

**A Descriptive Framework for Electronic
Meeting Systems Based on the UML
Language**

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A Descriptive Framework for Electronic Meeting Systems Based on the UML Language

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Abstract. A descriptive framework has the purpose of identifying the major components of a system and their relationships. This paper proposes a descriptive framework for electronic meeting systems. Our intention is to clarify and organize the conceptually and functionally distinctive components that we find in this technology. The proposed framework simplifies the evaluation of EMS functionality by organizations. The adoption of the UML language increases the potential of communicating EMS requirements to IS developers. The paper presents the evaluation grids of a collection of 10 EMS highlighting what framework components are supported and what components have been ignored.

1 Introduction

The generic objective of Electronic Meeting Systems (EMS) is to improve meeting processes and outcomes. EMS have the potential to remove many limitations associated to the information that people use in meetings, improving manipulation, modelling and sharing, supporting more information sources, parallelism and dynamism. EMS have also the potential to change the traditional meeting processes, either by increasing participation, stimulating collaboration, guiding individual and group tasks to assure coherent results, or avoiding conflicts.

However, the laboratory and field results are mixed and ambiguous (Fjermestad & Hiltz 1999). Most of the problems are attributed both to the complexity of the problem and to the complexity of the research setting (Briggs & Vreede 2001). To some extent, the situation may also be attributed to the complexity of the technology: sometimes distributed (in time and space), linking many users with distinct abilities, supporting many different hardware and software configurations, supporting different tasks and functionality, forcing people to plan in advance the system use, and sometimes requiring experts to manage and use the technology in benefit of the users.

In this paper we will attempt to define a baseline for EMS. We will specifically analyse the different elements that make up an EMS – independently of the technology – categorizing the relevant properties of each element and identifying the relevant relationships between those elements.

The results from this process of analysis make up a descriptive framework consisting of three packages: (1) agents and roles; (2) the meeting process; and (3) the meeting resources.

The paper is organized as follows. The next section presents some goals and related work. The following section is dedicated to establish the context of EMS within the larger scope of the organizational system, thus defining the perimeter of the problem that we are describing. Then, the paper characterizes the three packages mentioned above. Next, we illustrate how the proposed framework can be used to compare the functionality of different EMS. Finally, we present some conclusions about this work.

2 Goals and Related Work

One issue to ponder, when analysing EMS, concerns the different domains where the analysis process itself may take place. There must be a clarification about what is pertinent to analyse and include in the framework, and that depends on the selected domain or viewpoint. Miles and Huberman (1994) describe analysis as a process with interwoven tasks of data reduction, display and verification. Furthermore, Miles and Huberman (1994) highlight an analytical progression associated to the analysis process: one that goes from descriptive to explanatory conclusions about phenomena.

We will adopt this view to make a distinction between EMS descriptive and explanatory frameworks. An EMS explanatory framework seeks to explain “how” and “why” EMS improve meeting processes and outcomes, while an EMS descriptive framework seeks to explain in detail “what” an EMS is.

Several researchers have already defined explanatory frameworks for EMS. One such approach regards meetings as production systems, with inputs, processes and outputs. This approach was proposed by Pinsonneault and Kraemer (1989) and later adapted, extended and enhanced by others (e.g. (Nunamaker, et al. 1991a; Tung & Turban 1998; Fjermestad & Hiltz 1999)).

Our goal is to build a descriptive framework that complements explanatory frameworks since, usually, it is hard to explain something satisfactorily without describing in detail what it is (Miles & Huberman 1994). Thus, our first goal delimits the domain of the descriptive framework:

Goal #1 – Define a descriptive framework for EMS. The descriptive framework will seek to describe EMS is.

In more detail, the descriptive framework is essentially preoccupied with the identification and categorization of the conceptually and functionally distinct elements of EMS, as well as their presumed relationships. Our second goal establishes the outcome of the descriptive framework:

Goal #2 – Provide detailed descriptions of EMS relevant elements. The descriptive framework clarifies and organizes EMS functionality, addressing the issue of complexity at the conceptual level.

