Information Management with Meeting Automation Tool

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Abstract

This paper presents results of our research that targets the improvement of workgroup efficiency with technological support for the management of group-related information. We built a software tool that enables all the people in a workgroup to work with information related to their common projects. We present our solution: the theoretical concepts that are implemented, its structure, functionality and architecture.

1. Introduction

The idea to use computers to improve the efficiency of a work process is probably almost as old as computers are. Presently, within information-driven work processes, computer technologies are considered promising for providing information and knowledge management solutions to support the framework of the new knowledge economy. Much research has been made to offer solutions and to study mechanisms of such processes. In this paper we present our research that is in the scope of Information Management domain supporting workgroup projects and is focused on a specific part of that process: management of group meetings and of the information related to them. We present our solution, explain it, compare it to other systems on the market, and show the positive value that our solution adds to everyday group work.

To draw diagrams in this paper we used Unified Modeling Language (UML) [8].

2. Meeting as a decision-making process

The application of computer technologies that aim to improve meeting effectiveness has been intensely studied in the past. Considerable experimental and field literature exists demonstrating that Group Decision Support Systems (GDSS) can improve both productivity and satisfaction for idea generation and decision-making meetings [7]. At the same time, several authors have suggested that the physical environment plays a primary mediating role in the meetings [4,5,9]. So when proposing a solution with computer mediation, it is important to understand the limits of the technological influence on the meeting's process. It would probably be an error to underestimate the importance of live communication. In order to understand the area of application for computer mediation, we took the approach described by M. Doyle and D. Straus [3] and separated the process of a meeting from its content, considering a meeting as a process whose content relates to decision-making. We studied different questions that were related both to the process (such as its optimality and efficiency) and to the content (quality of solutions, rationality of decisions). We concluded with the idea to implement technology support for the meeting process, to leave content-related questions to be managed by humans within a framework of live communication but to provide a means to capture ideas and decisions generated during meetings and conceptualize them storing in the Group Information Base. This approach supports both process and content management, and corresponds to the vision expressed by P. Cook et al. [1] that technology can positively change meeting culture if it is introduced and used in sensitive, socially responsible ways.

3. Target

A set of research questions that are of interest to our institute (EPFL-ICA) is positioned in the domain of Information & Knowledge management and CSCW. Particularly we are interested in improvement of workgroup efficiency with the help of technological support for management of group-related information. A group of people working together usually has a variety of common projects and information that relates to these common activities (See Figure 1). Within a projects framework, meetings of a group's collaborators are considered to be one of the most important events because many strategic decisions are made there and because

ideas and information from meetings are contributed to the Group Information Base. So, to improve workgroup efficiency, we need to improve the way group projects are performed (group meetings being important part of them) and the way group information is treated.

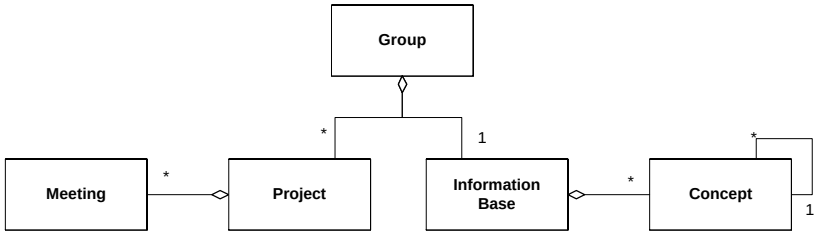

Figure1. Conceptual Model of Group Collaboration

Presented work is an attempt to provide technologically supported solution that helps people in a workgroup to deal with information related to their common projects. It supports different scenarios of group organizations including the case of geographically distributed workgroups. The solution positions workgroup meetings as a key concept within a project framework.

3.1. Origins

Presented work was originated by idea to tackle the problem of computer support for group meetings. This problem was proposed by Swisscom, the biggest Internet Service Provider (ISP) in Switzerland. They needed a solution to improve their regular project meetings automating standard processes such as for example production of meeting minutes document. From the other hand one of research directions in EPFL-ICA was dedicated to questions of groupware and CSCW since the initiation of the institute. The correspondence of interests originated a research project that is called “Meeting Automation Tool” (M.A.T.) and whose current results are described in this paper. Swisscom intends to use the results in their work and may be to offer the solution as a service to their clients within a framework of WWW services for small and medium size enterprises. First version of the tool is currently in use in EPFL-ICA.

