Factors Affecting a Person to be Perceived as a Leader in Computer-Mediated Communication Virtual Team
ปัจจัยที่ส่งผลกระทบต่อการรับรู้ผู้นำในทีมเสมือนแบบที่ใช้คอมพิวเตอร์เป็นสื่อกลางในการสื่อสาร

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เมื่อพิจารณาถึงการวิจัยเกี่ยวกับภาวะผู้นำในทีมเสมือน พบว่ามีงานวิจัยจำนวนไม่มากที่ทำการศึกษาเกี่ยวกับการรับรู้ภาวะผู้นำในทีมเสมือนแบบที่ใช้คอมพิวเตอร์เป็นสื่อกลางในการสื่อสารว่าเกิดขึ้นได้อย่างไร งานวิจัยนี้จึงมีวัตถุประสงค์เพื่อศึกษาถึงปัจจัยที่ส่งผลกระทบต่อการรับรู้ผู้นำในทีมเสมือน โดยใช้กระบวนการวิเคราะห์เนื้อหาเพื่อจำแนกกลุ่มหน้าที่ตามลักษณะภาวะผู้นำที่ได้จากแบบจำลองแนวคิดภาวะผู้นำตามบทบาทหน้าที่

ผลจากการศึกษาสรุปได้ว่า สมาชิกในทีมเสมือนแบบที่ใช้คอมพิวเตอร์เป็นสื่อกลางในการสื่อสารสามารถรับรู้ผู้นำได้มากกว่าหนึ่งคน โดยสมาชิกในทีมจะรับรู้ผู้นำจากพฤติกรรมที่เกี่ยวข้องกับการทำงาน ในขณะที่พฤติกรรมทางสังคมไม่ก่อให้เกิดการรับรู้ผู้นำอย่างมีนัยสำคัญ โดยปัจจัยที่ส่งผลกระทบต่อการรับรู้ผู้นำได้แก่ “การนำเสนอแนวความคิดใหม่” “การจัดการลำดับขั้นตอนในการทำงาน” และ “การแบ่งหน้าที่ในการทำงาน”

คำสำคัญ : ภาวะผู้นำ; ปัจจัยที่ส่งผลกระทบต่อการรับรู้ผู้นำ; ทีมเสมือน; การติดต่อสื่อสารโดยใช้คอมพิวเตอร์เป็นสื่อกลาง

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Abstract

While considered the research about leadership in virtual team, little research has examined how leadership is perceived in Computer-Mediated Communication (CMC) team. The goal of this study was to find out factors affecting a person to be perceived as a leader using a content analysis derived from functional leadership model to distinguish type of task role.

The results of the study have shown that CMC virtual team may identify more than one leader. When identifying emerging leader, team members perceived leaders by task-related behaviors while social behaviors were not significantly perceived. The factors affecting a person to be perceived as a leader in CMC Virtual Team were “Idea Generation”, “Creating Process”, and “Dividing Labor”.

Keywords : Leadership; Factors Affecting Perceived Leader; Virtual Team; Computer-Mediated Communication

1. Introduction

As a result of globalization, innovation of technology, and inter-organizational alliances, the Internet usage has been increased from 16 millions (0.4% of world population) in 1995 to 1,734 millions (25.6% of world population) in 2009 ("Internet Growth Statistics," 2009). Modern organization life becomes more dispersed in time and space, so its members tend to rely on information technology and electronic communication to accomplish work. The fast-forming virtual teams have become more important, because they accomplished many important purposes such as diverse specialized knowledge from the people who work interdependently together to accomplish specific organization tasks (Grant, 1996).

Jessica Lipnack and Jeffrey Stamps (2000, p. 18) defined a virtual team as a group of people who work interdependently with a shared purpose across space, time, and organization boundaries using technology. Virtual teams allow organizations to access the most qualified individuals for a particular job regardless of their location. Many important organization's tasks cannot be accomplished within the formal organization's boundaries. Virtual teams allow the organizations to bring expertise that scattered throughout the organization, or even outside the organization, together at precise time and place it is needed.

Virtual teams are able to respond effectively to the environment that becomes more complex, uncertain, and faster moving. They enable organizations to respond to increased competition effectively and also provide opportunity to individuals to work from home or even on the road. There are many examples of such teams and groups in organization. In many industries, cross-functional project teams are usually take part in information system development and product design. A group meeting of manufacturing workers is set up to identify and solve problem or improve work processes. Consulting specialists are frequently called together to analyze and recommend solutions to the problems in organization. Firm may join personnel with the external specialists on short-term projects or develop a third party to handle longer-term projects.

Leadership in virtual team is an interesting subject to be studied because virtual teams are becoming an important part of adaptive capability in modern organizations and one of the factors that make them more or less effective is team leadership (Bowers & Seashore, 1966; Kayworth & Leidner, 2001). The research on the nature of leadership in virtual team has not been much studied (Avolio, Kahai, & Dodge, 2000; Bell & Kozlowski, 2002; Hooijberg, Hunt, & Dodge, 1997; Zigurs, 2003), even though the leadership remains one of the most studied topics in organization and management research and the studies on technology mediated in virtual teams are also widespread (Kahai, Fjermestad, Zhang, & Avolio, 2007).

The goal of the study was to find out the factors that affect a person to be perceived as a leader in Computer-Mediated Communication (CMC) Virtual Teams without leaders assigned. The

study was designed to address the research question, "What factors affect a team member to be perceived as a leader in CMC Virtual Team?"