Many authors have identified relevant elements in EMS. Hoffer and Valacich (1991) identify the organizational memory elements associated to EMS. Aiken, et al. (1991) identify a collection of fundamental EMS components including a database, model base, interface, network, facilitator and user. Bui and Jarke (1986) characterize the functionality of the communication manager. Jacob and Pirkul (1992) define a framework specifically focussing on group decision making, with three major components: language system, group problem processing system and group knowledge system. Silver (1991) proposes a taxonomical view with three major

different perspectives that are of interest to designers and users: interface, functionality and holistic attributes. Zigurs and Buckland (1998) offer a definition of task and overview different classifications of tasks in a group context. Rao and Jarvanpaa (1991) present a categorization of EMS technology in three different features: support to improved communication, support to increased participation and computational support for tasks (information processing). Nunamaker, et al. (1991a) characterized four major EMS mechanisms: process support, task support, task structure and process structure. DeSantis and Gallupe (1987) categorized EMS technology in three levels of increasing complexity: level 1 systems facilitate information exchange among the participants; level 2 systems provide decision modelling and group decision techniques; and level 3 systems support machine-induced group communication patterns and can include expert advice. Kraemer and King (Kraemer & King 1988) characterize EMS as a socio-technical package, comprising hardware, software, organizationware and people.

We have not yet seen a proposal to specify an integrated view of these elements, building up a descriptive framework. Yet, such integrated views have been developed in other fields. For instance, the Dexter Hypertext Reference Model (Halasz & Schwartz 1994) defines a set of components that capture the relevant abstractions for hypertext systems. The Dexter model serves as a basis for terminology, for comparing different hypertext system designs and even for assessing conformance with the reference model. The goals behind the Dexter model motivated our intentions to develop a baseline for EMS:

Goal #3 – Define a baseline for EMS. The baseline will define a terminology, facilitate the evaluation of different EMS and allow making comparisons.

One of the endeavours of modelling is to provide templates, and we hope that the proposed model elements may be reusable in the future. Reusability requires a higher level of abstraction though, and thus the baseline will describe EMS elements at the highest level of detail.

The proposed descriptive framework will use the UML language, commonly accepted and understood by software system builders. By offering UML descriptions of EMS functionality we hope that in the future at least parts of this functionality may be more pervasive.

3 Meeting and Organizational Systems

Considering an information systems view, we may regard organizations consisting of systems that structure and accomplish work using different forms of communication and coordination mechanisms (Malone & Crowston 1994). These mechanisms include workflows, plans, direct supervision, rules and procedures, training sessions and, inevitably, meetings (Figure 1). All these different mechanisms must interact with each other in order to support organizational goals, but a characterization of such interactions is outside the scope of the meeting system since it depends on many organizational factors such as culture, rules, objectives, formal and informal structures, institutionalised practices, market climate, etc. (see e.g. Mintzberg (1979)).

Fundamentally, our intention in separating the meeting from the organizational systems is to make a clear separation of what pertains to the meeting from the factors related to the organizational system.

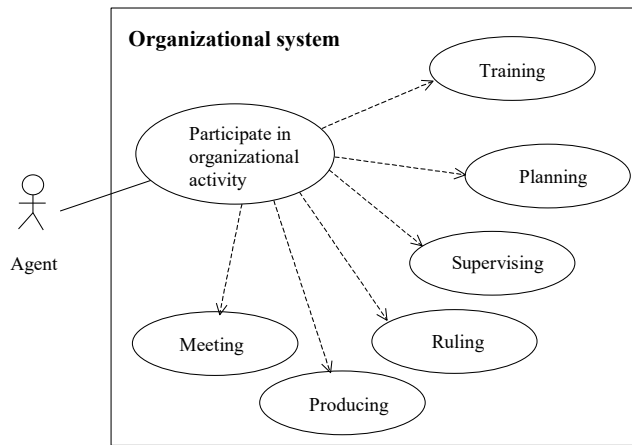


Fig. 1. Meetings as part of the organizational system

4 Meeting Agents and Roles

We portrayed meetings as one of many coordination mechanisms available to organizations. Another definition, more focussed on the inner details, describes meetings as communicative processes accomplished by a group of people, in which the group tries to accomplish specific objectives.

An essential aspect of the communicative process is associated with the agents involved in the meeting and their roles. Five different agents should be identified: sponsor, facilitator, participants, secretary and organisational agents. Three of these agents are directly involved in the meeting sessions (facilitator, participants and secretary, see Figure 2), while the other two are only indirectly involved in the meeting.

