Multimedia Groupware Design for a distributed Government

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Abstract

The decision to shift essential parts of the German government from Bonn to Berlin is a challenge for the design and implementation of groupware systems. The distribution of the government functions defines new requirements for support through telecooperation; e.g. for ministries whose units are divided up between the two locations. The focus of the system developed in POLITeam is the support of asynchronous and synchronous cooperation in big organizations. The asynchronous cooperation has an essential share here. In this context, the metaphors of the electronic circulation folder and the common workspace proved to be suitable means for the description and implementation of office processes. Based on an available groupware system, its further development is pursued together with pilot users from ministries and industry. The user requirements were deployed to implement a couple of prototypes which were evaluated again by the users, leading to a participatory design.

1 The application field

In 1991 the German Bundestag decided to move essential parts of the seat of the Federal Government from Bonn to Berlin. For many ministries this decision results in a distribution of the units to the two locations. Within the framework of POLIKOM [7], a research program of the German Federal Ministry of Research and Technology, the telecommunication and telecooperation technologies required for the distributed government work are developed. In POLITeam, one of the four POLIKOM projects, a system for the support of mainly asynchronous cooperation of geographically distributed organizations is designed and implemented [9]. In this work, we first describe the development approach and the basic system of POLITeam. The focus of system development is explained subsequently. Finally, we discuss first experiences which resulted from the actual use of the system through the pilot users.

2 A design strategy

From the beginning cooperative work and office processes should be supported with POLITeam technically and organizationally. An already existing basic system is introduced, evaluated and advanced to this purpose. POLITeam pursues an integrated approach of use research and application development. The requirements and ideas of computer-supported cooperative work gathered within the framework of accompanying scientific research are integrated into the current development and provided for further system versions.

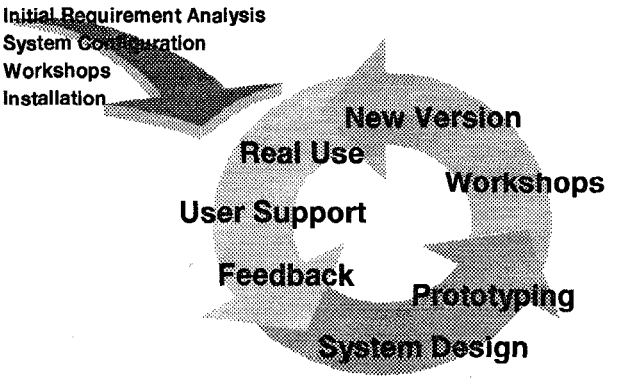

Fig. 1: Cooperative evolutionary system design

The development philosophy of POLITeam is based on activities which come from Eason [3], Floyd [5] and Mambrey, Oppermann and Tepper [11]. In order to reach our goal, some basic ideas shape our development approach: We introduce an available system which enables us to evaluate it under everyday life conditions and not only in the laboratory [1]. We emphasize the work practice and adapt the system correspondingly. We use an evolutionary cyclic approach which is more open to system revisions than a structured top-down design approach. Through inclusion of the users into the development process, we reshape existing functionality and design new features. The users are seen as the experts of their work, therefore, we use interactive methods during the entire development process such as workshops, meetings, group discussions etc. instead of a unique requirements analysis at the beginning and a use study at the end of the project. Consultants support the users from the beginning on site and selectively during the use of the system. Thus, new requirements are recognized early and fed back into the development. Evaluation criteria of the system are the suitability and the benefit for the organizations as well as the support of the users during their daily work. Moreover, the methods and tools used by us include the users as partners and do not regard them as research objects. We design the cooperative development as mutual learning process for users and developers to exchange experiences in design and work practice and to improve the cognitive access of all participants to technically supported cooperative work.

3 Conditions to be considered

The POLITeam design approach is based on the use and the step by step refinement of an available and operational basic system. At project beginning, a suitable platform had to be selected therefore, where a series of basic conditions had to be considered:

The system had to be commercially available, to guarantee a certain maturity degree and, in addition, to enable support for the users after the termination of the project. It had at least to support rudimentarily the design aims pursued by POLITeam in its basic functionality. And it had to enable the integration of different applications and platforms since it could not be required from the users that they did without their existing hardware and software. Finally a crucial factor was the possibility to be able to extend the system by new functions; for this, a programming interface had to be available.