This study is important today because (a) team leadership is a significant factor of working as a team (Bowers & Seashore, 1966; Kayworth & Leidner, 2001) and (b) the globalization and the innovation of technology make the virtual teams become the significant vehicles for the modern organizations.

2. Literature Review

The theoretical foundations of this research lie within three streams of literature, which are leadership, virtual teams, and leaderships in virtual teams. Relevant literature is reviewed in separate sections below.

2.1 Leadership

Early research on leadership has been focused on studying people who were great leaders (the "great man") that usually describe that leaders are exceptional people, having inborn capabilities, and destined to rise to leadership when needed. Subsequently, the research on leadership was based on the psychological. Similar in some ways to "Great Man" theory, trait theory assumed that leaders are born, and not made. Good leaders are people who inherit certain traits that make them suited to leadership (Stogdill, 1974).

Behavioral theories of leadership do not seek inborn capabilities, but concentrate on what leaders actually do rather than their qualities. The managerial grid model originally identified five different leadership styles based on combinations between concern for people and concern for production (Blake & Mouton, 1964). Situational leadership looks at leadership as specific to the situation in which it is applied. The most successful leaders are able to adapt their leadership style, based on the task behavior and relationship behavior, to the level of maturity levels of the followers. It also suggested that the different leadership styles are required at the different levels of management in the same organization (Hersey & Blanchard, 1988). Similar to situational leadership, contingency theory suggested that there is no single way that is always right. According to Fiedler (1964, 1978), the leadership styles are defined by three environmental factors: (a) Leader-member relation; (b) Task structure; (c) Leader position power.

On the other hand, functional leadership model offers a different view of leadership. Functional leadership model is worth to study in virtual environment because it focuses on how leadership occurs rather than who has been assigned a leader role. This model concentrates on the communication behaviors of any team members that lead the group to achieve its goal. It suggested that the leader should observe which functions did not perform adequately to make them accomplished. According to functional leadership model, leadership functions were distributed. All team members can take part in leading the team. More than one team members may perform the same leadership behaviors at different times. These make the functional leadership

model some advantages. In many situations, team members are still making decisions while the appointed leader is not performed as the real leader. The functional leadership model focuses on how the decisions are being made when there is no single person acted as a leader (Hackman & Walton, 1986; Kozlowski, Gully, McHugh, Salas, & Cannon-Bowers, 1996).

In order to follow leadership behaviors effectively, task-related behaviors should be distinguished between two types of task roles, procedural and substantive. Procedural behaviors are those involved in developing and shaping of team processes (scheduling, dividing labor, creating processes, etc.) while substantive behaviors are those that actually managed team performance and accomplished the group's work (idea generation, evaluation, integration, etc.) (Hackman & Walton, 1986; Heckman & Misiolek, 2005; Kozlowski et al., 1996).

2.2 Virtual Teams

Study on the impact of information technology in organizations has investigated factors affecting the performance of individuals collaborating virtually for over twenty years (Bikson & Eveland, 1990). Recently, this stream of research has increasingly experimented with different type of work arrangements (Townsend, deMarie, & Hendrickson, 1998). Organizations will use virtual, or technology-mediated, teams to leverage knowledge and expertise existing in the organization regardless of the physical locations of team members. Thus, organizations are able to increase competitive ability and provide greater flexibility in completing organization tasks (Bell & Kozlowski, 2002).

Early research on virtual team has focused on comparing virtual to face-to-face teams on the specific outcomes such as decision and quality (Galegher & Kraut, 1994), task complexity and structure (Hollingshead, McGrath, & O'Conner, 1993), idea generation (Dennis, Valacich, Connolly, & Wynne, 1996), team/group size (Valacich, Dennis, & Connolly, 1994) and information flow and access (Bensabat & Lim, 1993; Sproull & Kiesler, 1991). However, the empirical research comparing virtual and face-to-face teams suggested that virtual team had a negative influence on group dynamics that was moderated by task complexity and technology.

Recently, research on virtual team has been focused on study team interaction such as knowledge-sharing (Majchrzak, Rice, King, Malhotra, & Ba, 2000) and trust-building (Jarvenpaa, Knoll, & Leidner, 1998; Jarvenpaa & Leidner, 1999). Leadership in virtual teams seems to be a major part of team success but there is very little knowledge about it. For example, the effective team leadership in virtual contexts depends on the development of trust, which impacts the ability of team to perform effectively (Jarvenpaa et al., 1998). Zigurs (2003) suggested that in virtual contexts, leadership roles that leaders were expected to do are not likely to be filled by a single individual, so we are likely to find role shifting among team members in virtual context.

Satisfaction level of virtual or Computer-Mediated Communication (CMC) team members was reported at lower level than face-to-face team (Straus, 1996; Warkentin, Sayeed, & Hightower, 1997). Moreover, in Baltes and colleagues' meta-analysis (2002), it reported that there was a decrease in team members' satisfaction in CMC team when groups were anonymous, discussion time was limited, and groups size became larger. However, satisfaction level of members in CMC team seem to be more satisfied when they performed brainstorming or idea generation tasks because computer-mediated allows all members to talk at the same time (Gallupe et al., 1992).

Study on satisfaction in virtual team suggested that satisfaction level had positive relationship with team performance (Sosik, Kahai, & Avolio, 1999). Besides, several studies suggested that whether a leader was elected, emerged, or appointed, team performance had positive relationship with the level of acceptance upon team leaders (Goldman & Fraas, 1965; Pavitt, 1998).

