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Utilization of Organizational Memory in Distributed GDSS

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ABSTRACT

Utilization of organizational memory is beneficial in various organizational activities, including group decision making. In this paper, a general approach to building an information system to support utilization of organizational memory is suggested. The approach focuses on active reminding by the system, sharing retrieved information among the participants, importing information from external sources, and construction of memory with minimal effort. A design of GDSS for asynchronous and distributed environment based on the approach is presented. With the designed system, generation of ideas, discussion on selected ideas, and final selection of alternatives through voting can be performed sequentially. A prototype system under WWW(World-Wide-Web) environment is also presented that uses information retrieval technology as a core part.

1. INTRODUCTION

Group decision making has critical influence on organizational history by determining the direction of organizational movement at important points of chances and risks. Due to this importance, there emerged many systems to support group decision making with the development of information technology. Researches on GDSS(Group Decision Support System) so far have focused mainly on supporting group meeting by audio-visual devices, enabling teleconferencing by computer communication technology, and structuring decision process by developing decision models(King, 1988). However, a viewpoint which insists that it is necessary to take into account past decisions and decision rationale for improving decision quality, has been introduced recently(Ramesh & Sengupta, 1995). In most GDSSs, results from each session are lost or just stored in storage devices of computer systems. The information with this form can not be easily brought up to decision making again, just as stack of documents in cabinet.

In the researches of organizational memory, it is insisted that there exists memory in organization as human memory, and utilizing this memory can increase productivity of organizations(Murray, 1996). Some researches tried to support the utilization of organizational memory by information technology(Stein and Zwass, 1995). The reuse of decision and its rationale in GDSS can also be regarded as one application of organizational memory system.

There are a few GDSSs that are said to have organizational memory support, but they are only at the level of storing decisions indeed. Thus, what is required now is to show how information generated by GDSS can be stored as organizational memory, and at the other hand, how information from organizational memory can be used effectively in group decision making.

In this paper, a general approach to building information system to support utilization of organizational memory is suggested. Based on this approach, a GDSS for distributed environment is designed and prototype system is developed.

2. RELATED STUDIES

There have been only a few organizational memory systems so far. However, we can find some features supporting organizational memory in information systems of various types. Regarding GDSS, those features are mainly about storing decision history for later use. One of those systems, gIBIS(Conklin, 1992), captures decision process with IBIS model(Conklin, 1988) and makes it accessible to users. Another system, IBE(Lease et al., 1990), also provides decision history and, furthermore, links to other organizational information relevant to current decision. Other systems including SYBYL(Lee, 1990) and REMAP/MM(Ramesh & Sengupta, 1995) also have some features of organizational memory system.

There was a study which presented a general architecture for OMIS(Organizational Memory System) (Stein & Zwass, 1995). The architecture was based on the four functions of organizational efficiency which was driven from organizational theories. They put mnemonic functions as a lower layer under those four functions. But since this approach is based from organizational theories, its implication is not readily applicable to actual design.

The approach suggested in this paper is based on the problems found in existing systems and applies the concepts from other studies.

3. System Design

3-1. Approach toward organizational memory system

The approach is well explained with the following diagram. This approach can be applied to other organizational memory systems different from GDSS because it has no feature specific to GDSS.

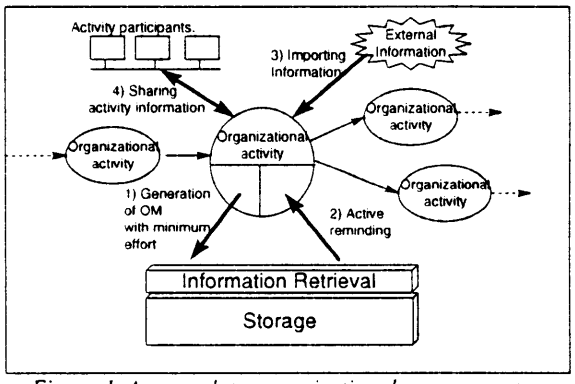

Figure 1. Approach to organizational memory system

First, organizational memory has to tap into activities of organization. It implies that the capture of information must be done at the creation point of the information, and the creation point usually lies inside the activity. Of course the information to capture needs to be in digital form. This approach is important, because by this way, organizational memory can be built without users' additional effort(Ackerman, 1994). It is a very practical approach considering that most activities in office environment are done with desktop computers these days.