As industrial project partners, VW-Gedas introduced LinkWorks™ into POLITeam which meets the above requirements to a high degree. LinkWorks enables the integration of any office applications. Furthermore, the system is available for different hardware platforms. The offered functionality can be adapted to a certain degree to specific requirements via a comfortable administration interface. Further functionality extensions can be implemented making use of the integrated APO interface (Applications Plus Objects) which makes the access to internal structures of the system possible for the programmer.

LinkWorks offers an object-oriented user interface which is based on the wellknown desktop metaphor. After logging in, the user sees his personal desk. Different storage facilities, e.g. closets, compartments and folders (so-called container objects), are made available for structuring the desktop. Communication and cooperation between users is supported by e-mail, electronic processes as well as shared objects. A process component enables appending circulation slips to any LinkWorks objects. The circulation slip describes the path of the corresponding object.

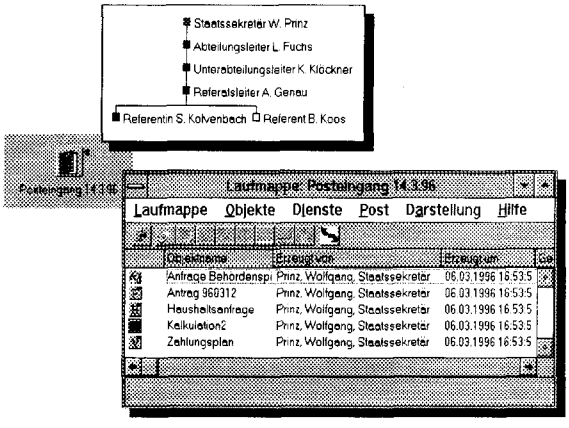

Fig. 2: An Electronic circulation folder in POLITeam

Shared container objects constitute a simple possibility to implement document exchange and common document processing: every object which is put e.g. into a common file is visible for everyone which has access to the file. In order to also obtain information about the sequence of operations outside of their desk, users have the possibility to announce "interest" in specific objects. They are then informed of third-party changes which these objects affect. Altogether, LinkWorks supports the essential development aids of POLITeam at least in a rudimentary form.

4 Components for cooperation in POLITeam

Based on the basic system described above, POLITeam consists of several main components which we will detail below.

These are workflow processing, common document

and task processing as well as the notification and information service delivering basic information for the coordination of sequences of workflows. None of these components constitutes a fundamentally new application if taken by itself; the challenge is in the integration of the different areas rather into a comprehensive overall system [13] which can be adapted to different application areas.

• Electronic circulation folders

The support of workflow processing is one of the essential aims of POLITeam. The metaphor of the *electronic circulation folder* is used here in analogy to the circulation folders used in the real office world. Similar approaches are contained in Shephard [16] and Karbe [8]. Electronic circulation folders in POLITeam [15] contain any documents; its contents can be changed during execution of the process.

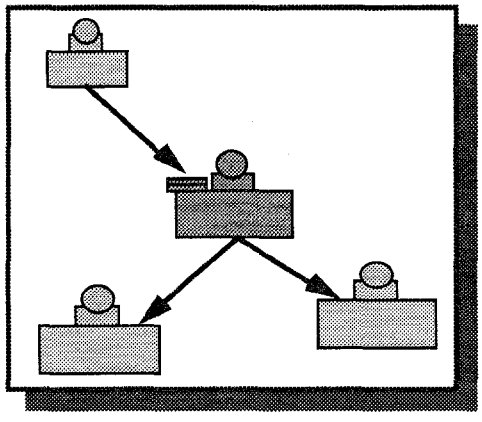

Fig. 3: The workflow concept

Recipients of a circulation folder can be both individual users or role descriptions defined in the organization management, where the latter can be removed during run time. Every user can add informal notes to a circulation folder or remove them from it. The actual path of a circulation folder is described by a circulation slip which coordinates the sequential order of the individual operation steps. Since its information can be modified on run time depending on situation and access rights, the electronic circulation folders constitute a flexible mechanism for the coordination of processes. In particular, the requirements such as flexibility and modifiability resulting from previous experiences gained with office procedure systems are considered [10].

• Common workspaces

As a supplement to the workflow system and for the support of less structured cooperative work, a component for the common document and task processing in the form of a *common workspace* is being developed. A common workspace provides an environment for coordinated document and task processing in a group. It enables the integration of tools for document processing without restricting the users to a pre-defined set. Unlike the electronic circulation folder, the members of a common workspace [14] have a permanent access to its contents. This enables processing tasks for which common work material must continuously be available for the different group members.