2.3 Leaderships in Virtual Teams

Few empirical research has focused on leadership in virtual teams (Avolio et al., 2000; Bell & Kozlowski, 2002; Cascio & Shurygailo, 2003; Kayworth & Leidner, 2001; Yoo & Alavi, 2004; Zaccaro & Bader, 2003; Zigurs, 2003), while others have noted that leadership seems to be a significant role that affects team process and task outcome (Jarvenpaa et al., 1998; Jarvenpaa & Leidner, 1999).

Four team leadership patterns were found and studied in previous research: leaderless teams (as perceived by team members), teams with a single elected leader, teams with a single appointed leader, and teams with multiple leaders in which leadership roles are distributed among different team members over time.

The research on behavioral leadership in virtual teams has shown that effective team leaders tended to present both social and task-related behaviors, adapting to the situation and showing the requisite behaviors as necessary (Jarvenpaa et al., 1998; Jarvenpaa & Leidner, 1999; Kayworth & Leidner, 2001; Yoo & Alavi, 2004). This is consistent with behaviorally-based theories of leadership. Social behaviors are those involved in social function such as greeting, apology, complement, and emotional express. Task-related behaviors are those involved in developing team processes or manage team performance, such as idea generation, dividing labor, creating processes, and integration.

Moreover, in Kayworth and Leidner (2001) and Yoo and Alavi (2004) studies, leaders tended to involve both social and task-related aspects, which support behavioral theory. However, the leaders were appointed in Kayworth and Leidner's study. There was no opportunity to observe whether these behaviors would have been distributed if no leaders assigned. On the other hand, in Yoo and Alavi's study, only task-related behaviors were significantly associated with being identified as an emerging leader, while leaders' behaviors tended to engage

in both social and task-related aspects. Therefore, task-related behaviors are associated with factors affecting a person to be perceived as a leader, while social behaviors were not absent from the communication.

Hypothesis 1: Leaders tend to engage in both social and task-related behaviors.

Hypothesis 2: Social behaviors are not associated with being perceived as a leader.

Several studies have studied about emerging leader in face-to-face contexts that may relevant to virtual contexts. These researchers were interested in differences in the behaviors of team leaders and other team members that one individual performed the leadership behaviors that the team required. The research suggested that team members that performed procedural behaviors were more likely to be judged as leaders. Team members that performed procedural behaviors were considered to be team leaders 79% of the time (Bales & Slater, 1955). Moreover, team members that presented procedural behaviors were more likely to be perceived and judged as leaders by team members (Baker, 1990; Ketrow, 1991).

Hypothesis 3: Team members perceive leaders from procedural behaviors more than substantive behaviors.

3. Methodology

To investigate the problem proposed in this research, the factors affecting a person to be perceived as a leader in Computer-Mediated Communication (CMC) Virtual Teams, the qualitative research was conducted.

In this section, the methods for selecting the participants, task and questionnaire manipulation, how to conduct the CMC Virtual Team experiment, and the analysis and interpretation of the results will be described.

3.1 Selection of Participants

The 2603629 Information Technology class, which is the class offered by Master of Science in Information Technology in Business Program of Chulalongkorn University in the first semester, was selected for the experiment. The class had 54 students. The participants were randomly assigned to 14 teams. There are 12 teams with 4 members which were used as the samples in this research and 2 teams with 3 members were excluded.

3.2 Task

In this research, each team was assigned to do the assignment (see Appendix A) for the length of a one period class (3 hours). The computers with networked were used as a tool for doing the class assignment. All activities during these 3 hours were recorded in log files. The participants used Windows Live× Messenger as a tool for online collaboration. Other tools such as word processing or Microsoft Office PowerPoint were allowed as well.

According to the interest in this research, examining the factors affecting a person to be perceived as a leader, it was necessary to ensure that there was cooperation between team members.

Therefore, the participants were informed that there was score given on the assignment according to quality of work and team contribution. The maximum score given on the assignment was 5. This score was taken part in grading of the Information Technology class. However, the scores assigned were not used to analyze these factors.

3.3 Questionnaire

Because profile and satisfaction of the participants and opinion about the team leader are valuable information in this research, it is important to ensure that this information was collected effectively.

In the profile part of the questionnaire, Question 1 to 8, the significant information that was collected is the proficiency in information technology and typing skill since they probably affected the leadership in CMC environment. Not only the skills, but also educational and working backgrounds were collected as well. In the satisfaction part of the questionnaire, Question 9 to 10, the process and outcome satisfaction were measured using Green and Taber's (1980) satisfaction scale. In addition, the opinions about the team leader were collected as well (Question 13 to 15).

To manipulation check the anonymity of the participants, the questions on which the participants indicated, the extent to which they could identify the other team members and could be identified by others, were also included to the questionnaire using 3-point scale (Question 11 to 12) (McLeod, Baron, Marti, & Yoon, 1997). The participants reported significantly low ability to identify the other team members (Sig. (2-tailed) < 0.001) and low belief that they could be identified by the others (Sig. (2-tailed) < 0.001).

Since the CMC Virtual Team was experimented under the Thai culture environment, some topics of the questionnaire were translated into Thai. To verify the translation quality, the back-translation (Brislin, 1970) was taken place to evaluate the equivalence between source and translation version of the questionnaire. Full details of questionnaire are shown in Appendix B.

