# Chapter 2

# Literature Reviews

The individualist cannot solve many problems that organizations face because no person has all the experiences, all the resources, or all the information to accomplish such a task alone (Nunamaker et al., 1997). The complexities of the organizational problems are driving a move toward to create a teamwork for business teams and to use the computer-mediated system for supporting them along the dimensions of space and time. Teams of people must collaborate effectively and efficiently to solve complex problems in a limited time. Although many researches provide simple information sharing to support the group framework, the organizational problem extends far beyond mere information sharing. Group support system (GSS) is a new kind of computer technology that targets the trouble spots for team productivity. Besides supporting information access, GSS can radically change the dynamics of group interactions by improving communication, by structuring and focusing problem solving effort, and by establishing and maintaining an alignment between personal and group goals. This literature review discusses the researches on GSS and GSS facilitation support for the electronic meeting system.

## 2.1 The Role of Group Support System (GSS)

Many GSS researches (Briggs et al., 1994-1995; Nunamaker et al., 1995) have suggested that the methods that system supports the user may have a critical impact on the effectiveness of GSS. Additionally, they also recommended that many problems associated with groups often require facilitative support to make the meeting effectively. A group support system, from Nunamaker et al. (1995), is a computer-based environment to support concerted and coordinated effort for joint problem solving and task completion. Participants type their contributions into computer workstations and the system immediately makes all contributions available to other participants on their workstations. Each software tool in a GSS supports group dynamics in some unique way. A brainstorming tool, for example, prevents a group from thinking deeply, while encouraging them to diverge from familiar thinking patterns. An idea organizer, on the other hand, encourages a divergent group to focus quickly on narrow set of key issues. Some researches specify on the tool for group's computer-mediated decision-making by providing a scripted structure to the group's text chat discussion. The other tools might include electronic polling and voting, multi-criteria evaluation, team outlining and writing, and shared drawing tools.

Early GSS research at IBM, Boeing, Bellcore, and other organizations tracked hundreds of teams in yearlong case studies (Grohowski et al., 1990; Post, 1992; Vogel et al., 1990). They found out that the team using GSS reduced their labor costs an average of 50% and reduced the number of calendar days from the beginning to the end of the project an average of 90%. The U.S. Army (Nunamaker et al., 1997) reported a total saving of $ 1 million in eight 1-week sessions to design a new Army-wide personnel-tracking system. Bellcore found a 66% reduction in labor costs for teams when they were using the technology. The Army National Guard saved over 70% in labor costs and 90% in project elapsed time over three documentation projects. In a decade, there are many researches, developments and implementation of GSS from providing information sharing until supporting the decision-making to the group. Most of works, they design GSS to enhance

leadership ability that help the group reach the consensus of meeting, rather than replacing the human leadership. GSS is also designed to make more people reaching the decision-making while ensuring that decisions are timely. Some researches focus on the effort of group size while using GSS. The research result shows that larger group size helps to keep the big picture in focusing and eliminating a group leader's need to communicate separately with smaller subgroups. As the group builds an understanding of problems and tasks, there is less wheel spinning, more cooperation, less chaos, and more acceptances of decisions. Additionally, some researches tend to use GSS for contributing much more fully and equally than the traditional meeting (Briggs et al., 1994-1995). According to ideas that enter the system and are circulated without attribution, GSS frees people to generate ideas without force of another participant or to discuss ideas without fear from the superior and higher-priority person. GSS encourages people to participate in meeting without inhibition or reduces the tendency for a few to dominate a meeting.

In finale, the study on group support system has been rapidly increases in many different directions. GSS researchers (Aytes et al., 1994; Hiltz et al., 1992) have suggested that GSS research is moving toward providing any-time/any-place /any-technology support for team of any size. This technology will still improve communication, structure and support deliberation, and provide access to information and technology that does not substitute for leadership.