According to the client requirements, several constraints were established from the outset of the project. In particular, it was assumed that:

- To use the tool, each of the meeting participants should have a PC or a laptop;
- The attendees may be present locally (in a meeting room, for instance) or at some remote location. A general case would be the meeting at some particular place where remote participation is allowed;
- There is one special role, the meeting’s chairman, who schedules meeting, creates the agenda and invites the participants;
- M.A.T. should be tightly integrated into an office software environment, that is to be easily used in combination with popular office software products;
- The tool should be designed to provide different levels of access to project-related information (see later in the Section 5.1). It was planned as a WWW based solution allowing functional integration with Personal Desktop Assistant (PDA) systems.

❑ 4. Standpoints

We began our research from an analysis of the current state of practical implementations in the area of GDSS. Many systems were checked during this study. After classifying the different available solutions, we can highlight two main approaches that they take.

The first approach implements sharing of the content related to meetings. The primary interest here can be, for example, to allow meeting participants to collaborate on the same content from different locations during their meetings. Audio and video conferencing, application sharing and meeting synchronization over distance are the problems that this approach attempts to solve. Microsoft Netmeeting and Lotus Sametime are probably the two most successful products that can be positioned here.

The second approach provides a computer-supported framework for the meeting process and concentrates on capturing the content of meetings. Here, in most of the cases, people are gathered in the same location during a meeting. Ventana Groupsystems is a successful example here.

These approaches are complementary, not only because they occupy different parts of a well-known 2x2 matrix that describes time-space conditions of meeting process, but also because they have a different attitude about meeting content. The former emphasizes interactive collaboration over shared content while the later emphasizes content management within meetings.

Our work can be positioned within the second approach. We implemented strong points that were found in other solutions and proposed functionalities that we didn't find in the products we analyzed. For example, Ventana Groupsystems concentrates on meeting process and has nice utilities to support it, but it doesn't consider the evolution of the meeting-related information from one meeting to another. We can view meetings as milestones within projects, and the information discussed during a meeting can very well represent the current state of the project. So the evolution of this information has a value since it gives a continuous representation of the project. In our solution we have tried to provide a means to work with meeting-related information not only during a meeting but also before and after.

5. Solution

5.1. Information Management foundations of the tool

In parallel with our investigation of the state of practical implementations in the area of GDSS, we also have spent some time studying its theoretical foundations. As a result of this research we built a model shown in Figure 2, which represents the domain of Information Management from the perspective of activities that can be performed in it.

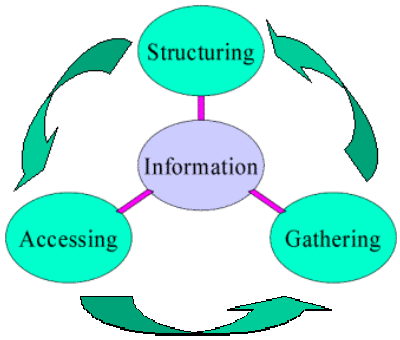

Figure 2. M.A.T. Use Case Diagram

The model shows a cycle of activities that are performed by collaborators in information-driven workgroups. Information itself is a central point of the model. People in everyday life are surrounded by numerous factors and events that offer an *Access* to information related to their ideas and activities. Every event, as soon as it can be considered relevant with regard to particular interests of a person or group, carries certain informational potential, that is to be consumed. Once a relevant piece of information has been obtained it needs to be combined with other pieces that are coherent with each other. *Gathering* of pieces combines together their informational potentials. It continues until the overall potential becomes significant enough to be realized by the person or group, in other words, for the idea that was behind the informational potential to be understood. Here, a physical analogy with Ohm's law may be very well applied: the bigger the resistance of a person or group against the realization of information, the bigger the informational potential is needed to generate the realization. As soon as an understanding of an idea is triggered, it needs to be saved for future applications. The *Structuring* of understanding (understanding being *the way* concepts are understood) can help in the storing the

experience that is being accumulated. Structuring is just a convenient way to memorize what once was realized. The accumulated experience is then available for future access.