3.4 Preparation

For the purpose of this research, the CMC Virtual Team experiment was conducted in the computer lab with approximately 60 computers at Faculty of Commerce and Accountancy, Chulalongkorn University. All computers were set up with network that could connect to the Internet as well. The software installed on each computer includes:

- Microsoft Windows XP Professional Service Pack 2
- Microsoft Office 2003
- Windows Live Messenger
- Internet Explorer

To ensure that the messages from the conversations among team members were entirely collected, Windows Live× Messenger "Automatically keep a history of conversations" option were enabled.

The task instruction and the assignment were prepared and randomly distributed to each computer. An e-mail account used for signing in to Windows Live× Messenger network were signed up and assigned individually. The e-mails of other team members were added to the contact list. The e-mails were also included in the task instruction.

Due to this research, the participants should not be acquainted. Therefore, the simulated work environment was an anonymous CMC; all of the participants did not allow to know each other.

3.5 Running the CMC Virtual Team Experiment

Once participants took seats in the computer lab, the researcher then explained the task, as shown in the paper copies handed to each participant. The participants then were instructed to begin their tasks.

After the workshop was finished, the participants were informed to fill in the questionnaire. Complete session procedures are shown in Table 1.

Table 1: Detailed Session Procedures

Procedure	Time
Introduction and preparation	10 minutes
Explain task	5 minutes
Perform task, preparing the presentation	150 minutes
Fill in questionnaire	15 minutes
Total	180 minutes

3.6 Qualitative Research on Leadership

Qualitative research has been proven valuable in many research topics: understanding relationship between leadership and change process (Brooks, 1996), how leaders manipulate symbols and meaning to achieve organizational goals (Dubin, 1979; Pfeffer, 1981), uncovering leadership aspects that were neglected by quantitative researchers (Sagie, Zaidman, Amichai-Hamburger, Te'eni, & Schwartz, 2002), understanding the contextual relevance for leader behavior (Spaulding, 1997), and enhancing understanding of the importance of language for leadership (Pondy, 1978).

Qualitative research allows researchers to be able to quickly explore new areas of leadership, such as e-leadership (Brown & Gioia, 2002), ethical leadership (Trevi?o, Brown, & Hartman, 2003), leadership in TQM (Waldman et al., 1998), and environmental leadership (Dyck, 1994; Feyerherm, 1994; Flannery & May, 1994).

Many advantages of qualitative research on leadership include enabling researchers to investigate processes and contextual factors effectively and understand some unexpected ideas through research processes (Alvesson, 1996; Bryman, Bresnen, Beardsworth, & Keil, 1988; Conger, 1998). Therefore, the qualitative research is suitable for researching on leadership related topic.

3.7 Data Analysis and Interpretation

The log files and questionnaires were analyzed to find out what had happened in the CMC Virtual Team experiment. A profile of each participant was composed from the log files and the results of the questionnaires (Seidman, 1983). Log files are the conversations among team members while doing workshop. For log files, all conversations of the participants were used for creating the profiles. They were collected from the conversations history of Windows Live× Messenger. For questionnaire, raw data from the questionnaires filled in by each participant were transformed into excel format and used as profiles. In addition, team performance, indicated by the score on the assignment of each team, and team satisfaction level were used in data analysis.

In addition to and along with the profile-making, the analytic processes carried on: identifying themes, marking profile margins, collecting and filing theme material, so that they were easily retrieved.

A priori coding scheme developed by Heckman and Misiolek (2005) was used in content analysis of the logs files. The scheme was refined and modified during the analysis process. The coding schemes were grouped into three categories: (a) procedural behaviors; (b) substantive behaviors; (c) social behaviors.

The processes of analysis began with identifying factors from Question 15 in the questionnaire which the participants were asked about the reasons why they perceived the team leaders. These responses were subjected to content analysis which the ideas from each participant were identified and categorized by two independent coders. The results from the coders were compared. The same results were recorded as the factors of those responses. The different results were further discussed to find a consensus opinion which was recorded as the factors. After that, the log files were also content analyzed to identify the factors matched to the messages with the same procedure.

4. Result

4.1 Identifying Leaders

To assess what degree each participants was perceived as a leader by the team members, the participants filled in the questionnaire on which they indicated:

- How many team leaders in your team?
- Who are your team leaders?

Perceived leadership was determined by a "leadership index" (LI), derived from the perception of team members (Heckman & Misiolek, 2005). The leadership index was calculated for each

participant by counting the number that he or she was identified as a leader by team members divided by the total number of team members. The range of leadership index is zero to one. The leadership index for each team member is shown in Table 2 and Table 3, labeled "A", "B", "C", or "D" within each team in the table. For example, from Table 2, team 1 had one team member identified that there was only one leader in the team and there were three team members identified that there were two leaders in the team. LI of B is 0.5 shown that there were two from four team members identified B as a leader and LI of C is 0.75 shown that there were three from four team members identified C as a leader.

The results have shown that teams vary in the number of perceived leaders. Five teams had two members identified as leaders. Five teams had three members identified as leaders. Two teams had four members identified as leaders. There are 34 participants who were selected at least once as being leaders, including 3 self nominations.

It is clear that perceptions of leadership vary among team members in most teams and each individual had the different perception of who the leaders were. There were only two teams (team 6 and 9) that had a consensus among the team members about the number of leaders in the team and who the leaders were.

According to analysis of the questionnaire responses, the results allow me to distinguish 12 teams into two perceived leadership patterns: "Strong Perceived Leadership" and "Weak Perceived Leadership" (Heckman & Misiolek, 2005).