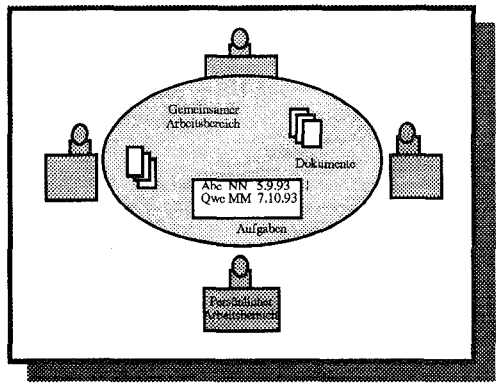

Fig. 4: The shared workspace concept

The access rights for the contents of a workspace can be defined as desired which secures a wide range of possible applications extending from private areas up to public ones. Archived documents or external message sources (e.g. distribution lists, press releases, electronic communication systems) can be integrated into a workspace via corresponding filters of these sources are available in electronic form. In this way, useful background information for task processing can be made automatically available to a group.

• Notification and information service

A further essential design aim of the POLITeam system is to provide the users with information about the activities of other users as far as their cooperation is concerned by it [6]. This is to visualize the dynamics of the working environment resulting through existence of several users at the user interface. The perception of the cooperative events is an essential prerequisite for both the coordination and tuning of cooperative work and for entering into communication. The latter is enabled by indicating that other users are available [2]. POLITeam supports both an active approach (notification service) and a passive approach (information service). In the active case, the system indicates important events to the users, in

the passive case, the user might inquire the system about specific facts.

- **Security**

Signing processes are a very important part of many document production procedures. In POLITeam we offer a functionality to sign an electronic document. Electronic signatures using SmartCard technology improve the security and authenticity of a cooperative process. Later on it is possible at any time to prove who signed which version of a document.

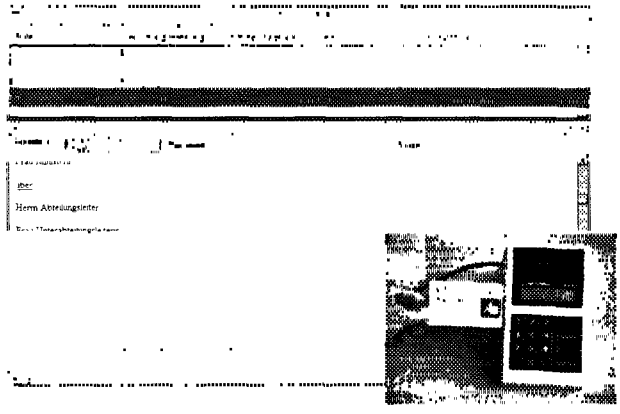

Fig. 5: Authenticity through electronic signatures

- **Video Conference**

Distributed document processing by a group of people very often affords the integration of different opinions. The electronic conference is an easy way to exchange ideas about a shared document. With the video conference component in POLITeam document changes are discussed and completed simultaneously.

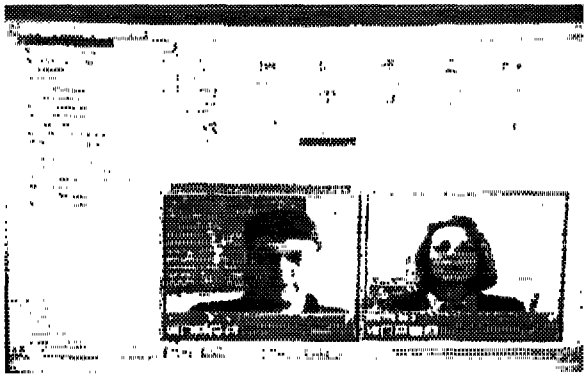

Fig. 6: A video conference on a shared proposal

5 Lessons learnt

The introduction of the system took place at the beginning of 1995. In the initial phase of POLITeam, the consultants supported intensively the accomplishment of the practical work with POLITeam. After a phase of intensive user guidance in March 1995, consulting took place first weekly and afterwards every two weeks. In particular with respect to the organization of the cooperation between several participants, the consultants had to help the users to come to suitable agreements and to define use conventions for individual functions. Common workspaces, for example, were set up between the typing pool and the unit employees for storing the texts to be processed jointly.

The consultants could determine quite a number of new requirements on site [12], namely electronic signatures, handwritten annotations, hierarchy-specific use of pen colors, integration of paper and electronic documents as well as a series of improvements of user guidance if compared with the first POLITeam version. Further requirements ranged from access facilities for external information sources, the traceability of procedures by user-controlled access right assignment up to a fast document exchange with other locations. A requirement multiply expressed was the adaptation of standard applications such as Word, Excel and PowerPoint not only to the local demand, but also to in-house utilization standards. The consultants gathered, generalized and discussed them again with the users where appropriate.