In Figure 3 we present the use cases associated with the meeting agents and, in Figure 4, we identify the classes that make up the agents and roles package. Next, we will describe the different roles in more detail.

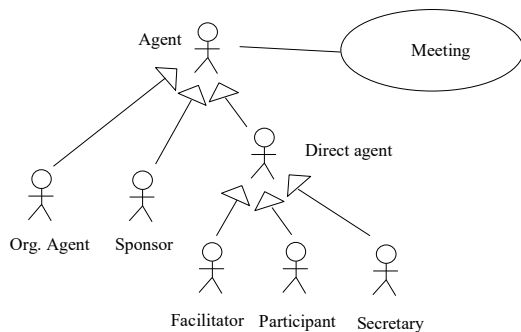


Fig. 2. Intervening agents

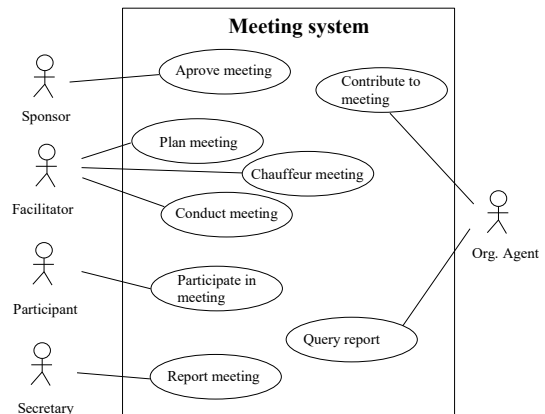


Fig. 3. Agents and roles

Participant

The participants are those people that intervene in the meeting, producing and sharing various types of information such as ideas and comments. The participants have two attributes that are within the context of the meeting system: qualification and status. The personal attitudes towards the group, meeting, or meeting results are beyond the scope of this package. The number of participants is something that generically characterizes meetings in different genres, such as task forces, assemblies, commissions or committees (Jay 1976), and so should be an attribute of this package.

Facilitator

The facilitator is an agent, accepted by the meeting participants, who carries a vast set of facilitative functions (Bostrom, et al. 1993; Clawson, et al. 1993): (1) Promoting a sense of belonging and responsibility; (2) Demonstrating self-awareness/expression; (3) Selecting and preparing the technology; (4) Hearing, clarifying and integrating information; (5) Developing and asking the right questions; (6) Maintaining the group targeted in the results; (7) Creating comfort with technology; (8) Creating an open and positive atmosphere; (9) Building harmony and relationships; (10) Presenting information to the group; (11) Demonstrating flexibility; (12) Planning and developing meetings; (13) Managing conflicts and negative emotions; (14) Understanding technology and its capacities; (15) Encouraging and supporting multiple perspectives; and (16) Directing and managing the meeting.

The manner in which this role delivers its facilitative support to the meeting can be classified in the following categories: user driven (UD), when the facilitative functions are available to all meeting participants and thus there is no person specifically assigned to this role; facilitator-driven (FD), when there is one person designated to assume this role; and chauffeur-driven (CD), when the person designated to assume the facilitation role only manages the technology but not the process (Dickson, et al. 1993).

The role of the facilitator is fundamental to the meeting process, and may contribute in a decisive way to its success (Nunamaker, et al. 1997; Clawson, et al. 1993; Jay 1976). Thus, it must be explicitly considered by the meeting system. From the set of 16 categories mentioned above, we define in this package three major aggregated behaviors and corresponding use cases (Figure 3):

- Plan the meeting session
- Conduct the meeting, maintaining and updating the agenda
- Provide technical support to the meeting (chauffeur the meeting (Clawson, et al. 1993))

Note that, since the same actor may exercise facilitative and participative roles, there is no need to consider content interventions in this package, such as asking the right questions or presenting information to the group.

Secretary

The secretary takes notes and produces a meeting report (The 3M Meeting Management Team 1994). One fundamental aspect to consider in this role is the type of technology available to take notes and produce reports, since this functionality may

be centralized or distributed (carried out by a group of people); and user-intensive or automated (Aiken, et al. 1991; Aiken & Vanjani 1998).

Sponsor

The sponsor is a fundamental, although sometimes neglected, element in a meeting. The sponsor is the “owner” of the meeting and, ultimately:

- Is the repository of the meeting objectives;
- Defines and clarifies the meeting objectives;
- Approves the meeting agenda, set up by or in collaboration with the facilitator;
- Provides an interface between the organization and the meeting system;
- Queries the meeting outcomes.

