Chapter 1

Introduction

Group communication is a heart of a group framework. It is believed to be one of the key success factors in a group working. Since no person alone has all experiences and all knowledge to accomplish the complex tasks, every team work need to communicate for brainstorming ideas, producing contributions, and then achieving sufficient information to help them make a decision. Face-to-face meeting is the most natural form of the group communication. This traditional way of communication allows all members within a group to meet at same-time/same-place and supports group working as preserving the degree of co presence of the cooperative work (Antunes and Guimaraes, 1996). However, the use of face-to-face meeting is usually costly in term of both time and travel. According to 3M Meeting Management Institute as much as 7 to 15 % of companies personnel budget is swallowed by meetings, and a typical manager usually spends between 30 to 80 % of his/her time in meetings (Fisher, 1974). Additionally, participants of face-to-face meeting must gather in the same place at the same time. Arranging meetings within group members at the same-place/same-time are difficult and rarely full corporate. Although the prior problems can be solved for a time, the quality of group meeting still depends on the ability to draw out and combine group members' ideas and knowledge (Patrick et al., 1999).

Many researches show that there are many problems connected with group working and groups are often ineffective (Haller, 1994; Chen et al., 1996). While they have a meeting, the problems might be that they lack clear focus on the discussion topics or distract from the purposes of meeting, e.g. some members dominate the others. Almost every time an important decision is made or a difficult question is brought up, group members tend to be incapable to suggest their ideas without force of another participant or dominate the meeting without inhibition. Beside, the overwhelming information that has been produced creates a burden for meeting participants in idea organization and missing information apparently occurs. When this process becomes a bottleneck, as is often the case, it counteracts productivity gains and reduces the quality of making a decision. Regarding to all of these problems, many organizations require other technologies such as computer conferencing or electronic meeting system to support their group work (Fulk and DeSanctics, 1995; Pervan, 1997).

A new form of meeting, so-called Electronic Meeting System (EMS), has been widely used to improve group communication as well as enhance workplace performance (Nunamaker, 1991; Gallupe et al., 1991; Dennis et al, 1991). A major advantage of the electronic meeting, from Chen et al. (1996), is the ability to support the group in a parallel mode. This helps participants improve the meeting quality by allowing anonymous messages over networked computers, by providing instant access to information and by encouraging equal membership participation during the meeting. Moreover, the technologies help the participants free from place restriction while still preserve the characteristic of the conventional meeting. Thus, EMS provides a fully system with any-time/any-place to support for group meeting of any size. From previous researches, most studies on EMS have shown that EMS does not only solve some of those problems of the conventional group work, but also gives new possibilities since it is a completely new way of working (Simons, 1999). The use of information technology like EMS allows faster and better task to support than it could be achieved by conventional methods. Conducting

group meeting using EMS will save teamwork the time and expense associated with traditional face-to-face meetings. This electronic format allows team members to contribute status information and to ask questions of one another at any time that is convenient for them. The group meeting with EMS is accessible at all times, and is unaffected by differences in schedules, time zones, etc. In addition, the information from the EMS can easily be used as a reference point for organizing ideas after the meeting.

Although the system that supports group meeting can unravel many problems of the conventional meeting, the problems of the quality to draw out and combine group member' ideas and knowledge is remained. Usually participants have to create their own ideas, browse and understand the ideas generated in the EMS, judge the merits of these ideas, merge similar ideas, eliminate redundant or irrelevant ideas (distraction), consult other members' opinions, and so on while they were meeting. These create a burden for meeting participants and obstruct ability to reach the conclusion within a time constraint. To alleviate these difficulties, facilitation is applied to the group meeting (Jahng and Zahedi, 1998; Griffith et al., 1998).

