

Collaborative Organization Design: A Synergy of Groupware and Web-based Infrastructures and Technology

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Abstract

With GroupOrga (Groupware Based Organization Design) we present a "thinkable" application environment and framework for distributed and collaborative organization design. The relationship between collaboration and organization structure is touched by addressing the question how people in an organization can collaboratively design constantly evolving organization structures.

After specifying the term collaboration in the context of GroupOrga we discuss how collaboration technology can support global organizations. With the GroupOrga architecture we present a technological layer for a deeper understanding of collaboration in general. This framework is not restricted to a specific technology, such as the World Wide Web, but considered to be an open architecture.

Despite this fact, we look at two collaboration technologies in comparison: groupware and the Web. The question which technology is flexible enough for which requirements is one aspect. Another aspect is that of concrete Web- and groupware-based applications in the GroupOrga project. Our experiences from selected case studies and test implementations will be the concluding topic.

Keywords

Collaboration Architectures, Distributed Databases, Global Enterprise Directories, Groupware, Modeling of Information Systems, Organizational Design, Organizational Structures, Workflow Management

1 Introduction

Katzenbach and Smith ([12], p. 70) describe a team as a being small group of people whose capabilities complement one another and who are all engaged for a common cause. In an earlier investigation, the trend towards teams in organizations has been diagnosed as stimulated by numerous developments in businesses, such as fast-moving markets, a trend towards lesser hierarchies, team-based performance ratings, or reports about role model organizations with massive team-orientation ([19]). The assignment given to a team from the organization will be coordinated, directed and completed in the form of independent processing as collaborative teamwork.

This paper is about collaboration between team members in a specific business context which can be

better solved through collaboration: structural organization design.

2 Collaboration in Organization Design

As a preliminary to our workshop contribution we want to clarify our understanding of *collaboration* within the GroupOrga research in the following section. Afterwards, a scenario is set up which requires collaboration technology at different places of collaboration: Structural organization design through teams. We will show how this collaboration technology can contribute to the success of modern organizations and how it relates to organizational structure.

2.1 Collaboration - A Working Definition for Organizational Design

Dhar and Olson ([7]) use the term collaboration "to refer to a goal-oriented process involving contract definition and execution among two or more individuals" (p. 34). Hence, collaborative work comes about, when tasks for completion of a product or service are carried out by several people. The necessary relations for this collaboration are (pre-)planned and may be predetermined by the product's or service's own characteristics. Apart from collaborative work in physical teams, collaboration can come about in other forms, as well. In the case of the partners not interacting directly, the term *distributed collaboration* (cp. [2]) can be found. In this indirect model the participants do not (always) communicate personally, but use communication systems to interact and to adapt their personal behavior to the common task. In addition, collaboration is not bound to the physical borders of organizations. It is characterized through collaborative behavior as such, which can involve partners in various organizations and locations.

Difficulties in defining the term collaboration are elaborated by Dhar and Olson when they identify three influencing factors to collaborative work: complexity, uncertainty, and ambiguity. With *complexity* they describe the problem of mapping the necessary activities in collective work with the resource requirements associated with these activities and the complexity from an individual's perspective to be involved in several projects simultaneously. *Uncertainty* refers to the lack of knowledge about what environmental states will prevail and to time estimates of projects' activities that the individual is involved in. *Ambiguity*, at last, refers to the fact that the collaborative activities may not be well defined.

This may particularly be the case in the early stages of a collaboration.

2.2 Two Systems Interact - Workflow Management and Organizational Design

The actors in collaborative scenarios have to perform complex tasks. If these tasks are executed by multiple actors in a more or less predefined manner, this is often called business processes. Business processes describe *what* has to be collaboratively done and *when* and *how* this is accomplished. However, regardless what form of collaboration we consider (direct or distributed, within an organization or across its boundaries), in a collaboration scenario also the question 'Who has to carry out a task within the process?' has to be dealt with.