This model presents our vision of work with information in everyday life. The ideas highlighted for the Gathering part are exploration on experiential learning, which was studied by different authors, for example [2,6]. We designed our tool in correlation with the presented model. The core function of M.A.T. is to provide the means for the Gathering of information, more concretely, for collecting workgroup-related information through the evolution of a project. It is applied in workgroup meetings that are considered as milestones in a project timeline. The tool implements interfaces for Structuring and Accessing parts of the Information Management model. For Structuring it is linked with Group Structured Information Base, which is designed to help people conceptualize information by means of Concept Maps [6]. All information collected with M.A.T. goes to this Information Base, which is shared within the group. For Accessing, the tool supports different levels of information access such as Individual, Group and Community levels mapped to PDA, Intranet and Internet.

From the beginning of our work the intention was to build a software tool that would be voluntarily used by people in their projects helping them to collect project-related information, supporting structuring of it (e.g. conceptualization) to allow better realization of informational potential that is carried by project-related events such as meetings. This approach adds value to the traditional way of information treatment since it helps attain a better understanding from the same amount of information. Another interesting point, which was confirmed in practice, is that collaborative building of concepts from the captured information in the Group Information Base helps create a shared understanding of the concepts within a group.

5.2. Process and activities

Figure 3 introduces a state diagram that represents a process supported by M.A.T. We can distinguish two parts: one of them is related to the project evolution, another to the meeting itself. The state diagram shows consecutive steps, which are performed in project, together with their stereotypes. The stereotypes represent sequence Information – Conceptualization – Action – Reflection, which is repeated iteratively in the process of project development. This sequence was taken from findings of Xavier Gilbert and to be published by Irwin Publishers: X. Gilbert, “Competing with Information”. A similar paradigm was expressed earlier by Jean Piaget [10].

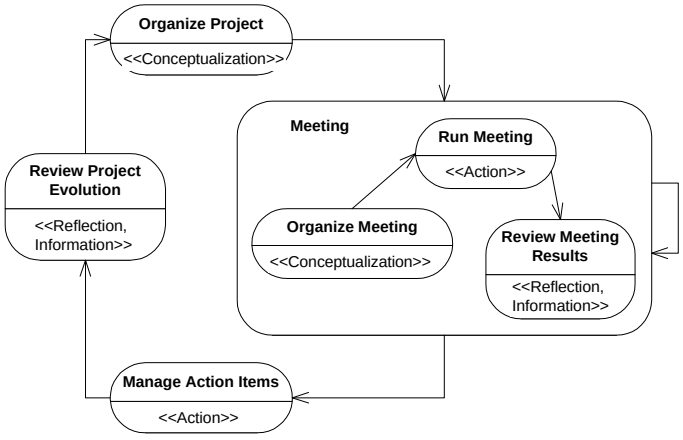

Figure 3. M.A.T. State Diagram

The state *Organize Project* represents part of the tool where a user can either organize a new project, including its name, description, participants and initial agenda, or change the organization of existing one. This state can be mapped to the *Conceptualization* part of the process. Projects can be considered as concepts, within a workgroup, that are either created or modified according to their previous evolution.

After conceptualization was performed, we can start acting on the concept that was developed. Here we move to project meetings that can be considered as a significant part of these actions. While being an action within a project, a meeting itself is a concept, and is separated in states within our tool. *Organize Meeting*, *Run Meeting*, and *Review Meeting Results*, – are the states that correspond to time phases: before, during and after a meeting. Meeting organization includes scheduling of meeting and its resources, creation of agenda, and sending invitations to participants. The running of a meeting implements collecting of the participants' opinions that are expressed during a meeting and assigning action items within a project to corresponding responsible people and with a due date. To review meeting results, users can read meeting minutes documents that are generated automatically after meetings, and review actions assigned during meetings. The last activity goes beyond the scope of the meeting concept. Manipulation with action items also contributes to a project lifecycle. An action is a concept by itself. It can be carried forward from one meeting to another; can have different statuses: not begun, completed, due, overdue; its statement can be modified over time. So in the tool we implemented a separate part, *Manage Action Items*, that supports all these aspects.