Organisational agent

The organizational agent is someone that, although being external to the meeting system, like the sponsor, sends information into the meeting or is affected by the meeting outcomes.

The type of information managed by the organisational agent is relevant in the context of the meeting system, considering the issue of organizational efficiency and flexibility.

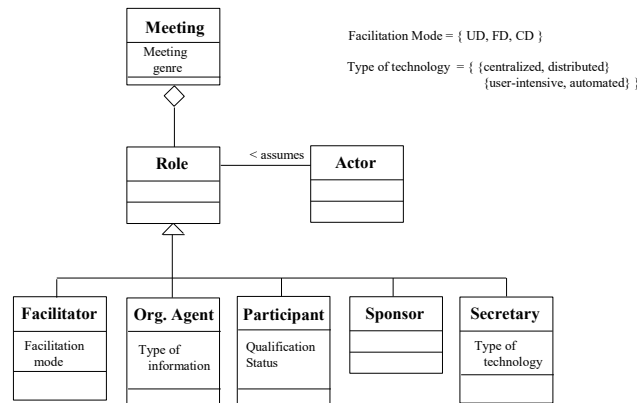


Fig. 4. Actors and roles in meeting systems

5 Meeting Resources

We consider two fundamental components in the meeting resources package: logistics and group memory (Figure 5).

Logistics

The meeting logistics includes generic meeting facilities, such as physical rooms, tables, chairs, computers, networks, tables, or liveboards (Wagner, et al. 1993). The possible different arrangements can be categorized in: meeting facilities, research laboratories, computer-based classrooms, distance learning facilities, software training facilities and internet training facilities (Jessup & Over 1996).

One intrinsic characteristic of meetings, which is related to logistics, is the definition of time and place of the meeting. This classification affords defining the following meeting settings: STSP (same time/same place), STDP (same time/different place) and DTDP (different time/different place) (Beise, et al. 1992). One more category has been added to this typology, designated ATAP (any time/any place) to classify situations that cannot clearly be confined in one of the other categories.

Another characteristic of meetings is the communication mode. In the absence of technology, the communication mode will be Face-to-Face (FtF). Electronic meetings, however, may support other modes (Fjermestad & Hiltz 1999):

- Group Support System (GSS) – This situation uses software tools that structure communication and assist group decision (such as voting tools);
- Computer Mediated Communication (CMC) – This type of technology supports group discussions through messages exchange (such as chat systems);
- Decision Support System (DSS) – A Decision Support System comprises single-user software and a single computer, shared in a FtF setting. This technology may also be designated chauffeured technology (Clawson, et al. 1993).

The combination of different technologies to support meetings has been considered influential to assert group productivity. Thus, it is necessary to characterize in more detail the particular room configuration, or roomware. Roomware may be classified in (Streitz, et al. 1997): individual workstations in a network (WS); a liveboard configuration, with one single computer (LB); and a combined situation, with individual workstations plus a liveboard connected in a network (WS+LB).

Finally, one should also consider the level of support provided by the technology. This characteristic was defined by DeSantis and Gallupe (1987) and includes: Level 1 systems facilitate information exchange among members of the group; Level 2 systems provide decision modelling and group techniques; Level 3 systems support more complex processes of negotiation, and can include expert advice. To this classification, Fjermestad and Hiltz (1998) added a level 0, which considers some types of technology that offer very low group support. For instance, chat systems that allow users to see a few lines of text exchanged between users are classified in level 0.

Group memory

The group (or organizational) memory concerns the shared information resources that the group uses to accomplish work. The major attributes of group memory items are (Orlikowski & Yates 1998): the purpose of the item; its contents; media used; who is involved in producing the item; when was the item produced and where should the item be produced or used.

We shall take into account the agendas, meeting reports and support documents. The agenda is considered a critical element to manage meetings successfully since meetings tend to crystallize their actions around it (Niederman & Volkema 1996). The agenda may have two different types of information: the list of topics or goals that the group must deal with; and the series of steps that the group must execute in order to accomplish their goals. Agendas including a list of steps are very rare and, in fact, frequently meetings are based on no agenda at all (Romano & Nunamaker 2001).