Thus, similar to other approaches of collaboration modeling (e.g. [5], [11] or [20]), GroupOrga clearly distinguishes the aspects *what*, *when*, *how* from the aspect *who*, or in other words, between process modeling and organization modeling. The latter aspect specifies the actors, who are responsible and qualified to carry out tasks within the collaborative setting.

While most implementations do not separate between processes and actor assignment specification, the implementation and continuous administration of a global enterprise directory as proposed in GroupOrga supports this requirement.

If at all, collaboration and workflow systems only support static actor assignment or strategies with simple role models (an overview of different approaches and definitions for the role concept can be found in [10], the aspect of organizational roles covers [9]). For a smooth interaction of such collaboration systems and the necessary organization modeling environments, a definition of arbitrary, problem oriented actor assignment strategies is inevitable. Process modeling and organization modeling aim at different goals. The first is concerned with the flow of work. The aspect *who* is also of interest eventually but cannot be coped by process modeling experts, since they do not have the sufficient know-how about organization and how to depict it in enterprise directories. The necessary link (or better: integration) between the two sides is done through organizational references saying who has to perform which work (cp. [18], p. 563). An organizational reference relates (parts of) workflows to entities in the organizational model which is laid down in the global enterprise directory. These entities may be described through an enumeration of actor's names. Alternatively, they might be defined by means of unit, role, actors, workgroup, knowledge/skill-group, software-agent, resource or similar specifications, indicating that only those members of an organization can perform a piece of work, who belong to such a group and show certain properties. For example, such a list of properties would characterize managers of project groups. Workflows may

be defined in such a way, that specific steps can exclusively be performed by actors who have the knowledge and skill of workgroup managers.

This separation of process modeling and organization design is quite natural and can be found in real-world organizations. Moreover, it bears some other advantages:

- *Separation of data:* If the two fields of organization are separated, they can be secured independently. This reduces the drawback that some departments would not allow that their organization directory is used for other purposes, than storing structural information (cp. section 4.1).
- *Separation of modeling tasks:* Different duties, like process modeling vs. organization design, are carried out by different staff. This mandatory separation is supported by clearly dividing process repositories and enterprise directories.
- *Reuse of partial organizational modules:* Organizational structures are modularized according to specific criteria, like location or responsibility. These criteria differ much from those used for process modularization. Hence, a separation allows for independent definition without mixing two distinct areas.
- *Distribution:* When process and organization repositories are separated, the effect of distributing the information helps a lot. With a distributed directory structure, more organizational members can participate in the organization design process.

An investigation in collaborative software in general and Workflow Management Systems (WfMS) in particular (cp. [14], [15], [13], [1], and others) reveals, that none (e.g. [21], [4], [6]) or only very few approaches pursue the design and documentation of structural organization - nevertheless, its necessity as a mandatory task for collaborative work is acknowledged broadly ([14]).

GroupOrga will bridge this gap between information systems and organization systems, or to be more precise, between today's WfMS and organizational structure. It will provide a collaborative environment for various places of collaboration in order to obtain fast, coordinated structural design with the support of enterprise directories that transcend intraorganizational boundaries. As a next step, interorganizational boundaries may need to be crossed, as well (cp. [17]).

2.3 Coordination Needs of Global Organizations

Moreover, collaboration contributes significantly to the success of modern, global organizations: Competing in a global economy requires an organization that is designed on a global and distributed basis ([3], p. 33ff.). Global strategies today frequently involve cooperation with coalition partners as well as within a firm's own subsidiaries. Encouraged by recent globalization trends,

many firms are leveraging new Information Technology (IT) to change their coordination and control systems, workflow and organizational processes. Many global firms lack a clear strategy for aligning their architectures ([8], p. 61ff.). The challenge is to find the organizational structure that best fits their global strategies. However, the problem is, that this structure may change quickly, requiring a facility to adjust to changes accordingly. In addition, today's global firm must be able to transfer complex structural information to diverse locations in its network. This report presents a technology framework which may be one component of a collaborative IT architecture that forms an infrastructure for the coordination needs of a global management team. Innovations in information technology may also greatly cut coordination costs by reducing the time of communicating information and, together with changes in the market structure, may shift competition to a global scope.