According to the described sequence of stereotypes, after making these different activities for a project, users pass to the *Reflection* and *Information* phases, which correspond to the *Review Project Evolution* state. Here the tool provides users with different views of project development over time. Dynamics of changes in a project's agenda, traces of project actions, and a timeline of key decisions may help to understand a current project's results and to make appropriate conclusions on its future development. The Group Information Base, which is complementary to the tool, should be also employed on this step, making use of the concepts that were contributed to it through a projects' evolution.

The tool implements Use Cases corresponding to the described states; they are shown on the Use Case diagram at Figure 4.

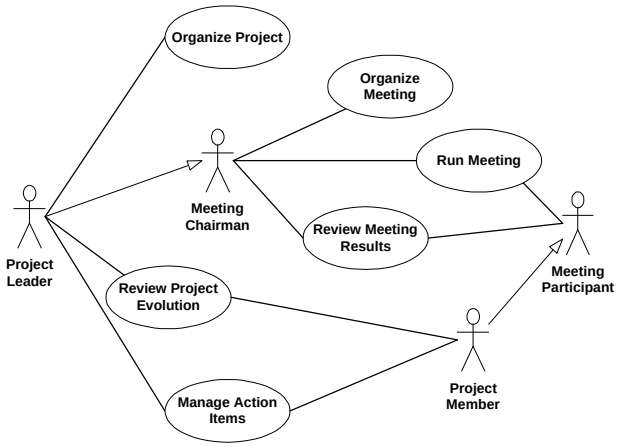

Figure 4. M.A.T. Use Case Diagram

Actors involved in the process are: *Project Leader*, *Project Member*, *Meeting Chairman* and *Meeting Participant*. Their relationships and actions with respect to the use cases are also shown on Figure 4.

5.3. Structure and Functionality

Conceptual model on Figure 5 extends the structure of concepts from Figure 1 with concepts implemented by M.A.T.

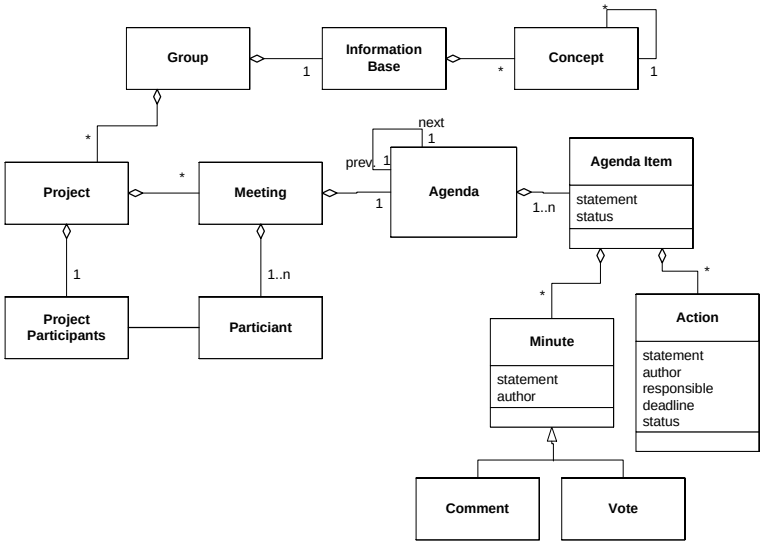

Figure 5. Conceptual model of M.A.T.

Each *Project* has *Project Participants* and a set of *Meetings*. A meeting of a project has its *Participants*, who are at the same time participants of the project, and an *Agenda* that is produced taking into account the agenda, which is previous to it in the project. *Agenda Items* contribute to the meeting's agenda and consist of the *Minutes* and *Actions* that are entered during the meeting. The minutes themselves can be of different kinds, such as *Comment* or *Vote.*

Meeting participants use all the concepts that compose the concept of meeting. They can participate with their comments and decide to assign an action. All contributions during a meeting are authored by their corresponding contributors. An action has its responsible person, status, and, optionally, deadline.

Figure 6 presents meeting-related Use Cases from Figure 4 that consist of different activities that are performed before, during and after a meeting. All of them are implemented in M.A.T.