The reports are the visible result of meetings. The most common form of meeting report is the meeting minutes, but other documents may be produced as well, such as action plans. The meeting reports are characterized by their structure and format. The structure facilitates the aggregation of items in a report. These items present a certain

content that results from the interactions of the meeting and is linked to the meeting agenda.

In what concerns technology use, one should consider four different report formats:

- Automatically generated transcripts of information exchanged during meetings (e.g. persistent conversation);
- Automatically generated summaries, such as voting results;
- Meeting data formatted to support visualization by the participants, reporter, sponsor and organizational agents (Nunamaker, et al. 1991b; Raikundalia & Rees 1995b; Raikundalia & Rees 1995a);
- A collection of group memory components, typically generated during meetings, such as dictionaries or formal definition lists. These components support complex group memory management. For instance, a browsing tool allows the users to move through the meeting memory, enlarging in a specific area to obtain details, or zooming out to have a high level vision of meeting data (Nunamaker, et al. 1991b).

In what concerns documents used to support the meeting, they can be essentially of three types:

- Base Documents – The documents that will be affected by decisions taken in meetings, for example a management report submitted for approval.
- Support documents – The documents used to directly support the decisions taken in meetings. For example, in an investment decision, a viability study would be a possible support document.
- The context documents necessary to characterise or explain the meeting process. For instance, some meetings, such as parliamentary meetings, follow a regiment, and that regiment is necessary to explain the meeting process.

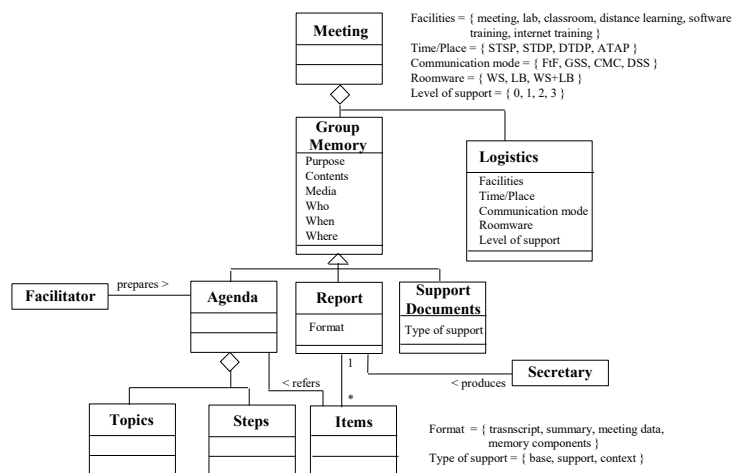


Fig. 5. Meeting resources

6 Meeting Process

There are many processes going on during meetings, such as decision, facilitation, conflict or learning. However, the meeting process deals with the set of issues discussed in meetings and corresponding activities organized towards a common goal.

The generic subject, objectives and status characterize the meeting process. Concerning status, a detailed analysis of meetings allows verifying that the process begins before the meeting session and has repercussions later on. Thus, the meeting process is composed by activities preceding the meeting session, by activities accomplished during the session and by activities that happen after the meeting session. Before the session, one should include meeting proposal, approval, planning (including definition of topics, goals and selection of participants) and invitation. During the session, we primarily find content interventions and process interventions, although some other tasks may be found as well, such as group development or strategy formation.

After the session, one should consider meeting assessment, report production and distribution, and progress review.

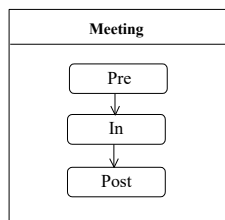


Fig. 6. Meeting status

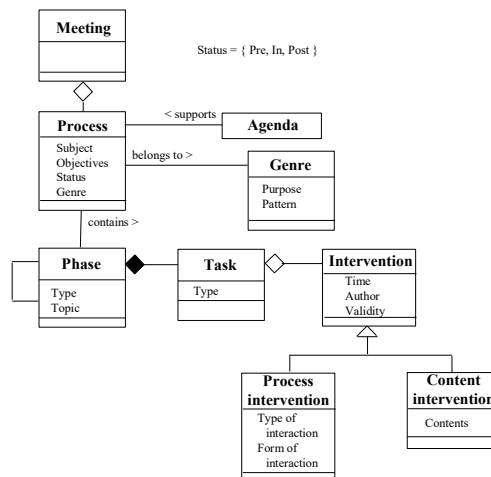


Fig. 7. Information systems support to the meeting process

The meeting process characterises the group activities at the following levels:

- The meeting as a whole;
- The decomposition of the meeting process in phases and tasks;
- The elementary components of meetings, such as the individual interventions or comments.