3 GroupOrga Technology to support Collaboration in Organization Design

The collaborative design process managed by GroupOrga can be compared to the process of designing the internal structures of a traditional organization, i.e. the design of structures which are supporting the business processes. Such structures consist of hierarchies, i.e. departments and units, but also of workgroups, roles, actors, skills etc. For a successful completion of business processes, the workflow and the structures have to be laid out once in order to clarify each partner's responsibilities.

The collaboration environment developed in the GroupOrga project was groupware based, in the first place. However, current development is focusing at yet another distributed platform for collaboration: the World Wide Web (WWW). The intention of the remainder of this manuscript is to discuss which technology is best for constructing infrastructures for collaboration in the field of organization design. First, the general architecture of the system and its components will be introduced, before we go into details with the current WWW implementations.

3.1 The General GroupOrga Framework

The GroupOrga project is conceptually based on a comprehensive organizational data model, the GroupOrga Enterprise Information Management Model (GEIMM), and computerbased tools will be available to the partners to design the meta-structure of the organization cooperatively and to later refine each member's contributing part in a distributed environment. In the idealistic form a complete picture of the organizational structure and its potential skills and know-how is available to everyone, afterwards. Moreover, the outcome of this evolutionary and ongoing process will be stored in an electronic organization handbook which is a groupware database. It will be available to every member and supplies with

information about each partner, his competencies and personal contacts. If such an electronic organization handbook is opened through the support of a standardized platform (such as the WWW), it can be developed into some type of yellow pages where collaborative partners present themselves. Here they would inform about their core competencies and their main know-how, whereby such an environment would evolve into a (virtual) organization catalogue.

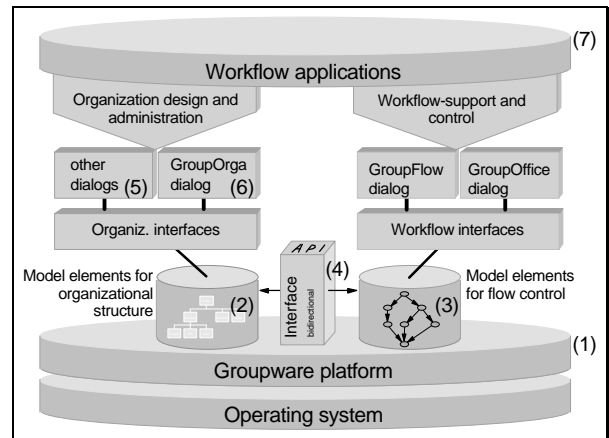


Figure 1: Schematic GroupOrga architecture

Figure 1 shows how the integral parts of the introduced collaboration environment interact and summarizes the respective goals: The groupware platform (1) allows to administer the organizational information in a distributed manner and to constantly define and check access and security rights. Furthermore, the architecture consists of mutually consistent information databases on the one hand for the structural or organizational data (2), i.e. the electronic organization handbook, and on the other hand for the workflow runtime system (3), which manages and controls the processes.

In-between the application programming interface (API) (4) would be placed which allows to transport organizational information directly from the directory to any operational system, e.g. a WfMS. Modifications and updates to the organizational data are definable through the easy-to-use graphical administration tool (5). The GroupOrga database front-end (6) serves well for simple information retrieval tasks. On top of these applications which are mainly focused at administrative tasks, the workflow applications can be found (7).

3.2 Web and Groupware - Synergy for Collaborative Web-based Organization Design

From this point of development we are currently extending the GroupOrga architecture onto the WWW. The distributed organization database (2) with its user frontend for administration (6) will be accessible for read and write access to Web-clients. The GroupOrga OrganizationModeler (5) exists as JAVA application. To date

this Web-based part of the infrastructure is not yet flexible enough to cope with most of the identified requirements for organizational design. In [16] we have discussed numerous specifications and functions which have to be developed to allow this. Some of them will be tackled as follows.