### 2.2 The GSS Facilitation Support for Electronic Meeting System

Over a decade of GSS research and practical experience suggests that the facilitation will be just as important as the collaborative support tools that team uses. Since facilitation could reduce the mystique of the GSS technology for user and provide the support to users during their use of technology (Dickson et al., 1993), several research groups then began experimenting with the use of facilitation to support group meeting (e.g. Lewe and Krcmar, 1991). Some of these researches (Ames, et al., 1998; Dennis, et al., 1997) tended towards their researches on the use of the GSS facilitation support to the EMS. This advent has opened a new opportunity for reconsidering traditional GSS. The EMS becomes an excellent framework for developing GSS facilitation due to its real-time, remote, and multi-user network interactions. With the EMS technology, the traditional restrictions such as limited portability and platform-dependence are unraveled. It allows groups of people to communicate and collaborate in performing their work without restrictions. Participants could easily access and exchange necessary information and conveniently communicate with each other through the Web with little limitation on group size, time or place. Additionally, it provides inadequate support for virtual work teams, who used the system, to collaborate although they were separated in space and time.

Although the groups use the GSS facilitation on EMS, some researchers argue that computer-mediated groups are less likely to reach consensus because they share less information and create greater conflict. Another possibility is the lack of structure that occurs in groups through a lack of leadership. Shelly et al. (2000) found that the structure had a significant impact on the group ability to achieve consensus and make higher quality decisions. The support in the structure to the process of GSS can make participants achieve more consensus, less confusion than GSS itself. Therefore, many modern concepts of organizational development and meeting facilitation are based on adding structure and scripting to the interactions. Meeting facilitation systems like Open Space Technology (Owen, 1997), Scenarios/Future Search Conference (Weisbord and Janoff, 1995), Strategic Forum (Richmond, 1997), and the World Café (Brown and Isaacs, 1995 and 1998) each take a unique approach to adding structure to person-to-person and person-to-

communication. Other existing online systems focus on structuring a group's task and its performance of that task (McGrath and Berdahl, 1998; Nunamaker et al., 1997). Some of such systems focus on structuring the process or workflow within a group in the meeting (known as workflow systems) (Agostini et al., 1997; Flores et al. 1988). All of these researches support the idea of using structure-based for meeting facilitation. However, there are three factors affect the success of using structure: faithfulness, positive attitude, and consensus over the structures' use. GSS facilitation can improve group process and cohesion by providing process guidance to encourage these three factors (Anson et al., 1995). Several researches on GSS facilitation system then point to provide guidance and structure to social interactive support group framework or the organization (Poole and DeSanctis, 1990). However, just GSS facilitation system are not very good at knowing what to guide or to support on the group interaction. In order to make GSS facilitation system steer on the group meeting with intelligent behavior and can decide for itself what it needs to do in order to satisfy the design objectives, we need to apply the concept of "Intelligent Agent" to the GSS facilitation system.

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While many intelligent facilitation systems may extend the bound of rationality of human facilitators by creating more consistency, persistence, and uniform quality in GSS, such those intelligent facilitators do not have a capability to help people focus on the discussion topics and prevent distraction that occurs when they are having a meeting. Therefore, it is a great deal of interest in developing useful and efficient tools or system to assist participants in focusing on the discussion topics and reduce group distraction during meeting. To reduce digression, it needs to apply features of topic detection together with natural language processing to build such a system. In recent year, there are several approaches have already been proposed in topic detection (Nakata et al., 2002; Schwartz et al., 2001; Dharanipragada et al., 1999; Lanquillon, 1999; Freitag and McCallum, 2000). Most of them are based on clustering techniques (Dharanipragada et al., 1999; Walls et al., 1999). Clustering techniques measure the similarity between a document and cluster, however, clustering is done as soon as the document (which has been morphologically analyzed) is seen. Therefore, we cannot apply the clustering technique to our system since

we are coping with dynamically changing domain without prior information during group meeting.