In the subsequent phase, the coarse conception was designed up to the level of software components. It was presented in several design meetings and discussed among the developers. Based on findings in the specification phase, a first update of the planned functionality was made. In the design process of POLITeam, the consultants advocated the user interests by entering the insight gained in the users' work. Newly developed functionality was tested by the consultants by means of practical examples from the users' work.

Within our empirical activities, we concentrated on the actual work procedures of our application partners and could thus get a more concrete idea of organizations, users, tasks and practical work.

We assume that there are many different communication forms in a ministry. Ellwein and Hesse [4] speak of formal, semi-formal and informal organization in the administration of a ministry. In POLITeam, we are concerned with the formal and semi-formal organization and consider the relevant information flows. These are used for coordination and cooperation in addition to the hierarchical structure. The formal organization and its information flows are regulated in the GGO I (Common Rules of Procedure for the Federal Ministries). In

POLITeam, we want to examine whether and how a system for supporting cooperative work in a ministry is accepted.

Within the framework of current application research, in addition to the requirements for adaptation and optimization of the groupware system, experiences have been gained for individual foci which are of a more indirect effect on current system design, but also of basic importance to the integration of cooperative work systems into the federal agencies. These are to be described in the following.

In the ministries, the rules of the GGO prescribing organizational structure and workflow are to be applied. In practice, the employees often smile at these rules, but nevertheless they are understood as framework for orientation, i.e. as the skeleton of the living organization to which the flesh is added by practical actions. The idea of the GGO is based on Weber's model of a hierarchically structured expedient rationality organization where control and supervision may be centralized. In practical work, however, the "short unofficial channel" is used if required which - strictly speaking - avoids the GGO. This applies primarily to the phase of negotiation and coordination with respect to facts, not to approval and information. The reasons for such a violation of rules are to be seen in the attempt of the employees to do their work better and faster. For the use of groupware, this means that informal work must also be supported.

The search for specific letters and files is a time-consuming process which often stops the contents-related work. This is annoyingly just in the case of urgent activities such as a proposal for the minister. Today search is done via a personal scanning of data files or telephone inquiries, the searching is highly dependent on the help of his/her colleagues. By providing search tools, the groupware system can offer a great amount of support. However, this requires that the documents are also available in electronic form that is that the officer have made them available to the unit or ministry. The GGO requires that all documents are official or at least "private-official". Therefore, there are no private documents. In practice, however, a document which is still being processed, is not made freely available. The release is made by the officer if he thinks that processing is completed and if it is addressed to the next level. A groupware system, for example, would make it possible to retrieve such documents and manipulate them independently of their state of processing. One would be able to withdraw a document from the reviser - in the case of a corresponding access authorization - or manipulate it without his/her noticing it. One would even be able to define the processing duration. However, this contradicts the idea of cooperative work. The access of the superior is accepted, but not at any time and to all documents of the officer.

At the beginning, our pilot partners placed great emphasis on the security of electronic documents. On the one hand, this concerned the security of the permanent physical reproducibility as a paper document, but also the authenticity of document and signature. It is to be secured, for example, that allowances sent to the responsible hierarchical level for co-signature cannot be falsified with respect to contents and signature. For a technical realization, we have developed the prototype of an electronic co-signature procedure [15]. The actual use will show how the developed procedures of authenticity securing, which are somewhat more time-consuming than the procedures applied so far, will be used. It is open for which applications they will be used.

6 Results and outlook

The POLITeam project is now running for two years. Our approach lead to a number on non expected user needs. Some of them can already be satisfied by system facilities. Many of them have been just tiny but important for daily work. A central question in the design process has always been how to deal with conflicting goals of users and how to prevent the system from being used as a tool for dominating or controlling other users. With the help of our users the POLITeam system will become a real aid which helps to overcome long distances. Two years after introduction of the first POLITeam system and two months after installation of the third version of our system, we have quite a good impression of the application field and the acceptance of new groupware functionality. We integrated the hierarchy level in the department, and new questions have to be answered: how to guarantee reproducibility of signature procedures? The next extension of the application field concerns the filing service and provides the integration of the file catalog.

The satisfaction of our users as well as its active influence on the further design of the system confirm our approach of the early system introduction. The means for cooperation - the electronic circulation folder and the common workspace - proved effective in practical use and are designed further. According to the requirements gathered in the further course of the project, the range of functionality will be extended.

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LinkWorks™ is a groupware product of Digital.