Second, organizational memory must behave actively, while current systems are quite passive. Organizational memory, kept as a passive storage, can not be viewed as a memory but only as a stack of information. Also, due to the limitation from human memory, users can forget the possible existence of useful information stored in organizational memory. This, which can be called as 'active reminding' function, can be supported by information retrieval technology, which is widely used these days for retrieval of textual information from a large sized data base.

Third, the system has to enable users to upload related information residing in some external sources. Activity of organization does not exist alone but has relation with other activities or information sources. Thus, the system has to be open to take information from all those sources.

Fourth, the information retrieved from organizational memory must be shared among users participating in the activity. This means that the one who uses the information must be the organization, not the individual, and this way, the utility of the information increases and participants can have common point of view about the activity. This is similar to the assertions of CSCW researchers.

3-2. System overview - Three step GDSS

It has been pointed out many times that a good model for structuring decision making is necessary for building GDSS with computer technology, and also for organizational memory. The target system of this paper uses the three step model illustrated in the following diagram. This 3 step model is composed of brainstorming, discussion, and voting. The initial input to this system is ISSUE and the final output is the DECISION. The ideas from brainstorming are brought to discussion as initial positions, where discussion is made according to IBIS conversational model(Conklin, 1988). After discussion is made for a certain period, elaborated positions are selected and brought to voting, where final selection is made by voting. The details of the models are explained again in the following section with the object modeling diagram.

Usually, IBIS is also used for idea generation and elaboration, but it is more suitable for discussing a few qualified ideas than lines of naive ideas. Thus, brainstorming can be used as a tool for rapid and rich idea generation, and the filtering by a session manager can provide good initial alternatives for discussion. This 3 step model is complementary to IBIS model in that it provides powerful input to IBIS by rapid and rich idea generation of brainstorming, and helps users make final decision by providing voting tool to process the output of IBIS.

3-3. Active reminding and Information Retrieval

Without active reminding feature, organizational memory can just be a tool for passive decision support. Of course users can use organizational memory without active reminding support if and only if they are active enough themselves. With active reminding strategy, organizational memory system can find and provide information with possible usefulness which users might have forgot.

Active reminding feature is realized by information retrieval. In this case, who uses information retrieval is the system, not human. The query at this point becomes the context of the activity which is composed of issue, ideas, positions, or argument. It depends on the point where active reminding occurs.

Information retrieval used in this paper has

been drawn from Frakes' research(Frakes, 1992). Although the technique used here has many weaknesses, there are massive researches(Harmann, 1995) about full-text retrieval now that it is possible to adopt them for stronger support.

3-4. Logical architecture of the system

Logical architecture consists of two memories. The short term memory keeps information related with current activity. The content of short term memory is preserved until the activity finishes. Long term memory keeps information of past activities. Information moves from short term memory to long term memory as current activity finishes.

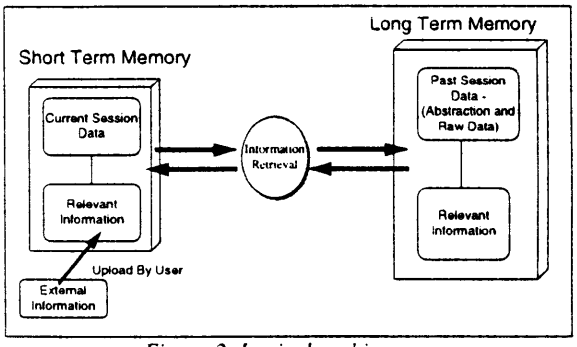

Figure 2. Logical architecture

The content of short term memory is shared among all participants, displayed at one part of the computer screen of all of them. This way, the organizational memory is used as organizational tool, not individual tool. Information in long term memory is brought to short term memory when users need it, or the system should remind users automatically.

