information exchange, and have little or no face-to-face interactions. Among all the communication technologies recently developed synchronous communication technology are considered notably useful for group work in and out-of an organization (e.g., virtual team's project, customer management, in-house training, or internal communication) [Herbsleb, Atkins, Boyer, Handel and Finholt, 2002 ; Nardi, Whittaker and Bradner, 2000]. Instant Messaging from Microsoft, for example, has been applied as an effective synchronous communication tool for group works.

The character of the workplace with electronic medium is not determined only by business processes and IT systems. The character of the work itself is changing (see <Figure 1>). Gartner Group forecasted that distributed and collaborative work style would increase. As work increasingly requires situational knowledge, the likelihood that people will work collaboratively, just-in-time and in multiple groups rises quickly.

Thus, enterprises must reexamine reward systems, redesign work and distribute work-

loads appropriately. While this new organizational structure create better opportunities for improving organizational efficiency, managers find it difficult to manage, coordinate, and maintain close collaboration among the members [Townsend, DeMarie and Hendrickson, 1998]. Managers of virtual team seek to find new ways of measuring performance and mentoring participants. Understanding how a work is done is becoming a fundamental competence for people in many organizations.



<Figure 1> Change of Work Style Source
[Gartner Group, 2001]

Most of the advanced synchronous communication tools possess a mixture of functionalities. In typical environment, participants interact by means of written scripts typed and read on computer screens. The use of this technology produces a large amount of text-based dialogue data, providing us a good opportunity to apply linguistic analysis to draw useful conclusions on group work behavior [Heracleous and Barrett, 2001].

This study identifies communication patterns in group with electronic communication

medium, and examines how these patterns are associated with creative performance of the teams involved. Researches in GSS (group support systems) and into the relationship between group dynamics and performance have focused on similar issues. Unfortunately results from previous research in GSS performance showed some inconsistencies [Gopal and Parad, 2000]. In addition, quantitative studies on group dynamics with electronic medium could not draw sufficient insights into the interim process and the needs for process investigation have been pointed out [Dennis, Wixom, and Vandenberg, 2001 ; Fjernerstad and Hiltz, 2001 ; Grinter and Palen, 2002 ; Trauth and Jessup, 2000].

With the premise that certain communication activities among members in an electronic group can help to improve creative outcomes, we examined the process of communication among group participants. A qualitative analysis method was employed to analyze the communication patterns. Qualitative analysis is considered as an appropriate technique when little is known and procedural aspects are of concern [Weber, 1990]. The results provide some useful insights for managing virtual activities.

2. Research Background

2.1 Communication Technology in Organization

One major stream of previous research on the effects of alternative means of communication was guided by media richness theory

[Daft and Lengel, 1986 ; Daft, Lengel, and Trevino, 1987]. This perspective implicitly assumes that communication media has inherent characteristics that make them more or less effective [Daft and Lengel, 1986 ; Fulk, Schmitz, and Steinfield, 1990]. For example, face-to-face communication (FTF) tends to convey rich social context cues [Sproull and Kiesler, 1991], and has been found to be particularly effective in creating a shared interpretation among organizational members [Zack, 1993]. In contrast, CMC (Computer Mediated Communication) is not as rich as FTF in its ability to convey social context cues [Daft, Lengel and Trevino, 1987], but is more appropriate within established structure [Zack, 1993]. Groups exhibiting effective communication would use FTF primarily for interactive discourse and CMC for discourse with alternating adjacency pairs [Zack, 1993]. Likewise, different communication media has their unique characteristics (see <Table 1>).

These approaches are based on media selection theories that compare synchronous offline media (e.g., face-to-face meeting) with asynchronous online alternatives (e.g., electronic mail or electronic bulletin board). Recent research complements and extends media selection theory by considering the effects of the social influence [Fulk, Schmitz and Steinfield, 1990 ; Kraut, Rice, Cool, and Fish, 1998]. In the social influence model, the social context (e.g., norms or culture) becomes a focus of interest.

One objective of this research is to examine the role of synchronous communication tech-

nologies within the context of electronic group norm. Historically, electronic groups have used electronic mail (e-mail) or electronic bulletin board (BBS) to share information and coordinate their work [Panteli, 2002 ; Wiesenfeld, Raghuram and Garud, 1999]. The use of email or BBS allows a group to call on business expertise and to discuss whenever needed regardless of the location.

The rapid evolution of new communication technologies makes both high richness and high simultaneity available. Synchronous communication tools, such as Instant Messaging, function as a type of collaboration technology. Contrary to asynchronous technology (e.g., email or BBS), this new technology allows us a synchronous and interactive conversation like a face-to-face meeting.

<Table 1> Comparison of Communication Media

	Face-to-Face	Document	Telephone	Electronic mail
Accessibility/ Synchronicity	Synchronous with respect to time and place	Asynchronous with respect to time and place	Synchronous with respect to time; asynchronous with respect to place	Asynchronous with respect to time and place
Formality	Dependent upon communicators	Highly formal	Dependent upon communicators	Highly informal
Shared interpretive context	Facilitates creation of interpretive context			Facilitates communication within established interpretive context
Social context cues	Strong	Moderate	Moderate	Weak

주) Wiesenfeld, Raghuram and Garud, 1999.