The first level allows characterizing the details of meeting processes while maintaining the perspective of the whole. One example is given by the genre approach (Orlikowski & Yates 1994). The genre approach regards a meeting as a pattern of recurrent communicative actions including logistics, agenda, the meeting itself and the meeting report. This approach allows typifying and characterizing meetings like briefings, progress report meetings, staff meetings and management meetings in terms of purposes and communication patterns.

The second level deals primarily with decomposition. The decomposition of meeting processes in several steps is a logical approach, recurrent in literature, to address complexity. According to this view, there exists a goal and a wish to maximize some utility function, and there is some systematic way to accomplish the task (bounded by considerations of time and cost; (Simon 1997)). Planning is a good example of such a systematic approach, where the group has to identify what actions should be taken, by whom, when, what resources are needed and how can success be measured.

Basically, process decomposition can be done in two different angles. The first one is partitioning a task in a set of successive phases. For instance, Kaner (1996) proposed a generic process consisting of divergent, groan, convergent and closure phases. Another example is Schwarz's (1994) nine-step model: define the problem; establish criteria for evaluating solutions; identify root causes; generate alternative solutions; evaluate alternative solutions; select the best solution; develop an action plan; implement the action plan; and evaluate outcomes and the process.

The second angle to consider is partitioning a task in a set of lower-level tasks. For example, McGrath's typology (1984) defines four main tasks: (1) generate (ideas or plans); (2) choose (logic or preference); (3) negotiate (criteria or interests); and (4) execute (competition or performance). In another example, Briggs and Vreede (Briggs & Vreede 2001) identify the following basic patterns that may assemble a meeting process: diverge, converge, organize, elaborate, abstract and evaluate.

Finally, the meeting process can also be characterized at an elementary level, according to the individual interventions produced by the participants and facilitator. These interventions can be categorized in process and content interventions (Miranda & Bostrom 1999). Defining the agenda, inviting the participants, opening and closing the meeting sessions, or tracking the agenda, are a few examples of process interventions.

An example of the characterization of the meeting process as a collection of content interventions is given by the IBIS argumentative structure (Conklin & Begeman 1988). IBIS (Issue-Based Information System) was developed to provide a simple yet formal structure for the discussion and exploration of wicked problems. Wicked problems, as opposed to tame, do not yield to the traditional approach to problem solving, which is to gather data, analyse the data, formulate a solution and implement the solution. With a wicked problem, the understanding of the problem is evolving along with the work on a solution.

The other attributes to consider in process interventions are:

- Contents – corresponds to what is really transmitted to the group.
- Time – An attribute of great importance to an intervention is the moment when it is produced. Based on this attribute, we can identify a set of characteristics of group communication. On the one hand there is the technical aspect of synchronous and asynchronous communication. On the other hand, associated to the time stamp, there exists the possibility of supporting simultaneity or parallel interventions. This possibility may contribute to improve some group activities, like idea generation, reducing the blocking effect (Gallupe, et al. 1991a; Gallupe, et al. 1991b).
- Author – The person that produces an intervention may be identified or not. This factor can have an important role in the process results. Several researchers have

reported the effects of anonymity in the interaction process (e.g. (Jessup, et al. 1990; Connolly, et al. 1990)).

- Validity – Associated to an intervention, we can identify a factor that is designated validity. The validity corresponds to the time during which the intervention can be accessible. The validity will have repercussions on the organizational memory.

In Figure 7 we present the classes that allow specifying meeting processes at the different levels of detail discussed above. The proposed structure is generic and avoids adopting any particular policy to specifying phases or tasks. Ultimately, the meeting process may just consist of a collection of process and content interventions.

7 Using the Framework to Evaluate EMS Functionality

In this section we describe an evaluation action of several EMS. This action analysed the following systems and tools:

GroupSystems (Dennis, et al. 1988), SODA/Decision Explorer (Eden 1989), MeetingWorks (Lewis 1987), Expert System Planner (Bostrom, et al. 1990), Idea Consolidator (Aiken & Carlisle 1992), Automated Facilitator Agent (Aiken & Vanjani 1998), LoganWeb (Raikundalia & Rees 1995b; Raikundalia & Rees 1995a; Raikundalia & Rees 1996), Cire (Romano, et al. 1999), D-Plan (Antunes & Ho 1999; Costa, et al. 1999), Jobber (Kazman, et al. 1996).