Short term memory consists of activity data, which actually consists brainstorming, discussion, or voting, and other information related with the activity. Related information can be either a document or past session data. Users can bring information from long term memory or other source, like their own PC.

Searching information from long term memory is done by information retrieval technique. When information comes into long term memory, the indexing process is called. The detailed explanation of information retrieval will be mentioned later in the paper.

The distinction between short term memory and long term memory is meaningful in two aspects, the efficient use of information and resolving the information overloading problem. The amount of information that can be used for decision making by human is limited, so it is impossible to use the entire information in organizational memory. Also, if it is not presented in the sight of users, the information can be possibly ignored regardless of its utility.

3-5. Prototype

What you see below is an example discussion screen. After brainstorming session, some ideas are selected for further discussion. Selected ideas become initial positions of the discussion. At this stage, the active reminding function is called with the context of previous brainstorming as the query. The information suggested by active reminding is shown in the frame at lower-right corner. Notice the values at the end of each information in the frame. The values indicate how many times the information has been accessed, and how high the matching score from information retrieval is. This helps users resolve information overloading problem.

Users can make new position by filling the text boxes in the session frame. To add argument to any position or existing argument, users have to choose a position or argument, and then enter proper information. The content of the frame in upper-right corner changes according to the selected position or argument in the session frame.

After discussion session finishes, the selection procedure is called, and the session manager selects reasonable positions. The filtered positions go to voting stage, where the final selection is made.

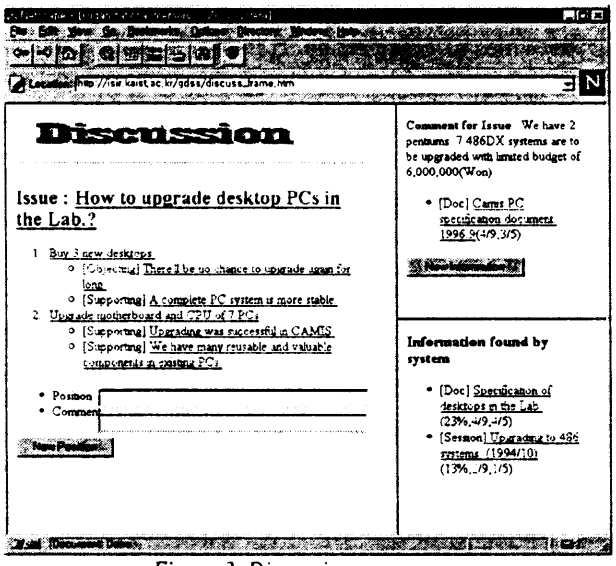

Figure 3. Discussion screen

4. Conclusion & Further Research

In this paper, the concept of utilizing organizational memory was applied to GDSS to improve the quality and increase the efficiency of decision making. Prior to designing actual GDSS system, a general approach to building organizational memory was suggested, which can be applied to other types of activity. The approach was based on the observations of existing systems that

are mainly focusing on structuring decision making process and merely storing the decision. In the approach and design, active reminding function of organizational memory system was emphasized along with the automatic building of memory. Also, the information sharing among activity participants and enabling users to upload information from external sources were stressed. The result of whole session goes through indexing procedure of information retrieval without any user's additional effort. Users share the same view to the set of relevant information during the entire decision making activity. Also, to help users to resolve information overloading problem, possibly intrinsic in providing information from organizational memory, relevancy indicator was adopted. The decision model of presented system was designed based on existing group decision making models to supplement the IBIS model in idea generations and final selection of alternatives. The system supports asynchronous communication, and can be used in distributed, platform-independent environment. Implementation of prototype system was done under WWW environment.

For practical usage, more supplementary work on information retrieval function should be done. Since the designed system deals with only textual information, extension to other types of information is desired.

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