2.2 Effectiveness of Group with Electronic Communication

Groups with electronic communication are considered to have several advantages compared to traditional face-to-face groups. A group that communicates and coordinates member activities using advanced communication technology has become an emergent organizational form or a new type of marketing communication channel. As members of electronic groups have less face-to-face interactions, communication technology takes the

major role for information exchange.

Among all, the use of synchronous communication technology has become a focus of interest in activities for a team-based project, customer management, in-house training, and internal collaborative work. Electronic communication can also provide several supportive functionalities for effective group relationships [Benbasat and Lim, 1993 ; DeSanctis and Monge, 1999 ; Hender, Dean, Rodgers and Nunamaker, 2002 ; Lurey and Raisinghani, 2001 ; Maznevski and Chudoba, 2000 ; Townsend, DeMarie and

Hendrickson, 1998].

However synchronous communication systems also have several limitations. The technology is not effective in conveying vague interpretive contexts and social context cues [Wiesenfeld, Raghuram and Garud, 1999]. Some problematic results from the use of collaboration systems in decision-making processes have also been reported for [Strauss and McGrath, 1994].

Although the level of member participation was better in computer-mediated group than in face-to-face meeting, computer-mediated groups had less total amount of communication, had difficulty achieving consensus, and required more time to draw a conclusion [Goldhaber, 1993 ; Volda, Newstetter and Mynatt, 2002 ; Walther, 1994]. Attempts to improve technological environment have been made to cure the problems without any notable achievements.

Participants in those groups mainly used text-based messages. Since the written message is the medium of communication, they reflect most of the group communication processes and outcomes. We believe that a language analysis of the messages will provide us with rich insight into the nature of communication in groups. This approach involves representing unique patterns of language at group decision-making processes. This will be done by categorizing language and by demonstrating. In order to do this, we shall borrow from related theory the framework of computer conferencing [Henri, 1992].

2.3 Group Communication and Language Analysis

Members of a decision-making group would want to have equal opportunity to speak and express their opinions, and want to see honest evaluation without using offensive and demeaning language [DeVito, 1992 ; Suler, 1997]. In many cases understanding the subtleties of the verbal code used in small groups is not very easy [Cragan and Wright, 1999]. Groups mediated by communication technology are not able to communicate non-verbal messages. Therefore, a close examination of language is necessary to improve effectiveness and efficiency of those groups.

Henri's framework [1992] was developed to analyze attendants of computer conferencing. It was reported that the framework was useful for understanding the communication processes and contents of computer-mediated conferencing messages. This model highlights five dimensions of communication process : participation, interaction, social, cognitive, and meta-cognitive dimensions. Henri presented operational definitions of the dimensions, and identified indicators to analyze expressions in a text (see <Table 2>).

Based on the language analysis approach we could characterize the following dimensions.

- Metacognitive statements are used for creating shared and interpretive context, building norms.
- Cognitive statements are used for communication within an established context and norms.

- Interactive and social statements support building context among members.

Flavell introduced the concept of 'metacognition' in 1976, in the context of developmental psychology and research on metamemory [Simons, 1996]. He defined metacognition as "one's knowledge concerning one's own cognitive processes and products or anything related to them. Metacognition refers further more to the active monitoring of these processes in relation to the cognitive objects or data on which they bear, usually in service of some concrete goal or objective" [Flavell, 1976]. To gain a better understanding of successful group decision making with synchronous communication text medium, metacognition seems to be important [Henri, 1992]. There is a high possibility for an effective group with online text-based communication medium to use meta-cognitive statements relatively extensively at the beginning of a meeting in order to creating shared con-

texts. Once a context is developed and shared, cognitive statements will be used to perform a work under the established context.

The proposed analysis of the cognitive dimension makes it possible to identify the skills linked to critical reasoning and then to evaluate the level of information processing applied by decision makers [Henri, 1992]. Since our interest lies in the communication process, it made sense to try to identify the elements within messages which would tell us something about the ways people think or learn.

The importance of the concept of interactivity in CMC made it imperative that we give it some in-depth analysis. Analysis of interactivity allows us to describe the actual structuring of chatting contents. It progresses on a basis either or interactive contributions. An analysis of interactivity will reveal where the process occurs. So, the analysis of interactivity can lead to an evaluation of the levels of collaboration at work among team members.

<Table 2> Framework for Communication Pattern Analysis

Dimension	Definition	Indicators
Metacognitive	Statement related to general knowledge and skills and showing awareness, self-control, and self-regulation of learning	"I understand ..." "I wonder ..."
Cognitive	Statement exhibiting knowledge and skills related to the learning process	Asking questions Making inferences Formulating hypotheses
Interactive	Chain of connected messages	"In response to Celine ..." "As we said earlier ..."
Social	Statement or part of statement not related to formal content of subject matter	Self-introduction Verbal support "I'm feeling great ..."

Many studies have offered in-depth analysis of the social dynamics of conferencing exchanges [Berger, Pezdek and Banks, 1987]. The results suggest the importance of this aspect of communication for participation, social cohesion within the group, and the feeling of belonging. The frequency of socially oriented statements in online chatting which deal exclusively with the subject under study allows various interpretations which can be supported by other data. The frequency might indicate the level of communicator focus on the task, or the level of social cohesiveness established in the group.