An important argument for implementing the GroupOrga project on top of a groupware platform has been its necessity of distribution technology (e.g. replication), high security standards, distributed database architectures and the fact that many WfMS are also groupware applications. While these reasons remain valid, the following presents an extension - not a replacement - to it. Parts of the architecture shown in Figure 1 have been translated into the WWW.

The underlying groupware platform allows to easily publish any organization database (such as (2) in Figure 1) into the WWW with the complete functionality available to the Web-client, as well. An open publication of information about an organization's assets, skills and know-how fosters the idea of a global collaboration across organizational borders. With such Web-based technology, actors could collaborate for short periods, complete the joint task and finally separate in order to meet again in a new structure and with changed partners.

Collaborative organization design includes different user types. Their varying requirements result in a scale of possible user classes which are illustrated in Table 1. It shows that the target group of this organizational design process are all members of the organization, i.e. it ranges from people who only want to get informed to those who actively and regularly participate in the design. All four types of information retrieval *may* be supported by the (proprietary) core GroupOrga tools (5) and (6) depicted in Figure 1.

<i>"Push-button" information needs</i>	<i>Occasional changes or adaptations</i>	<i>Regular departmental design and planning</i>	<i>Regular design, planning, analysis, reporting</i>
← end-user		administrator →	

Table 1: Varying requirements by different user type classes

Although this is true and all user types could be equipped with the full set of tools some of them have only reduced information needs. In their case a fully installed organization design environment appears to be outsized. Especially for users in the categories *"Push button" information needs* and *Occasional changes* small-scale applications without large implementation effort are better suited. Java-programs, for instance, can be run in Web-browsers in form of Java-applets. The Internet provides the largest common basis for end-user applications which reach a large and multi-layered group of users.

The point which is made here is, that those who are in need of powerful technological support should be equipped with comprehensive (and proprietary) collaboration technology, while others are well-off with a reasonable implementation effort by simply using their standard Web-browser with an applet running on it.

Technically, the Java GroupOrga Organization-Modeler is integrated as Java-applet into the groupware organization database. This database, in turn, is then published into the WWW from where the applet can be started at every desktop with a Web-browser. Thereby, the role of the groupware platform is enlarged and is thus used as applet-server for organization design in teams. After the applet has been started at the user's desktop, data about the organization structure is retrieved from the server. This data is internally processed and then graphically displayed. After this first interaction a bi-directional exchange between applet and host (i.e. the underlying GroupOrga organization database) is established. Figure 2 displays the above procedure.

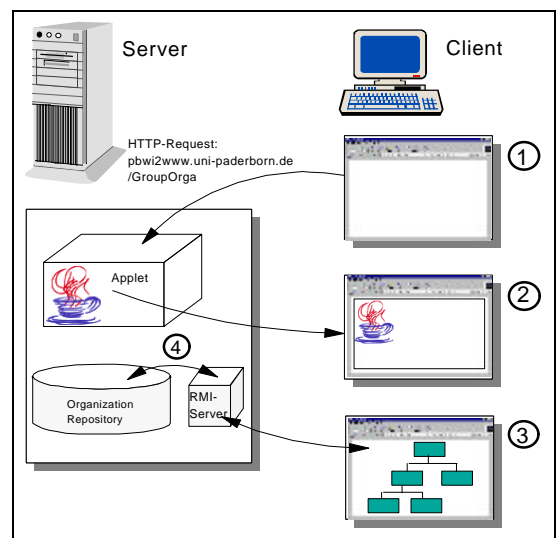


Figure 2: Phases of applet invocation and organizational design

The aforementioned argument for using Web-based technology only to a limited extent was based on organizational reasons. I.e. in the former case users would not *want* to have more functionality at their fingertips than what can currently be provided by Java-applets, for instance. But even if more functionality at a Web-client's desktop was wanted, today's versions of Java or other Web technologies do impede some concepts, still. The following minuses of Java-based software have been encountered during its most recent use in the GroupOrga project.