Table 2: Strong Perceived Leadership Teams

Team	Number of Leaders (from questionnaire)			Leadership Index			
	0	1	>1	A	B	C	D
1	0	1	3		.50	.75	.50
3	0	1	3	.75	1.00		
6	0	3	1	.25*			1.00
7	0	1	3	.75			1.00
9	0	3	1	1.00		.25*	
12	0	3	1		.75		.50

* self nomination

Table 3: Weak Perceived Leadership Teams

Team	Number of Leaders (from questionnaire)			Leadership Index			
	0	1	>1	A	B	C	D
2	0	2	2	.50	.50	.50	
4	0	4	0	.25		.50	.25
5	0	1	3	.25	.75	.50	.75
8	0	2	2	.50	.25	.75	.75
10	0	2	2	.25	.25		1.00
11	0	2	2	.75	.50	.25*	

* self nomination

■ **Strong Perceived Leadership:** characterized by a high degree of consensus among team member. No more than one member disagreed about number of leader and LI were 0.5 or higher. There are 6 teams match this pattern (1, 3, 6, 7, 9, and 12).

■ **Weak Perceived Leadership:** characterized by a low degree of consensus among team member. Six teams match this pattern (2, 4, 5, 8, 10, and 11).

4.2 Identifying Perceived Factors

In order to answer the research question, "What factors affect a team member to be perceived as a leader in Computer-Mediated Communication (CMC) Virtual Team?", the factors affecting a person to be perceived as a leader in CMC Virtual Team (which referred to as "Perceived Factors") would be identified. The participants filled in the questionnaire, which they responded to the question why they perceived the team leaders. These responses were subjected to content analysis which the ideas from each participant were identified and categorized by two independent coders. The factors that were identified from the keywords classified by the opinions about the team leader in the questionnaire are subjected to numeric code as shown in Table 4. All of these factors can be separated into three categories: procedural behavior, substantive behavior, and social behavior. The examples of the Perceived Factors identified from the questionnaire are shown in Table 5.

Table 4: Content Analysis Coding Scheme

ID	Theme/Factor	Description
Procedural Behavior		
1	Scheduling	Speaker suggests a schedule or revision to a schedule for the team to complete task.
2	Dividing labor	Speaker suggests a division of labor for performing task.
3	Creating processes	Speaker suggests a procedure for performing task.
Substantive Behavior		
4	Initiate or start project	Speaker informs the others team members to start project.
5	Idea generation	Speaker suggests a new idea for the content.
6	Decision making	Speaker makes a decision in any circumstances.
7	Integrate project	Statement indicating that one individual is performing the task of editing or integrating the document
8	Wrap up or finalize project	Statement indicating that one individual is finishing off the task.
9	Smart or clever	Statement indicating that one individual is more intelligent than the others.
Social Behavior		
10	Social Behavior	Communication that serves a purely social function such as greeting, apology, complement, thank, praise, criticize, insult, agreement, and emotional express.

Table 5: Example of Perceived Factors Identified from Questionnaire

Sentence	Perceived Factor
Put PowerPoint from the other team members together	7, 8
Assign job to the team and put them together	2, 7, 8
Understand the task content and have a good competent in technology	9
Lead the other team member to work by asking opinions from other team members first	5, 6, 10
Planning and allocate job	2, 3

Table 6: Perceived Factor Obtained from Log Files

Factor	Team												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
Scheduling		1	1	1	1	1		3	2	7	2	1	20
Dividing Labor	5	6	5	3	9	14	9	9	11	11	6	11	99
Creating Process	5	10	3	9	8	12	8	6	4	14	9	8	96
Initiate or Start Project	3	1	1	3	1	1	1	1	1	2	1	1	17
Idea Generation	7	29	12	24	13	35	11	23	9	23	17	8	211
Decision Making	3	16	3	11	7	9	3	2	2	3	11		70
Integrate Project	1	14	5	10	8	7	3	1	2	9	3	2	65
Wrap-up or Finalize Project		6	3	5	5	1	2	4	2	2	1	3	34
Smart or Clever													
Social Behavior	26	32	7	34	19	12	8	8	18	2	21	21	208

Table 7: Perceived Factor Obtained from Questionnaire

Factor	Team												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
Scheduling		1			1	1						1	4
Dividing Labor			1	3	1	2	2					1	10
Creating Process	1	3	1	1	1	1	1			1	1	2	13
Initiate or Start Project	1		1	1					2			3	8
Idea Generation	2	1	2	1		1	3	1	3	3	1	3	21
Decision Making		1			1		1	1	1		2	1	8
Integrate Project	1		3	1		2	1	1					9
Wrap-up or Finalize Project	1		2	1		1							5
Smart or Clever	1				1				1	1			4
Social Behavior	1								1				2

As a result of content analysis of the log files, the top four frequent factors from chat log are “Idea Generation”, “Social Behavior”, “Dividing Labor”, and “Creating Process”. Social Behavior is the most frequent factor of seven teams. Besides, idea generation is the most frequent factor of five teams and the second most frequent factor of five teams that have social behavior as the most frequent factor (see Table 6). The result has shown that social behaviors usually provided by team members and distributed along with task-related messages. This shows support for the first hypothesis that leaders tend to engage in both social and task-related behaviors.