2.4 Creativity in Management

The importance of the value created and supported by information and knowledge increases rapidly. Creativity or the enhancement of it, in this regard, has quickly become the focus of corporate attention. IS researchers also showed interests in the relationship between the use of IT and the ability to solve problems creatively [Elam and Mead, 1990]. In practice, groups with electronic medium are frequently formed to generate idea generation work and build knowledge.

In this research we used creativity as the major criteria of outcome quality. The idea generation task such as the one we used in the research has a close relationship with the level of creativity [Hender, Dean, Rodgers and Numamaker, 2002 ; McGrath, 1984 ; Parent, Gallupe, Salisbury and Handelman, 2000]. For example, once a problem is formulated, potential criteria

and alternatives must be identified. Idea generation is an ideal approach. Creative ideas generally lead to better solutions. In brainstorming, there are some specific creativity measures : the quantitative (number of ideas) and qualitative (quality of ideas) components [Shirani, Tafti and Affisco, 1999]. Both can be positively impacted by the use of a group support system [Masseti, 1996 ; Wierenga and Van Bruggen, 1998].

Creativity - commonly defined as the ability to make a novel and appropriate outcome - is a complex composite construct [Amabile, 1983 ; Urban, 1991]. The two most frequently used criteria for creativity measurement are novelty and appropriateness. Urban's model [1991] of creativity especially emphasizes the importance of interaction among problem, process, product, personality, and environment.

According to Lubart [1994] creativity is also composed of several sub-components as follows :

- Fluency : number of ideas or images produced
- Flexibility : number of categories where the outcomes belong
- Originality : infrequency and unusualness of the response
- Elaborateness : depth of contemplation

We will specifically focus on the level of creativity outcome, as reflected in the outcome of the task. Other views and measures sometimes focus more on the process of thinking such as divergent data gathering, brainstorming and convergent idea integration.

3. Research Strategy

In this study, ten artificially designed groups were examined and their communication patterns were compared. Log data were collected throughout experimental online decision-making process. To explore the internal processes, text protocols were qualitatively analyzed using content analysis method.

3.1 Research Questions

The main purpose of this study is to explore the dynamics within the managerial decision-making process, where synchronous communication technology is used as a medium. This research will focus on the identification of communication patterns used by group members. We had the following research questions in mind :

- How do group members discuss for their decision-making by using synchronous text communication medium?

3.2 Design of Experiment

3.2.1 Experimental Task and Treatment

Idea generation exercise is used as an experimental task. Idea generation work is an unstructured task with high level of ambiguity [McGrath, 1984]. Members of each group would need to communicate extensively to reduce uncertainty and resolve ambiguity.

We furnished experimental subjects with Instant Messaging tool (MSN Messenger 3.0) as a synchronous communication system. Instant

Messenger supports one-to-one or group chatting, file transfer, and voice communication. We used only text-based group chatting in the experiment.

3.2.2 Experimental Procedure

Through a pretest with five graduate students majoring MIS, the design of the instructions and materials were reviewed, adjusted, and outcome measures were calibrated.

Forty-six university students taking DSS (decision support systems) course from the school of business administration served as experimental subjects. Those students who could understand the context of the experiment were believed to meet our objective. They were motivated to participate in the experiment as part of class requirements.

The subjects are positioned randomly in two computer laboratories and a specific time limit (25 minutes) was set. A post-experimental questionnaire was also administered to check the level of satisfaction with the decision-making process and outcome.

3.3 Data Analysis Method : Content Analysis

Content analysis of texts helps us make valid inferences on the sender of message, the message itself, or the audience of the message [Weber, 1990]. It is also useful in analyzing authorship, document pattern, and shifts in opinion [Riffe, Lacy and Fico, 1998]. The central idea of content analysis is that large number of words or sentences of a text are classified into small number of categories [Weber, 1990].

The process of content analysis is composed

of six steps [Kidder and Judd 1986] : (1) The phenomenon to be coded must be chosen. (2) The media from which the observations are to be made must be selected. (3) The coding categories are derived. (4) The sampling strategy is determined. (5) The evaluators are trained. (6) The data is analyzed

We applied “pattern coding” method to chatting scripts of each group [Miles and Huberman, 1994]. Two post-graduate MS/MIS students served as coders. We first asked two coders to divide the group chatting scripts into individual paragraphs. A paragraph was defined as a single thought or topic or quotes one speaker’s continuous words. We then asked them to classify these paragraphs into conceptual categories.

The paragraphs are classified into CG (cognition), MC (meta-cognition), IT (interaction), SC (social), and CN-## (continued on the line no. ##) categories using “Data Sheet for Content Analysis” and “Data Accounting Sheet” as appeared in <Figure 2> and <Figure 3>. After checking and improving the reliability of coding procedure, the major coding work was completed.¹⁾

After each group was reviewed individually, a cross-group analysis was done to further explore the similarities and differences across groups. To conduct the cross case analysis the information from the “Data Sheet” and the “Data Accounting Sheet” were reorganized to fit into “Cross-Case Meta-Matrix [Miles and

Huberman, 1994]”, which is a master chart assembling descriptive data from several cases in a standard format.