- The programming language Java and technologies belonging to it (JVM, JIT-compiler) as such, are close to being perfect, but to date few Web-

browsers are on the market that support these innovative technologies.

- Reduced speed and low performance of Java-programs cannot come near traditional programming languages (e.g. C++). This is due to two reasons: platform independence and Java's interpretative bytecode.
- Applet-security is of course an important aspect for data protection and protection of user's computers. Without a doubt, security requirements in collaborative applications are a major concern but on the other hand, this complicates the programming effort, e.g. in case of access to locally administered organization databases.
- For each start the Java-applet must be loaded from the server. In times of heavy workload on the network or reduced bandwidth this can result in bad response time. In addition, the existence and faultless operation of a network is mandatory for Java-applets.

Some of these drawbacks will be solved with further development of Java technology while the last two obstacles can be overcome with a combination of groupware and Web-based technology.

Thus, in our GroupOrga project we first implemented those concepts for the Web which take advantage of the programming language's assets. Most likely the weak points will soon be solved so that Web-based applications can cope with most of the identified requirements for distributed organizational design.

4 Social and Political Obstacles to Collaboration in Organization Design

For organizations with complex, heterogeneous and distributed business processes and workflow computing environments, there are many good reasons to implement a collaborative organization design strategy. Unfortunately, there are just as many impediments to setting up and fully exploiting such an organizational structure directory. The result is that, while many organizations are working with WfM and collaborative information systems and are planning for a global directory besides, only few are actually implementing one.

Last, we would like to give a glimpse on some of the social and political obstacles we had to learn about in case studies and during test implementations.

4.1 Organizational Politics - Or: Hands Off my Data!

Some kind of organizational data, such as user names and network access lists already exists in application- and network operating system-specific directories. Typically, this data may be brought into a collaboratively used, distributed directory from existing specific directories. Alternatively, several directories may be integrated and mended together into an apparently seamless whole

without moving data. Either way, as soon as a project for a global enterprise directory lays its hand on someone's data, this is a matter of organizational politics.

As an example from our cooperation with a large, global, Germany based business bank: If through some bureaucratic process the human resources' database would be chosen as the center for a global enterprise directory and if then this database should be modified to suddenly store IP and email addresses or availability information, as well, the human resources responsible would not stand for this change. This single example shows, that organizational politics may derail any collaboration project unless a powerful champion in the organization can be found.

4.2 The Privacy Concern

When information is promoted from limited-access systems such as payroll or human resources to a much more widely and collaboratively accessible global directory (e.g. through replication technology to other locations), privacy will become an issue. Hence certain information may need to be protected by password and finely tuned access rights and certificates. Integrating such strong security may complicate the directories usability but also makes it suitable for a wider range of information retrieval, as well as workflow and office management applications. In addition, searches should be reasonably limited.

5 Resume

In this paper we have introduced the GroupOrga concept and framework for distributed, dynamic organizational design processes. It provides a user-friendly, collaborative framework for the specification and execution of organization structure entities for WfMS. Advantageous graphic interfaces and the comprehensive enterprise model have been taken into account. Implementation in the WWW has also been outlined and discussed. Finally, we gave a brief insight into the architecture of GroupOrga and outlined some social and political impediments to collaboration technology in organizations.

This manuscript intended to show how we can integrate collaborative and organizational requirements with today's technological possibilities to successfully construct collaborative applications. With a focus on groupware technology and the World Wide Web we have introduced two technology fields that appear to fit perfectly with collaboration requirements, respectively.

Even though few companies can implement such distributed organization directories today, forward-looking users have grasped the idea of directory and application integration and are heading this way. GroupOrga has been implemented in form of evaluation installations in various practical settings and conditions: Among others are cooperations with KPMG, Siemens Nixdorf Informationssysteme AG, Deutsche Bank AG,

Deutsche Babcock Dienstleistungs GmbH, and agens Consulting GmbH. Moreover, parts of the GroupOrga toolset are integrated in an office and workflow management application offered by Pavone Informationssysteme GmbH.

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