Anson et al. (1995) noted that facilitation is important in enhancing group meeting effectiveness, and that higher quality facilitation can produce better group outcomes. Facilitation within the EMS usually entails operating the technology and/or facilitating the group's discussion (Clawson et al., 1993; Niederman et al. 1995). In addition, facilitator enhances the quality of group meeting by supporting indirect contributions to the final solution through neutral enhancement of the processes of communication and information processing by the group (Griffith et al., 1998). Since facilitator allows people to generate ideas equally without force of another participant or to discuss ideas without fear from the superior and higher-priority person, he/she can encourage people to participate in meeting without inhibition and reduce the tendency for a few dominate a meeting. However, in a real world meeting, high quality facilitators are few and not easily available, and third party facilitators are often problematic in view of cost and information sensitivity (Clawson et al., 1993; Anson et al., 1995). Although impartiality is an important feature for facilitation, a human facilitator may sometimes cause unintentional bias on group decision. Sometime facilitators may have their own agendas. Acknowledgement, training, and standards for facilitators may prove useful ways for groups to retain the benefits of facilitation without incurring the costs of inappropriate facilitator influence. Moreover, a human facilitator may not be possible when group meeting is arranged on Internet (Jahng and Zahedi, 1998).

Although human facilitator may unintentionally bias and has the problems in a view of information sensitivity, group meeting still need some sources to enhance the EMS performance. Therefore, the facilitation with somewhat "intelligent" system is created to act like a human facilitator in facilitating group's discussion in the EMS. We believe that the integration of the intelligent facilitation aid with EMS can extend the bound of rationality of human facilitators by creating more consistency, persistence, uniform quality in group meeting, and improve meeting effectiveness. This may turn out to be the biggest benefit of using such a technique in an electronic meeting environment. A meeting facilitation agent allows participants to generate ideas at any time during their discussion process and assist participants to examine ideas under discussion with identifying other potentially interesting topics. In addition, the facilitation agent also provide an efficient and trustworthy analysis for the participants just like what a knowledgeable facilitator will do. Therefore, the intelligent facilitation system is projected to support on the EMS technology.

Since the intelligent facilitation system is pointed to support EMS technology, many researches are proposed the models to develop the system. Jahng and Zahedi (1998) proposed the intelligent facilitator for supporting human facilitation instead of reliance solely on the human facilitator as well as Aliken et al. (1991) introduced the integration of expert systems with group support system and proposed the use of an electronic expert session manager for helping human facilitators. However, this model still does not ease the problems of human and free of subjective human judgment and biases. From Chen et al. (1996), they developed an AI-based software agent for categorizing ideas in electronic brainstorming sessions, and showed that it was as effective as human meeting facilitators and took one-fifth time to accomplish its task. This model can help participants consolidate and conclude the ideas from meeting in a short period, however, it cannot act like human facilitators in order to help participants focus on the meeting, reduce the distraction, and dominate the meeting. In fact, this phenomenon occurs more often than miscommunication that interrupts to the ongoing discussion (Haller, 1994). Since those intelligent facilitators do not have a capability to help people focus on the discussion topics and prevent distraction that are occurring when they are having a meeting, some group meeting fails to achieve decision outcome according to insufficient information for decision making. Then the satisfaction level and productivity of the meeting participants after the meeting may go down significantly. These are the important factors, which make discussion inefficiency and nonproductive. Therefore, it is a great deal of interest in developing useful and efficient system or application to assist participants in focusing on the discussion topics and reduce group distraction during meeting.

A new form of application so-called "an intelligent topic detection agent (ITDA)" is proposed to facilitate group discussion through an online group discussion system. ITDA is an intelligent agent for identifying one or several event-based topic labels and following them in a flow of textual utterance in order to detect the digression. Unlike other system, our agent can help both in detecting topics and facilitating group discussion automatically that make participants be able to discuss following a set of pre-defined topics and prevent distraction that occurring when they are having a meeting. However, ITDA still presents many challenges and difficulties. Our data is discussion data, which is usually short sentence with few keywords. In each sentence, the frequency values of the word are mostly one. Sometime words in a sentence are informal or omitted by ellipses in the next sentence. Moreover, in discussion data, topic is sometime expressed with only two or more sentences and frequently changed over time (Lanquillon, 1999). This makes one discussion consist of some more or less mixture of independent topics. To detect topic of discussion, many researches are usually applied text classification concept to identify topic(s) in discussion data (Schwartz et al., 2001; Hauptmann et al., 1999). However, it is not easy to use previous topic detection system to cope with these problems directly. Our ITDA need to cope with dynamically changing domain and attempt to prompt in real time to detect topic change (online) when the utterance arrives.