Data Sheet			Page.##
Group Name :			
No.	Member Name	Contents	Category Code

<Figure 2> Data Sheet for Content Analysis

Data Accounting Sheet			
Group Name :			
Member Name	Member of Cognition Statements	Member of Meta-Cognition Statements	Member of Interaction Statements

<Figure 3> Data Accounting Sheet

4. Results

4.1 Validity and Reliability

Naturalness in research may increase the external and construct validity of qualitative analysis [Kidder and Judd, 1986]. We made good use of students taking DSS courses. They could understand the context of the experiment and were motivated to participate in the experiment as part of class requirements. Use of multiple sources may also raise the external and construct validity [Yin, 1994]. We selected ten groups.

1) For example, if someone said, ‘First, don’t break when someone speaks’, coders recorded “MC” in category code field of the data sheet.

Coders' training manuals included conventions for scripts as well as conventions for utterance units, along with an analysis of decision-making interaction and a dictionary of the code categories. Reliability of content analysis is assessed based on agreements among two or more coders on their ratings of the same events or objects [Kidder and Judd, 1986]. In the first round of coding of arbitrarily selected scripts, the resulting inter-coder agreement was 0.623. The disagreements were discussed and guidelines were adjusted. In the third round inter-coder agreement increased to 0.814, higher than 0.7 acceptable level of inter-coder agreement [Riffe, Lacy and Fico, 1998].

The participants were also asked to submit results of group work for creativity analysis. Creative Product Test measures were developed by authors by adjusting existing instruments used for measuring the level of general creativity. Two coders evaluated the level of creativity of the outcomes based on a set of pre-defined rules (see Appendix 1). The inter-rater reliability was 0.745. The scores for creative fluency, flexibility, originality, and elaborateness were also computed. We classified groups into high creativity and low creativity groups based on the mean value (overall mean = 3.2) in <Table 3>. The highest scored group was group 3, and the lowest was group 5.

<Table 3> Comparison of Creative Decision Outcomes with respect to Group

No	Group Name	Fluency	Flexibility	Originality	Elaborateness	Avg.	Level of Creativity
1	Canz.com	4	1	4	4	3.3	High
2	eBrain	4	5	1	2	3.0	Low
3	FlowerDeer	5	5	2	5	4.3	High
4	Jolly Roger	3	3	2	4	3.0	Low
5	JSM	2	2	2	4	2.5	Low
6	LK Family	2	2	3	4	2.8	Low
7	Mixer	5	3	1	2	2.8	Low
8	Solution No.5	3	2	5	5	3.8	High
9	Speed.com	5	4	2	3	3.5	High
10	Strawberry Brother	4	5	2	3	3.5	High
						3.2	-

4.2 Analysis of Protocol

<Table 4> briefly summarizes the patterns of communication used by the ten groups. Participative factor is the sum of cognitive, meta-

cognitive, interactive, and social statements. There is a correlation between participative factor and other statements. Nevertheless, we will only make observation of distribution and previous researches support this logic. The fol-

lowings are some of the major findings :

- Nine out of the ten groups relied heavily on cognitive statements than on other statements. The result implies that cognitive statements are of great importance for idea generation works.
- Although group 4 used cognitive statements heavily (74.2%), the level of their creativity was not high. It means that the outcome creativity is not proportional to the use of cognitive statements
- Groups 1, 2, and 3 show a relatively evenly distributed balance of different communication activities (their standard deviations are less than the average deviation of 19.38). These groups, however, did not have any clear connection with the level of creativity and/or that of participation.
- Generally, the level of creativity is not consistent with the level of satisfaction.

<Table 4> Comparison of Communication Pattern with respect to Group : Summary

No	Group Name	Cognitive	Meta-Cognitive	Interactive	Social	Total : Participative	Standard Deviation	Level of Creativity
1	Canz.com	37 (20.6)	62 (34.4)	59 (32.8)	22 (12.2)	180 (100)	10.53	High
2	eBrain	125 (43.1)	29 (10.0)	90 (31.0)	46 (15.9)	290 (100)	14.97	Low
3	Flower Deer	180 (46.4)	60 (15.5)	129 (33.2)	19 (4.9)	388 (100)	18.45	High
4	Jolly Roger	98 (74.2)	10 (7.6)	17 (12.9)	7 (5.3)	132 (100)	32.98	Low
5	JSM	128 (61.0)	39 (18.6)	37 (17.6)	6 (2.9)	210 (100)	25.02	Low
6	LK Family	112 (58.6)	29 (15.2)	40 (20.9)	10 (5.2)	191 (100)	23.35	Low
7	Mixer	182 (61.5)	31 (10.5)	61 (20.6)	22 (7.4)	296 (100)	24.97	Low
8	Solution No.5	111 (52.1)	36 (16.9)	61 (28.6)	5 (2.3)	213 (100)	21.03	High
9	Speed.com	98 (56.3)	35 (20.1)	34 (19.5)	7 (4.0)	174 (100)	22.17	High
10	Strawberry Brother	170 (53.6)	39 (12.3)	79 (24.9)	29 (9.1)	317 (100)	20.27	High
Total		1241 (51.9)	372 (15.5)	607 (25.4)	173 (7.2)	2393 (100)	19.38	-

주) () : Percentage.

According to some previous research in the field of GSS (Group Support Systems), high level of participation among group members

has a tendency to lead a high level of performance [Bikson, 1996]. In electronic conference, it is used total number of statement as the level

of participation [Henri, 1992]. Some of the observation from this research shows a contradiction. For example, the best performing group (group 3) and worst performing group (group 5) both showed a high level of total communication representing high level of member participation.