The classification grid was constructed from the framework components described in this paper, organized around the agents and roles, meeting process and resources packages. The roles and procedures package was not evaluated.

Roles	GroupSystems	SODA / Decision Explorer	MeetingWorks	Expert Planner	Facilitator Agent	Idea Consolidator	LoganWeb	Cire	D-Plan	Jobber
Sponsor				1					1	
Facilitator	1	3	1	3	3	3			2	
Participant	2	1	2		2	3		1		
Secretary	1	1	1				2			2
Organizational agent							1			1

Table 1. Agents and roles

Considering that the meeting process package is generic, for this evaluation action we had to stipulate the intended level of detail. We adopted a compromise between a very detailed decomposition of the meeting process and no process at all. The adopted meeting process considers three major phases: pre, in and post. Furthermore, the in phase is decomposed in three other phases: start, follow and stop agenda.

The resulting classification grid identifies a total of 61 framework elements, shown in Tables 1-3. In order to characterize the level of support to these framework elements provided by each system and tool we adopted the classification in Levels 1, 2, and 3 from DeSantis and Gallupe (1987) mentioned in section 2.

Phases		Tasks	GroupSystems	SODA/Decision Explorer	MeetingWorks	Expert Planner	Facilitator Agent	Idea Consolidator	LoaganWeb	Cire	D-Plan	Jobber	
Pre		Revise previous meeting											
		Define problem				1					1		
		Develop objectives				1					1		
		Define participant roles	1	1	1	1							
		Select tools	1	1	1	2					2		
		Prepare room											
		Invite participants	1		1								
	Brief participants	1		1	1						1		
In	Start	Clarify meeting objectives	1		1								
		Review agenda	1		1		1						
		Review tools	1		1		1						
	Follow agenda	Monitoring meeting	1		1		1						
		Force phases and tasks	1		1		1						
		Task: generation	1	2	1		1				1		
		Task: structuring	1	2	1		1				1		
		Task: voting	1		1		1	3			1		
		Focus on process	1		1		1						
		Focus on task	1		1		1						
	Register information	1		1									
	Stop	Sumarize meeting	1		1				2	1			2
		Review meeting											
Define next steps													
Post	Produce report	1	1	1					1			2	
	Identify organizational agents												
	Distribute report												
	Evaluate meeting												
	Communicate next step												

Table 2. Process

Resources	Attributes	GroupSystems	SODA/Decision Explorer	MeetingWorks	Expert Planner	Facilitator Agent	Idea Consolidator	LoganWeb	Cire	D-Plan	Jobber
Logistics	Facilities	1								2	
	Time/place	1		1						2	
	Communication mode	2		1							
	Roomware										
	Level of support	2		2						2	
Agenda	Purpose	1		1						2	
	Contents	2		1						2	
	Media									2	
	Who	1		1							
	When	1		1						1	
	Where	1		1						1	
Support docs.	Purpose							2	2		
	Contents	1						2	2		
	Media							2	2		1
	Who	1	1								1
	When	1	1								1
Meeting	Purpose	1	1	1				1			
	Contents	2	2	2				1			1
	Media							1			
	Who	2	2	2							
	When	1	1	1							
	Where										
Report	Purpose										
	Contents	1	1	1	1	1	1	2			2
	Media										
	Who										
	When										
Where											

Table 3. Resources

In Figure 8 we summarize graphically the results from Tables 1-3. This evaluation shows that two of the analyzed systems cover a large amount of the framework elements: GroupSystems and Meeting Works. The other systems seem more specialized in particular packages. For instance, LoganWeb and Cire are specialized in documentation support while D-Plan is specialized in the agenda. The detailed results also show a common lack of support to sponsors and organizational agents, as well as to post activities such as distributing meeting reports and communicating next steps.

An overall comparison of the different systems is difficult because the number of framework elements in each package is substantially different. For instance, the agents and roles package has 5 elements while the process package has 27. In Figure 9 we normalize the scores obtained by each system, taking into account that the contribution of each package to the overall functionality should be equal. We believe that this approach is fair showing the overall differences between the evaluated systems.