Table 7 shows the number of team members in each team that perceived leader in each factor, which derived from the content analysis of the questionnaire. The result has shown that the top three frequent factors are “Idea Generation”, “Creating Process”, and “Dividing Labor”. There are eleven teams that have at least one member perceived leader by idea generation and ten teams for creating process.

Therefore, the factors affecting a person to be perceived as a leader in Computer-Mediated Communication Virtual Team are “Idea Generation”, “Creating Process”, and “Dividing Labor”. It is clear that social behaviors were not significantly associated with being perceived as a leader. This shows support for the second hypothesis.

Table 8: Binomial Test of Perceived Factors Obtained from Questionnaire

Team	Procedural	Substantive	Exact Sig (2-tailed)
1	1	6	0.125
2	4	2	0.688
3	2	8	0.109
4	4	4	1.000
5	3	2	1.000
6	4	4	1.000
7	3	5	0.727
8	0	3	0.250
9	0	7	0.016
10	1	4	0.375
11	1	3	0.625
12	4	7	0.549

To analyze the third hypothesis that team members perceive leaders from procedural behaviors more than substantive behaviors, the number of team members in each team that perceived leader in each factor were aggregated according to their categories (procedural and substantive). There are 8 teams that team members were perceived leader from substantive more than procedural behavior. Furthermore, the result of binomial test between substantive and procedural behaviors has shown that there is only one team that has Exact Sig. (2-tailed) < 0.1 (Table 8). This result has shown that there is no significant different in the number of team members in each team that perceived leader from procedural and substantive behavior except one team (Team 9). Therefore, the third hypothesis is rejected.

4.3 Comparison of Strong and Weak Perceived Leadership Teams

In order to know if there was any different between strong and weak perceived leadership team, they were compared in three aspects: team performance (score of the assignment), team satisfaction, and perceived factors.

Table 9: Team Satisfaction and Performance

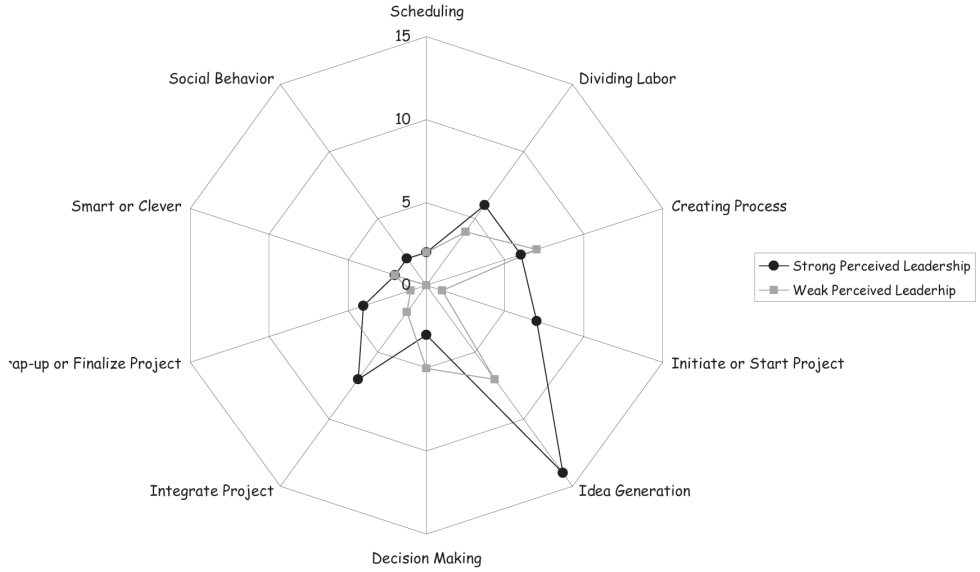
Team	Score	Satisfaction			Leadership Style
		Process	Job	Average	
1	5.00	4.70	4.17	4.43	Strong
2	4.00	4.60	4.58	4.59	Weak
3	4.00	3.80	3.58	3.69	Strong
4	4.00	4.00	4.17	4.08	Weak
5	3.00	3.70	3.50	3.60	Weak
6	3.00	3.50	3.67	3.58	Strong
7	3.00	4.25	4.08	4.17	Strong
8	3.00	4.15	3.92	4.03	Weak
9	3.00	4.05	3.67	3.86	Strong
10	4.00	3.90	3.83	3.87	Weak
11	5.00	4.25	4.50	4.38	Weak
12	3.00	4.50	4.25	4.38	Strong

(a) **Team Performance:** The correlation coefficient between team performance (score of the assignment) and team leadership style is -0.22. Moreover, four of the top six rankings were weak perceived leadership teams (Table 9) but with relatively low correlation coefficient, the researcher cannot statistically claim that weak leadership teams performed better. However, the researcher can be more confident to the conclusion that whether strong or weak perceived

leadership does not seem to offer any performance advantage.

(b) **Team Satisfaction:** The correlation between team leadership style and process satisfaction, job satisfaction, and average satisfaction are 0.04, -0.26, and -0.11. These correlation coefficients are not statistically significant, and do not allow me to assert that weak leadership teams has higher satisfaction.

Figure 1: Comparison of Perceived Factors



(c) **Perceived Factors:** When compared the perceived factors between strong and weak perceived leadership teams, strong leadership teams tend to be perceived leader from Idea Generation, Initiate or Start Project, and Integrate Project more than weak leadership team.