Hirokawa [1983] found major difference between effective and ineffective groups in the communicative behaviors and interaction patterns : effective groups were much more attentive to the procedures used to solve the problem. Specifically, one member would make a statement of procedural direction (such as metacognitive statement), and the others would adopt this direction (such as interactive statement). An effective group also must maintain a balance between independent thinking and structured, coordinated work [Poole and Jackson, 1993]. Too much independence shatters group cohesion and may encourage members to focus on individual needs. Too much synchronous, structured work is likely to regiment group thinking and stifle creative ideas. Therefore, creative idea may come from communication processes reflected in the use of interactive statements.

4.3 State-Transition Analysis

Classification of protocols shows us overall distribution and patterns of communication in aggregation. We think analyzing the temporal sequence of protocols can reveal important findings as for the communication behavior of group members. We summarized the temporal

aspects in a simple table. Vertical axis of <Table 5> is the protocols that come right before the protocols residing in the horizontal axis. We performed a close investigation about state-transition of the communication processes. For example, the probability that a cognitive statement is followed by another cognitive statement is 57.3% on the whole.

<Table 5> State-Transition of Protocol : Total Groups

From \ To	C	M	I	S	Total
C	215 (57.3)	39 (13.1)	74 (24.7)	22 (5.0)	350 (100)
M	37 (45.3)	12 (23.3)	17 (23.5)	3 (8.0)	69 (100)
I	75 (50.7)	13 (15.9)	43 (30.2)	8 (3.2)	139 (100)
S	22 (35.1)	6 (27.6)	5 (12.8)	17 (24.5)	50 (100)

주) C : Cognitive, M : Metacognitive, I : Interactive, S : Social, () : Percentage.

We further made two tables one for the groups with high performance and another for low performance. <Tables 6> and <Table 7> help us to compare the communication patterns between the two groups.

<Table 6> State-Transition of Protocol : High Creative Groups

From \ To	C	M	I	S	Total
C	94 (49.4)	22 (16.4)	42 (30.7)	10 (3.5)	168 (100)
M	20 (38.0)	8 (28.7)	10 (26.8)	1 (6.5)	39 (100)
I	42 (45.1)	6 (19.5)	24 (32.8)	6 (2.6)	78 (100)
S	11 (41.7)	3 (26.2)	2 (7.2)	12 (24.9)	28 (100)

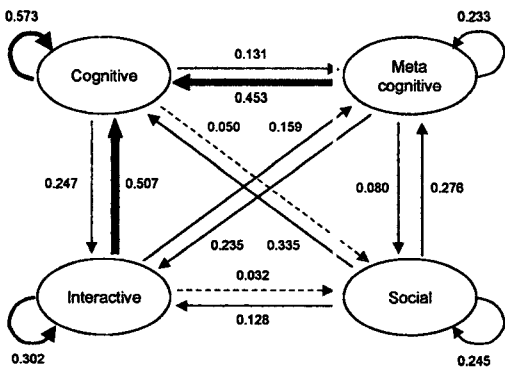
주) C : Cognitive, M : Metacognitive, I : Interactive, S : Social, () : Percentage

<Table 7> State-Transition of Protocol :
Low Creative Groups

To From	C	M	I	S	Total
C	121 (65.1)	17 (9.8)	32 (18.6)	12 (6.5)	182 (100)
M	17 (52.5)	4 (17.9)	7 (20.1)	2 (9.5)	30 (100)
I	33 (56.4)	7 (12.3)	19 (27.7)	2 (3.7)	61 (100)
S	11 (28.5)	3 (29.0)	3 (18.4)	5 (24.2)	22 (100)

주) C : Cognitive, M : Metacognitive, I : Interactive,
S : Social, () : Percentage

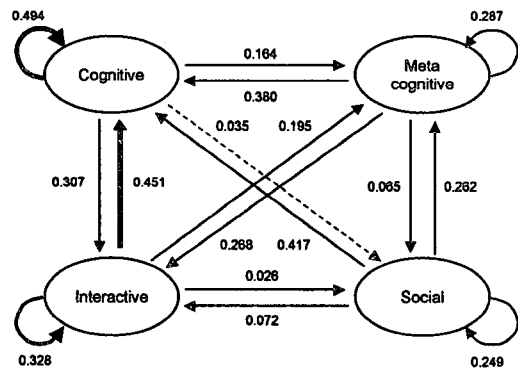
To visualize the results transition diagrams were also drawn (see <Figure 4>, <Figure 5>, and <Figure 6>). Overall, there is a tendency that cognitive statements directly follow other three types of statements in <Figure 4>. We guess that idea generation work is closely related to creative work.



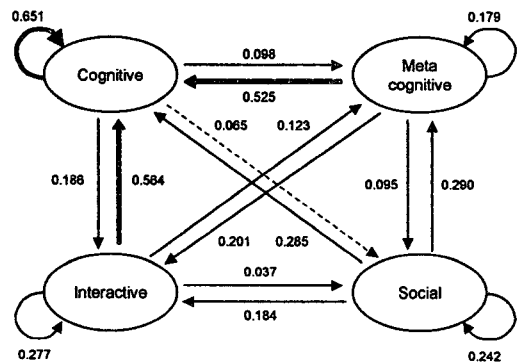
(Figure 4) State-Transition Diagram of Protocol :
Total Groups

The convergence pattern of the high performance groups is quite different from that of the low performance groups. From the diagrams on high-performing and low-performing groups (see <Figures 5> and <Figure 6>), one

can observe the importance of the mixed use of different mental strategies. Groups having diverse types of statements tend to achieve high performance regardless of the total amount of statements. Generation of creative idea is expected to require an appropriate level of control (represented by meta-cognitive statements) and proper responses (interactive statement) to a thought or a new idea (cognitive statement). That is, to get a creative idea, the sequence balance of protocol types is important to groups with synchronous text communication medium than face-to-face groups.