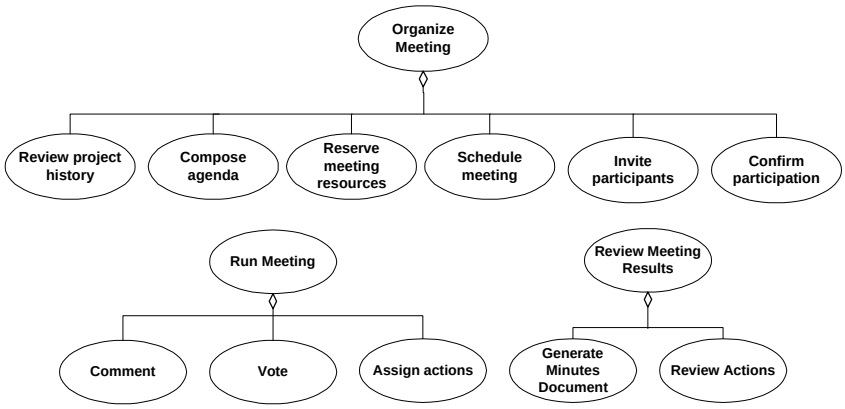

Figure 6. Implemented meeting-related Use Cases

5.4. Architecture and Implementation

As mentioned in Section 3.1 several constraints were set from the beginning of the project, specifically M.A.T. was planed to be tightly integrated into an office environment that is to be easily used in combination with popular office software products. According to the detailed analysis of the client requirements it was decided to

implement the tool on MS Windows platform integrating Microsoft technologies to support the presented functionalities. Today this is a reasonable choice since it is made in favor of the most popular software platform and allows us to implement all of the targeted functions, including support of different levels of information access, namely WWW and PDA systems. It also allows users to benefit from complementarity of M.A.T. and MS Netmeeting (see Section 4): using them together during a meeting - the former to support information gathering and conceptualization, the later for application sharing.

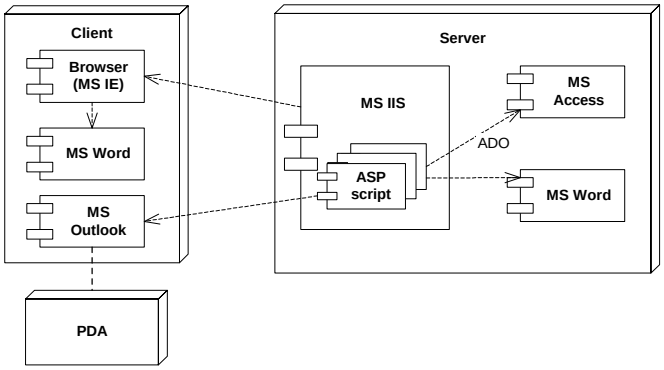

Figure 7. Architecture of M.A.T.

Keeping in mind the described use cases, the conceptual model and the technological constraints, we came up with solution for the system architecture that is presented on Figure 7.

The client part of the tool assumes that users have a WWW browser, such as MS IE, installed on their PCs. With the aid of a browser via HTTP, clients access the main application based on a server computer that runs MS IIS as a WWW service.

The application consists of set of HTML pages with ASP scripts residing on them. These scripts are responsible for all use cases from Figure 4. Most of the scripts perform interface between users that interact with HTML pages and database that structures and stores meeting-related data. This interface is implemented with ADO; the database is done in MS Access.

The automatic generation of meeting minutes is another application of ASP scripts in our system. It requires an integration of the tool with a word processor, such as MS Word in our case. When a user wants to generate the document he clicks the corresponding button in the meeting window in his browser. The corresponding ASP script, by means of MS Word objects, generates the document from a special pre-made template on the server site, then the web server transfers the generated document to the client. The drawback is that users who don't have MS Word or corresponding viewer software installed on their computers are not able to view the document on-line.

Another application of ASP scripts is the integration of the tool with MS Outlook by means of Outlook object model. These scripts allow users, particularly the Meeting Chairman, to generate and send automatically special e-mail messages that represent invitations for new meetings, and actions that were assigned during a meeting. Users that have MS Outlook on their computers get after that new meeting scheduled automatically in their calendars and receive actions formatted as tasks in Outlook Tasks folder. In such a way, by means of MS Outlook, synchronization of tasks and scheduled meetings can be performed between M.A.T. and PDA systems such as Palm Pilot. Users without MS Outlook receive regular e-mail messages generated with the aid of the tool, which contain information about an action or a new meeting.