5. Discussion and Implication

5.1 Discussion

The first finding of this research was that team members may perceive more than one leader. There was little consensus about number of leaders in the team and who the leaders were. This is consistent with the previous research (Heckman & Misiolek, 2005; Wickham & Walther, 2007).

Moreover, each individual had the different perception about leaders. Most teams had perceived at least two different leaders. This might be the result from the different role that leaders were expected to do (Bales & Slater, 1955). If each role was done by a different team member, then different members might be perceived as leaders.

However, in this research, there were two teams (Team 6 and 9) that had a consensus leader. In team 9, team members perceived leader from substantive behavior, especially idea generation. Although, the leader (A) presented substantive behaviors as much as the other team members, while A was the team members who initiated more task-related communication than the other team members. This result lends support to Yoo and Alavi's study (2004). In team 6, team members perceived leader from both procedural and substantive behaviors. Although, the leader (D) presented both procedural and substantive behaviors as much as C, while D was the team member who responsible for making PowerPoint presentation which was the most important part in the task. This might also affect the perception of leader of the other team members (Kahai, Sosik, & Avolio, 2004).

The second finding of this research was the factors affecting a person to be perceived as a leader in Computer-Mediated Communication Virtual Team. The factors found out in this research are only task-related behaviors while the social aspect does not significantly associated with the factors affecting a person to be perceived as a leader (Yoo & Alavi, 2004). While working in virtual environment, due to lack of nonverbal tools, a sender cannot easily alter the mood of messages. According to Kayworth and Leidner's (2001) study, the effective team leaders in virtual teams showed a high degree of sympathy toward other team members. In this research, even though the social behaviors were distributed among team members, they did not associate with perceived factors. This does not mean that the participants did not present social behaviors or social behaviors did not important in virtual teams. It means that social behaviors usually provided by team members and distributed along with task-relate messages in order to sustain the team dynamics (Hart & McLeod, 2003; Yoo & Alavi, 2004).

The task-related factors affecting a person to be perceived as a leader can be distinguished into two types of task roles by functional approach to leadership, (1) procedural behaviors are creating process and dividing labor and (2) substantive behavior is idea generation. While it is important to note that strong perceived leadership teams tended to perceive leaders from idea generation, initiate project, and integrate project more than weak perceived leadership teams. These are partially corresponded with Yoo and Alavi's (2004) study which suggested that emerging leaders perform three roles: initiator, scheduler, and integrator. Since the task in this study was one, 150 minutes session, other procedural behaviors such as dividing labor or creating process were considered to be more important than scheduling.

In this research, the team members who took the form of procedural behaviors were not likely to be perceived as leaders. Compared to face-to-face contexts, this result stands in contrast with the previous research, which suggested that team members who took the form of procedural leadership were more likely to be judged as leaders (Baker, 1990; Bales & Slater, 1955; Ketrow, 1991). Because of the task assigned in this study, the participants concentrated on searching information from the Internet to seek what to do to finish task first. When the topic was set, the participants then talked about how to do it. Therefore, the early messages were taken form of idea generation. This may cause team members who raised the topic that the other team members agreed to work on were perceived and selected as a leader. This makes idea generation an opportunity to be perceived more than the other factors.

Furthermore, the task assigned in this research was a short-term project that must be completed within 150 minutes. The participants were likely to focus on the task in order to do it in time. Thus, the primary communications were task-related while social aspects were not absent from the communications. When the task finished, most of conversations between team members were related to social aspect but were not significantly associated with perceived factors (Yoo & Alavi, 2004).

It may be important to note that this research was studied on the short-term idea generation task. There may be a possibility that task type and time frame may affect the behaviors of team members and the perception about leaders as well (Gersick, 1988; Straus & McGrath, 1994). Therefore, the contextual variables, such as task type, task complexity, and time frame, should be further investigated.

The last finding of this research was the proof to the difference of team performance and team satisfaction between strong and weak perceived leadership team. There were inconsistencies of the result in previous research. Several studies suggested that team performance had positive relationship with the level of acceptance upon team leaders (Goldman & Fraas, 1965; Pavitt, 1998). While the other suggested that there was no different in team performance (Heckman & Misiolek, 2005).

In this research, there was no different in team performance between strong and weak perceived leadership team. This might be the result from the task assigned in this study. Since the task assigned in this study was simple and straight-forward, the leaders might not have a direct affect to the task outcome as much as the larger and more complicated project, such as SAP implementation. Moreover, the maximum score on the assignment was 5 and the score on this assignment was given with no decimal point. Thus, the range was not wide enough to tell whether there is any different in performance or not.

In addition, there was no different in team satisfaction level between strong and weak perceived leadership. This might be the result from the inattention of the participants while filling in the questionnaire. This can be seen from some

questionnaires that the score of all questions about satisfaction were 3 (from 5-point scale). Moreover, since the low score (1 and 2) on satisfaction was absent, there was a few different in satisfaction level of each team.

5.2. Implication for Future Research

This research confirmed some significant factors that affecting a person to be perceived as a leader in virtual team, which provided information to support the importance of studying team leadership in virtual context. Future researchers may further examine the contextual variables, such as choose other different types of task or running similar tests over a longer period of time to find out whether they have any effects with the perceived factors or not.

Moreover, this research experimented on the anonymous virtual team. The participants worked together virtually through the entire project. The results may be different by running similar tests on the participants who have developed face-to-face relationships.

In addition, this research focused on perceived factors only, other future research may thoroughly examine actual behaviors and compare them with perceived factors using content analysis. Thus, these may lead to another research question: what happen in the reality and what factors are perceived, why do they differ?