<Figure 5> State-Transition Diagram of Protocol :
High Creative Groups



<Figure 6> State-Transition Diagram of Protocol :
Low Creative Groups

4.4 Usage Pattern Analysis

We chose to further analyze the difference between the high and low performance groups. We specifically analyzed the best performing group [Group 3, creativity score = 4.3] and the worst performing group [Group 5, creativity score = 2.5].

From the analysis, we found that members of the high performance group concentrated quickly on the discussion and responded timely and relevantly to other member's toss of idea (see <Appendix 2>). However, members of the low performing group were lacking focus (see Appendix 3). This group placed more weight on cognitive communication. They produced and dealt with various ideas at the same time, but couldn't manage all the ideas well. Electronic group focusing too much on meta-cognitive communication may obtain a high level of efficiency but lack originality. For below example (see <Figure 7>), members of the best performance group (group 3) concentrated their attention on their task and responded quickly and properly. However, members of the worst

performance group (group 5) didn't focus on their communication.

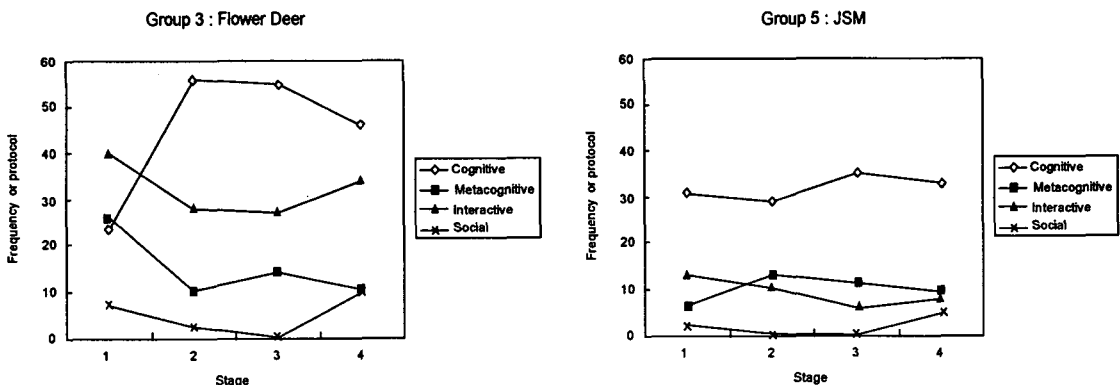
Example : Group 3 (the best performance group)

- A : "It's also important to consider business possibility as creativity"
- B : "Ah..."
- C : "We also have to build factories"
- D : "Right"
- D : "Sure"
- C : "Let's think about to minimize additional cost"
- B : "Proposal people suggested"
- D : "We have to make expensive products to make money"

Example : Group 5 (the worst performance group)

- A : "How about..."
- A : "Using for recreation"
- B : "Maybe, does the cost will be needed over a thousand millions"
- A : "For example",
- B : "Rifle range?"
- C : "What is a road sign?"
- A : "Survival game filed, etc"
- D : "What about using construction materials?"
- C : "Does it have durability of disused tires ..."
- B : "Not for road sign"
- C : "Can we use it for construction material?"
- B : "Crash prevention"

<Figure 7> Samples of Group Decision Making



<Figure 8> Frequency of Protocol by Stage

Example : Group 3 (the best performance group)
 A : "First, don't break when someone speaks"
 B : "Yep~"
 A : "Second, insert "/" when someone concludes one's speech"
 C : "OK//"

<Figure 9> Samples of the early stage of discussion

From the analysis of the cumulative graph of protocols (see <Figure 8>), we could observe that the high performance group relied much on meta-cognitive and interactive statements during the early stage of the discussion (see <Figure 9>). Through the extensive use of meta-cognitive and interactive statements, discussion rules were determined quickly from the beginning for effective decision-making. But, overall the worst group used a relatively stable mix of protocol types. For both of the two groups social protocols were used only in the initial and the last stages and hardly used in the mean time.