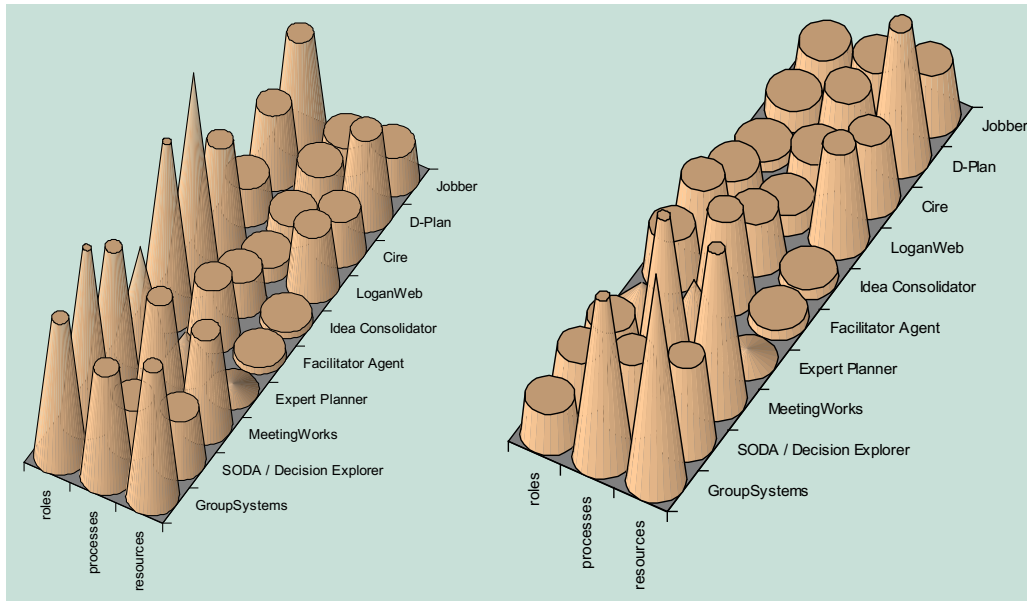


Fig. 8. Scores obtained by each system

Fig. 9. Normalized scores

8 Discussion

We proposed ourselves to accomplish three goals. Now we will review these goals and analyse their accomplishment.

The proposed descriptive framework consists of three packages: agents and roles, meeting process and resources. The first package allows specifying the types of agents involved in meetings, as well as the corresponding roles. The level of detail considered is the necessary one to clarify who interacts with the EMS and what functionality the EMS is expected to deliver to users. This package also affords EMS to manage information about users, and associating that information with the meeting process, such as users' interventions.

The second package is dedicated to characterize meeting resources. On the one hand, this package characterizes the major data components that get in and out of the meeting system (agenda, report and support documents). On the other hand, this package identifies how information is managed by the system (e.g., facilities, meeting configurations and time/space). So, we complement the functional description offered by the previous package with a model of data managed by the system at a high level of abstraction.

The third package addresses the meeting process. This package characterizes the EMS functionality in more detail than the previous packages. It affords decomposing the meeting process in several levels, while describing users' interventions in the system.

It should be noted that the proposed framework only describes how EMS manage information items generated by EMS users. The framework avoids describing the users intentions, and how users organize themselves and configure the technology to achieve their goals. The intention is to focus on the baseline. The baseline must have items that

are independent from any specific technology, meeting process, decision process, group interaction process, group facilitation process, etc.

Thus, we believe that our goals have been achieved.

9 Conclusions

This paper proposes a descriptive framework for EMS consisting of three packages: agents and roles, meeting process and resources. Each one of these packages consists mainly in a collection of use cases and class definitions. The framework is flexible enough to accommodate different meeting arrangements, software configurations and information resources, as well as different views over process definitions.

The major contribution of the framework is the clarification of EMS functionality, offering descriptions with the potential to be reused in the future.

The framework has also the potential to define an evaluation grid for EMS, allowing comparisons between quite different tools and systems, and facilitating the convergence between EMS functionality and organizational needs.

The evaluation grid was applied to a set of 10 systems and tools. The grid shows where there is some lack of support, for example, in the support to sponsors and organizational agents, and post activities such as distributing meeting reports and communicating next steps.

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