5.3 Implication for Practice

The findings of this research provided some useful information while working in Computer-Mediated Communication Virtual Team environment. Working in virtual environment without leader assigned would face some challenge related to team management and these following issues should be carefully considered in order to make virtual team more effective.

First, to be perceived and accepted as a leader in virtual context, an individual needs to respond and fill the expectation of team members. According to the perceived factors found out in this research, the tasks that the team members expect the leaders to do were “Idea Generation”, “Creating Process”, and “Dividing Labor”. However, these expectations are based on team member working on the short-term idea generation tasks, the expectations may be different when task types or other relevant contextual variables, such as time and team member characteristics, have changed.

Second, to ensure fairly rate outcome, goals and expectations for each team member should be discussed and clearly determined. Therefore, to ensure the success of the team, the role of each member should also be clarify. Team members might need more time in virtual team than in face-to-face team in order to understand their role (define work objectives and responsibilities), because of unfamiliar work environment.

Third, even though social behaviors are not likely to associate with perceived factors, the effective virtual team leaders should provide social behaviors such as, cheer up, motivation, or criticism to maintain team dynamic.

Last, it is important to keep in mind that not all virtual teams are the same. There are many contextual environments that make virtual teams different such as anonymity, group size, task type, and time constraint. Team leaders should understand the differences and adapt their approach appropriately.

5.4 Limitation

This research has several limitations that should be considered in evaluating its contribution. First, the participants were non-random sample of students enrolled in Master of Science in Information Technology in Business Program in the first semester. Even though student samples have been considered appropriate with the research environment, there is also the limitation in the generalization of results that should be concerned. Second, the sample size was relatively small. Therefore, some significant factors might have been failed to be found out. Third, the task in this study was completed in one, 150 minutes session. Due to time constraints, the task assigned was fairly simple, straight-forward, and could be completed within 150 minutes. The leaders might not have the influence to the team process and task outcome. It is possible that the result may be different when the team performing other task type or facing more complex task. Last, the communication method used in this study was only instant messaging software, which limited the generalization of the result to other communication methods such as electronic mail or video conference.

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Appendix A

Task

Working as a team, each team is required to select any one topic about the state of the art of any new Information Technology (IT) and then prepares at least 10 slides of PowerPoint presentation. The new IT can be either hardware or software.

- Name the PowerPoint file in this format "629_51_1_A1_NO" where "NO" is Group Number.
- Mail the PowerPoint file to "wachara @acc.chula.ac.th" and name the subject as "629_51_1_A1".
- This assignment has to be completed online within two and a half hours.
- The score will be given according to quality of work and team contribution.

Appendix B

Questionnaire

Please complete the following questions, based on the CMC Virtual Team experiment.

1. E-mail used to Sign-in to Windows Live× Messenger:

   _____

   Sex: ○ Male ○ Female

   Age: _____ years

2. **Undergraduate Education Background**

   Degree: _____

   Major: _____

3. **Working Experience (if any) (from the latest post)**

   1. Position: _____

      Company: _____

      Duration: _____ year(s)

   2. Position: _____

      Company: _____

      Duration: _____ year(s)

4. **Assessment of Information Technology Skills**

Skills	Competence			
	None	Basic	Average	Advance
Word-processing				
PowerPoint				
Windows Live™ Messenger				
Windows				
Internet (World Wide Web)				

5. How many hours do you spend on a computer?

   ○ More than 6 hours a day

   ○ 3-5 hours a day

   ○ 1-2 hours a day

   ○ 3-6 hours a week

   ○ 1-2 hours a week

   ○ Less than 1 hour a week

6. How long did you first start using computer? : _____ years ago

7. How would you describe you Thai typing skills? (Choose most applicable one)

   ○ I am completely unfamiliar with the basics of typing.

   ○ I am able to type with two or three finger.

   ○ I am very competent but cannot touch typing.

   ○ I am able to touch typing fluently.

8. How would you describe you English typing skills (Choose most applicable one)

   ○ I am completely unfamiliar with the basics of typing.

   ○ I am able to type with two or three finger.

   ○ I am very competent but cannot touch typing.

   ○ I am able to touch typing fluently.

9. **Satisfaction with the process**

   How would you describe your group's working process?

1. Inefficient	1	2	3	4	5	Efficient
2. Uncoordinated	1	2	3	4	5	Coordinated
3. Unfair	1	2	3	4	5	Fair
4. Confusing	1	2	3	4	5	Understandable
5. Dissatisfying	1	2	3	4	5	Satisfying

10. **Satisfaction with the outcome**

1. How satisfied or dissatisfied are you with the quality of your group's outcome?

Very dissatisfied 1 2 3 4 5 Very satisfied

2. To what extent does the final outcome reflect your inputs?

Not at all 1 2 3 4 5 To a very great extent

3. To what extent do you feel committed to the group outcome?

Not at all 1 2 3 4 5 To a very great extent

11. How many team members that you can identify who they are?

- There is (are) _____ person(s) I can identify.
- There is (are) _____ person(s) I cannot identify.
- There is (are) _____ person(s) I am not sure.

12. Do you think that the other team members can identify who you are?

○ Yes ○ No ○ Maybe

13. How many team leaders in your team? : _____

14. Who is your team leader? (you can select more than one choices)

☐ A ☐ B ☐ C ☐ D

15. Why did you perceived him as the team leader? : _____

_____

_____

_____

_____