4.5 Findings from Analysis on the Communication Protocol of Groups

Based on 'Protocol Pattern Analysis', 'State-Transition Analysis', and 'Usage Pattern Analysis', we propose that:

Proposition 1 : *For group with synchronous text communication medium, it is important to manage interactive responses and control on the new idea for the more creative idea.*

Face-to-face interaction and text-based synchronous interaction have about the same

decision making schema and protocol usage pattern on the dyad communication environment [Condon and Čech, 1996]. But, the multi-point communication environment is different from the dyad. In multi-point synchronous text communication environment, we could find that multiple decision-making processes happen simultaneously and are mixed frequently (see <Appendix 3>). In <Appendix 3>, conversation types show another kind of storytelling. On their decision-making process, various conversation topics are in progress at the same time. The expression, which wandered off the subject, occurred many times in their conversation. One of the most common and accepted tenets in the literature on cooperation is that "the larger the group, the less it will further its common interest" [Olson, 1965]. Researchers have identified a number of reasons why cooperation may be more difficult as group size increases [Dawes, 1980]. The larger the group, the more difficult it may be to affect others' outcomes by one's own actions. Thus, an individual may be discouraged from cooperating if his or her actions do not affect others in a noticeable way. How is proper cooperation possible? The pessimistic conclusion of many researchers in that coercion by a strong external authority is necessary in order to insure cooperation [Hardin, 1968 ; 1974]. But other researchers have argued that an external authority may not be necessary and may even make the situation worse [Fox, 1985]. So, groups with synchronous text medium need to manage themselves.

Proposition 2 : *High creative group with synchronous text communication medium depend much on meta-cognitive and interactive protocol for its making discussion rules in the early stage.*

Any successful groups or community will have a set of rules whether they are implicit or explicit that govern how common resources should be used and who is responsible for producing and maintaining collective goods [Kollock and Smith, 1996]. However, it is important that the rules are tailored to the specific needs and circumstances of the group. That is, for successful group decision making, group members must mainly use 'meta-cognitive' and 'interactive' protocols in 'orientation' stage, 'cognitive' statement in 'suggestion' stage, and 'interactive' or 'meta-cognitive' statement in 'consensus' stage.

5. Conclusions

5.1 Research Results

In our study we analyzed communication behavior of group members with synchronous text communication medium, and their relationship to group performance. There are ample opportunities to analyze electronic activities using various qualitative analyses, and such research has high potential to produce good practical implications. In addition, more structured research should also be performed to confirm the conclusions and obtain calibrated generalizability.

We find twofacts from these analyses as the following.

First, the production of creative outcome may

depend on the process or sequence of discussion among group members with synchronous text communication medium. That is, proper interactive responses(e.g., interactive protocol) and appropriate control (e.g., meta-cognitive protocol) of the discussion process are essential to obtain a high level of performance. Groups in this study followed a very similar decision making process which closely parallels the recommended decision making process for groups. Condon [1986] outlined a group decision making process. The decision making process is

1. Goal (Orientation)
2. Input (Suggestion)
3. Evaluation (Agreement)
4. Criteria (Consensus)
5. Output (Writing)
6. Nextgoal

Most of groups followed these steps. Good performance groups performed effectively their decision-making with interactive control and response. But, bad performance groups performed difficultly their job with improper control and response.

Second, it is import to make discuss rules based on meta-cognitive and interactive protocols in the early stage. Explicit rules relating to internal group processes as well as communication medium use are even more important to electronic groups than face-to-face groups [Duarte and Snyder, 1999 ; Haywood, 1998 ; Lipnack and Stamps, 1997]. For good performance groups, having explicit rules was a critical element of the group's interaction. Organizations have no norms to govern behavior and processes in virtual teams or virtual commun-

ities [Kiesler and Sproull, 1992], however, the groups in this study quickly developed similar rules or protocols to guide the way they interacted during their chats.

5.2 Implications

This paper has two specific contributions to the body of our knowledge on group communication and its decision making.

First, this study shows the new understandings of synchronous text communication medium. According to traditional researchers, they adopted text medium as lean. But, due to a perception of the limitations imposed by the medium, group members can adapt their behavior in order to overcome such limitation, producing outcomes whose quality is perceived as higher by them than in richer media [Kock, 1998 ; Panteli, 2002 ; Wijayanayake and Higa, 1999]. Therefore, even though chatting is often presented as a lean medium, the way text-based messages are constructed may convey the social cues of different style that are traditionally used to determine status differences in organizations. The study argues that chatting is a richer communication medium than is reflected in the scale of information richness theory.

Second, this research presents insights about communication patterns in group with electronic communication medium. Since technology profoundly affects the nature of group work [Suh, 1999], it is inappropriate to generalize the outcomes from face-to-face work groups to the electronic environment. Moreover, despite the persistently lower social presence of leaner media, synchronous groups performed

better than their face-to-face groups [Burke and Chidambaram, 1999].

Third, this study is unique in that it is a rare attempt to linguistically investigate the interaction of group communication. With the premise that certain communication activities among members in a group can help to improve creative outcomes, we examined the process of communication among group participants. A qualitative analysis method was employed to analyze the communication patterns. This language approach has led to increased interest by organization theorists in such issues as the intimate relationship between language and organization [Heracleous and Barrett, 2001].

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〈Appendix 1〉 Creativity test scoreboard

Group No.	Group Name	Number of Ideas	Number of Categories where the outcomes belong	Number of Overlapping Subject with Other Teams			Depth of contemplation
				Over 3	1-2	0	

Note) After testing, we transformed these numbers to 5-scale.