In this study, we use centroid-based classification algorithm (Salton, 1989) since it is known to have high precision performance with less restriction in the field of document categorization. Centroid-based classification algorithm is an instance-based learning algorithm that uses the technique of calculating the average distance of the similarity between documents. For our system, we use centroid-based classifier to detect topic by calculating the average relevance between the new input sentence and the former set of sentences. Grouping the input sentence with the preceding sentences increases number of characteristic words to be compared with topics in calculation. Although centroid-based classification algorithm can overcome the constraints of our specific domain of text

annotation, major characteristic or difficulty of text classification is the high dimensionality of feature space (Hauptmann et al., 1999). Generally the high dimensionality of feature space can make the classifier run slowly and increase over fitting (Schwartz et al., 2001). Therefore, it is highly desirable to find out the way to reduce the native space without affecting classification accuracy. In our system, we use information extraction agent to filter irrelevant information. This agent helps ITDA extract key decision factors, which are decision criteria and decision alternatives of discussion data, to reduce feature space in classification process. These factors were designed along the structure of the multi-objective decision making algorithm so-called Analytical Hierarchy Process or AHP (Saaty, 1980). The AHP model is the decision model for analyzing the relative importance of criteria and further evaluating alternatives. This decision model suits for the discussants, who are not able to quantify their preferences for various criteria and alternatives. Structure of AHP is composed of two important components, decision alternatives and decision criteria, for constructing the pair-wise comparisons between the decision alternatives on each criterion and ranking the relative importance among criteria. By applying information extraction agent, we suppose to remove all irrelevant discussion data from an incoming stream, such that only relevant information is presented to classification, which make an improvement of classification algorithm. With these combinations of information extraction agent and ITDA, our system can support real time topic detection and be applicable for the utterance input.

While information extraction agent keeps extracting the key decision factors from meeting messages and ITDA keeps detecting topic of a group meeting, the appearance of digression is signaled from ITDA if topic of the discussion changes. A system that can facilitate group discussion via electronic-meeting so-called Intelligent Facilitation Agent (IFA) will receive this signal and facilitate group discussion in focusing on the issues and preventing distraction of information via online discussion system. The basic idea on the IFA is to develop intelligent question-based software, which encourages group participants to focus on discussion and to reduce distraction issues, and communicates with group participants by using human-like language. The communication language sent to group participants is Thai language, in order to support group meeting for Thai people.

Our system assists the discussants in focusing on the issues and preventing distraction of information. Besides, the system summarizes possible decisions and enhances the decision efficiency. With these combinations, our system can help to refine the redundancy of key decision factors during the meeting and to consolidate and organize the meeting within a short period. In addition, the output result of our agent can help to support the decision making of the meeting participants. This result will also be the knowledge for future meeting and enable the meeting participants to access their previous online meeting information. Compared with the traditional system, our system makes the structure apparent and easy to understand. In order to analyze the efficiency of the system, three types of experiment are conducted. The first preliminary experiment is conducted to investigate the idea of using computer system as facilitator and its efficiency while second is conducted to study the performance of information extraction agent on retrieving the key decision factors from meeting messages. Final experiment is conducted to study the effects of the prototype of our system on detecting digression in an online discussion system.

From our experiments, the preliminary experimental results illustrate that the collaborate work of those three agents can help participants focus on the discussion as well as discourage irrelevant digressions during the meeting. From the results of the experiment,

our agent can retrieve the key decision factors with accuracy of 97.7% when compared with human extraction while intelligent topic detection agent was able to detect topic changing of discussion up to 99% accuracy.

This thesis is divided into five chapters. First, a brief introduction is provided. The next chapter discusses the background of group support system and their previous work. The third chapter discusses the overview of intelligent topic detection agent for electronic meeting system and its components. The fourth chapter presents the experiments and their results of the investigation of the effects of our intelligent topic detection agent on the group discussion via electronic meeting system. This thesis ends with the conclusion and recommendation in chapter five.