To deal with topic-changing detection, there are other possible methods to detect topic-changing label. One is from Ozaku et al. (1998). They develop an intelligent network newsreader for discussion-type newsgroup in order to facilitate the gathering of related article. They use the frequency of strings and cue words by comparing the ratio of unseen keywords of the previous article with all keywords of the previous article. This detection method is suitable for written texts but not for discussion utterances in the online discussion system, in which the input text changes over time. Another study is proposed by Nakata et al. (2002) to detect topic in dialog utterances. They propose a topic detection method applicable to one utterance in a dialogue as an input, which can be used for tracking the topic transitions dynamically and outputting most appropriate topic for the latest utterance. With their method, it can overcome the constraints for dialog utterances; however, they use clustering techniques to form the feature words in the input sentences, which make feature words become less effective when so many subtopics are in one cluster. To overcome this constraint, our study applies key decision factor extraction in order to extract key decision factors, which are decision criteria and decision alternatives from an online discussion system.

Since our input data rely on specific domain of text annotations and manual extraction is costly in term of time (Riloff, 1996), there has been recent interest in applying machine learning methods to the information extraction. Hidden Markov models (HMMs) are one of the most successful approaches being used as the machine learning technique in the information extraction task (Leek, 1997; Seymore et al., 1999; Freitag and McCallum, 2000; Ray and Craven, 2001). Advantages of HMMs are strong statistical foundations that are well suited to natural language tasks, handling new data robustly, and being computationally efficient to develop and evaluate due to the existence of established training algorithms (Seymore et al., 1999). Therefore, HMMs have been widely used in part of speech tagging (Kupiec 1992), dictionaries constructing (Riloff, 1993), and dialog-act modeling (Stolcke et al., 1998). Recently, HMMs have also been widely used in the information extraction tasks, for example, extracting information from the business card (Kushmerick, 2001), gene names and location from the scientific research (Leek, 1997), name entity recognition (Bikel et al., 1997), and topic detection (Allan et al., 1998). In most cases, HMMs provide significantly better accuracy than other learning approaches (Freitag and McCallum, 2000). Therefore, our study applies HMM as a machine-learning algorithm to extract key decision factors from the meeting messages.

Unlike other inputs, the meeting messages are often quite noisy due to the constraints of meeting time and variations in participants' typing skills. Incomplete or ungrammatical sentences and diversity of vocabularies are common (Chen et al., 1994). In addition, the information extraction process for group discussion via electronic meeting should be real-time extraction and be able to support automatically information extracting through electronic meeting. Based on these characteristics of electronic meeting, we require the system that can decide for themselves what they need to do in order to satisfy their design objective. Such computer systems are known as agents.

Surprisingly, there is no universally accepted definition of the term agent. The definitions of an agent fall on everywhere along a field from few parameters to truly intelligent agents, which demonstrate learning ability and artificial intelligent. Chen et al.

(1996) defined a term of "agent" as a program that can operate autonomously and accomplish unique tasks without direct human supervision. From Do et al. (2000), define the term "agent" as a software entity which has some degree of autonomy, carries out operations on the behalf of a user or another program, and in this process, represents or has knowledge of the user's goals and wishes. They also separated the qualities of an agent into three main dimensions: agency, intelligence, and mobility. They describe agency as the degree of independence, which an agent exhibits intelligence as the amount of learned behavior and possible reasoning capacity that an agent may process. Most intelligent agents have ability to learn. They will also be able to adapt to their environment, in term of user requests and the resources available to the agent. Finally, Do et al. (2000) described mobility as the dimension, which makes agents useful in Internet applications, yet poses many security issues. For electronic meeting system, agent should also be capable to deal with the dynamic group discussion without constant guidance from users during the meeting and capable to cooperate with the user during the meeting to achieve the meeting's goal. Therefore, agents are needed due to the exponential growth of information available on the Internet. Some agents can save user time by performing repetitive tasks such as gathering and posting e-mail and checking newsgroup. With the help of an agent, users do not have to waste their time gathering information and can help them saving some money. Finally, agents can make the Internet and computers easier to use.

With the characteristics of problem solving in the agent-based system and application of HMMs, our information extraction agent is able to assist in filtering the noisy term, consolidating vocabularies and ideas, reducing information overloading, and extracting information from the meeting messages simultaneously. Beside, this key decision factor extraction can remove non-information terms or words according to corpus statistic and remain only relevant information of discussion data without affecting to classification accuracy in real time extraction. Therefore, key decision factor extraction can reduce dimensionality of feature space and clarify the similarity between discussion sentences for topic detection during the discussion.