〈Appendix 2〉 Sample of discourse protocol of Group 3 (best performance group)

182	J. Lee	It's not related to engine part, but...	M
183	H. Kim	Everybody is serious	S
184	Y. Rhim	Do you know anything about that?	C
185	Y. Jeon	A packing for a hole	C
186	D. Jeon	Gosh ...	M
187	Y. Rhim	Ha-ha	S
188	Y. Jeon	a fuel pipe line	C
189	Y. Jeon	a pipe line for air filter	188
190	H. Kim	but, can we recycle rubber by melting?	C
191	Y. Jeon	fan belt	188
192	Y. Rhim	first of all, we already recycle disused tires ...	I
193	Y. Rhim	It sounds better to use for fan belt.	192
194	Y. Rhim	:	192
195	D. Jeon	Isn't it difficult using recycled rubber for fan belt? It is an important part	C
196	J. Lee	Hmm...	I
197	Y. Rhim	But, the quality is different	C
198	Y. Jeon	And, an insulating material of spark plug	C
199	Y. Rhim	Even though, it's old	197
200	J. Lee	If like that ...	I
201	H. Kim	Fan belt in process	C
202	D. Jeon	It's right	I
203	H. Kim	Hmm ...	I
204	Y. Jeon	Disused tire is used by attaching another tire onto old one.	C
205	H. Kim	It's a good idea, but ...	I
206	J. Lee	It's also a good idea ...	I
207	D. Jeon	Creative ...	M
208	H. Kim	I wonder it has business possibility or not	C
209	Y. Jeon	Creative ...	M
210	Y. Rhim	But, to recycle disused tires again..	C
211	Y. Rhim	It needs additional cost	210
212	H. Kim	It's also important to consider business possibility as creativity	C
213	J. Lee	Ah ...	I
214	Y. Rhim	We also have to build factories	C
215	Y. Jeon	Right	I
216	D. Jeon	Sure	I
217	Y. Rhim	Let's think about to minimize additional cost	M
218	J. Lee	Proposal people suggested	M
219	Y. Jeon	We have to make expensive products to make money	C
220	J. Lee	Fan belt, and ...	218
221	J. Lee	Fan belt in process	218
222	Y. Jeon	Let's do business diversity	C
223	Y. Jeon	let's also make tire	222
224	Y. Jeon	:)	222

(Appendix 3) Sample of discourse protocol of Group 5 (worst performance group)

108	K. Lee	Disused tires are not old as you think	C
109	Y. Woo	What about this?	C
110	K. Lee	It's better than that	C
111	K. Lee	What..?	110
112	Y. Woo	in apartments	C
113	K. Lee	For landscape...?	C
114	Y. Woo	When to make playgrounds	112
115	K. Lee	It is same idea as mine	I
116	Y. Woo	Using to make ride things in playgrounds	112
117	D. Kim	But, that market size is small.	C
118	H. Kim	It can be used another way if the tiers are painted	107
119	Y. Woo	It is good and safe.	112
120	K. Lee	But...too general.	C
121	Y. Woo	It's already being used as we said, but..	C
122	Y. Woo	I think there is demand for that	121
123	K. Lee	creativity	M
124	Y. Woo	kindergarten, etc.	121
125	Y. Woo	Hmm..	C
126	H. Kim	If like that,	C
127	D. Kim	We could make money if we knew people in local self-governing body.	C
128	K. Lee	road signs...?	I
129	K. Lee	What is that?	129
130	Y. Woo	How about...	125
131	Y. Woo	Using for recreation	125
132	D. Kim	Maybe. does the cost will be needed over a thousand millions	C
133	Y. Woo	For example,	125
134	Y. Woo	Rifle range?	125
135	K. Lee	What is a road sign..	I
136	Y. Woo	Survival game filed, etc	125
137	H. Kim	What about using construction materials?	126
138	K. Lee	Does it have durability of disused tires...	C
139	D. Kim	Not for road sign	C
140	K. Lee	Can we use it for construction material?	138
141	D. Kim	Crash prevention	139
142	K. Lee	Ah...crash prevention	I
143	K. Lee	Is there other way to help the country?	C
144	Y. Woo	Well	C
145	Y. Woo	So	144
146	Y. Woo	Vinyl houses	144
147	K. Lee	It's better for the country that the city	M
148	Y. Woo	What about for heating	C
149	H. Kim	If we put styrene foams into tire, it can be used for a cattle shed	C
150	D. Kim	Anyway, disagree for burning the tires	C
151	Y. Woo	For heating	C
152	Y. Woo	Right	151
153	K. Lee	Hmm...	I
154	D. Kim	To make houses using disused tires?	C
155	Y. Woo	But, the size is too small	C
156	K. Lee	It still remains in my mind to make a trench work using disused tire	C
157	H. Kim	it doesn't mixing well	C

저자소개



박 상 혁

한국외국어대학교 경영정보학과 학사, 한국외국어대학교 경영학석사(경영정보학), 한양대학교 경영학박사(경영정보학)를 취득하였다. 석사 취득 후

5년간 LG-EDS Systems(현 LG-CNS)에서 정보시스템 개발업무를 담당하기도 하였다. 현재 진주산업대학교 전자상거래학과 전임강사로 재직 중이며 주요 관심분야는 전자상거래, 정보기술전략, 지식경영 등이다.



조 남 재

서울대학교 산업공학과를 졸업하고, 한국과학기술원에서 경영과학 석사, 그리고 (미)보스턴대학교 경영정보학과에서 경영학 박사 학위를 각각 취득

하였다. 현재 한양대학교 경영대학 부교수로 재직하고 있으며 주요 관심분야는 전자상거래 및 e-business 전략, 정보시스템 전략, 지식경영, 소프트웨어 산업분석 분야이다.