As an example Figure 8 shows sequence diagram for procedures that are performed when new meeting is organized.

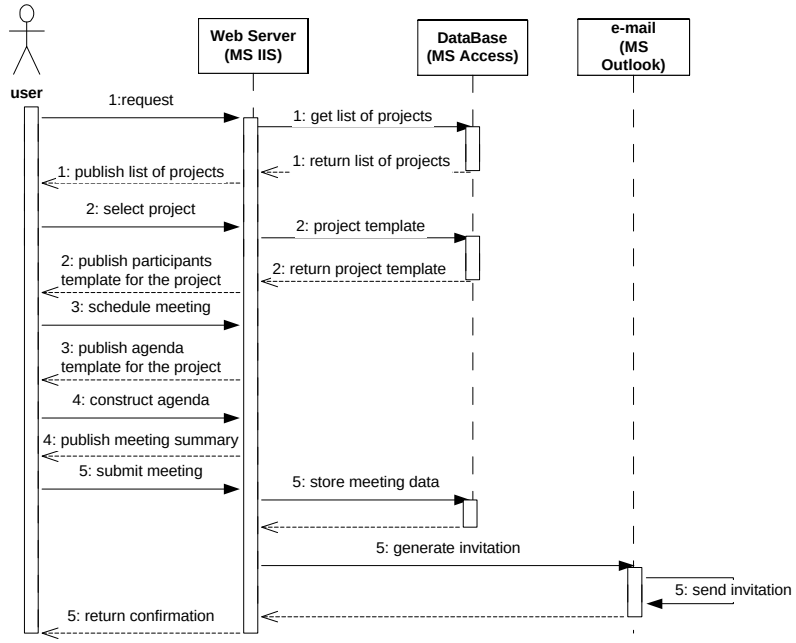

Figure 8. Scenario of organizing new meeting

6. Contribution

M.A.T. solves problems of information gathering during workgroup meetings and offers a means for future management of captured information within the scope of the process that was described in Section 5.2. It also gives means to include project-related information in the Group Information Base for further conceptualization for exploration of given information as it was described in Section 5.1.

Our system adds value to project management, since it provides tools for observing timeline of projects from one meeting to another, considering evolution of a project's agenda and changes of status of project's tasks.

Architecture of the system allows integration of popular e-office software components and presents it on the WWW. It supports not only a web based (Internet) level of information access but also personal (mobile) access with the aid of PDA systems.

The solution is complimentary to the products like MS NetMeeting and Lotus Sametime.

7. Future improvements

The present version of M.A.T. is used currently for research and educational projects at EPFL-ICA. Continuous feedback from real users allows to constantly improve the system. Now we can highlight several directions for future work.

In practice, it was observed that the concept of project agenda has significant importance with respect to many others. Now we are working to implement semi-automatic generation of an agenda having the previous agenda and a set of corresponding action items. We expect that further experience will show how agenda mining might be used to analyze project situation.

Support for reflection on the process with possibilities to adjust it to the needs of a particular project might be introduced in the tool in addition to the existing reflection on the content (see Figure 3).

Also we plan to explore in detail the possibility of a more extensive integration of the tool with PDA systems allowing the availability of interface for all project-related information at one's fingertips.

8. Conclusions

The designed solution provides different applications of computer mediation and automation for the process of workgroup meetings. It supports gathering of meeting-related information and offers different representations of the collected information. The representations give traces of a project's evolution and help in efficient use and application of the meeting-related data. Frequently these data, such as assumptions supporting decisions, evolution of project agenda and actions over time, etc, remain unfairly without demand in real life. Our system helps to realize their applications. In such a way presented solution not only supports the process of workgroup meetings but also provides an additional value to meeting-related information.

The system implements an interesting approach, presenting meetings that happen in everyday group work as milestones in the timeline of the projects that they contribute to. All data associated with these milestones contribute to the Group Information Base, represent evolution, informational concepts, and know-how of the project, and once collected can be applied as shared experiences in everyday group work.

The presented tool supports the process of a project's evolution in workgroups, contributes to Information Management for the project's content, and, if further intensive field trials will prove its value, may be promoted for everyday use in industrial companies such as Swisscom.

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