WORM: Web-based Communication and Project Management

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ABSTRACT

Communication among companies and between clients and companies has been revolutionized by the Internet, e.g., b2b market places, as well as new ways of collaboration like virtual companies. Many systems with holistic and individualized service, sales and marketing concepts are available today. In this paper we give an overview of the basic concepts of office communication, groupware, workflow management and virtual enterprises. WORM, our approach of web-based communication and web-based project management, is based on these concepts and can be used for a variety of activities over the Internet. We have successfully used WORM for projects of a digital photography agency and a middle-class marketing agency.

Keywords

collaborative systems & applications, web & internet tools & applications, project management, virtual enterprise

1. INTRODUCTION

The Internet allows new ways of communication both among companies and between clients and companies. A variety of dot.com companies provide systems for the creation and the maintenance of customer relationships. These systems are equipped with holistic and individualized service, sales and marketing concepts.

The term customer relationship management describes the holistic processing of relations of companies to their clients and contains all activities for the consequent support of client and service processes [1, 3, 4, 8]. Additionally, new ways of communication among companies are emerging, e.g., b2b market places, as well as new ways of collaboration like virtual companies.

In this paper we describe a web-based project management and communication system that enables companies to plan and execute business processes both with other companies and with clients.

In Section 2 we describe basic concepts. Section 3 outlines WORM, i.e., our approach of web-based communication and web-based project management, including an example and some data about the implementation. Finally, in Section 4 we draw conclusions.

2. BASIC CONCEPTS

Office communication, groupware, workflow management, and virtual enterprises comprise the basic foundation of our web-based approach for communication and project management. They will be described subsequently.

2.1 Office Communication

In company-wide networks, there are many different software concepts to support activities like writing letters or notes, administrating and finding documents, creating, forwarding and exchanging information, etc. Office communication systems should provide a variety of functionality and support users with many activities. They are supposed to

- increase the productivity of end users, without the need for end users to gain deep insight in information knowledge,
- to shorten office operations,
- to promote the reuse of work results,
- to reduce media breaks, i.e., personnel intensive, manual transmission of information from one media to another, and
- to integrate and combine information of various sources and to visualize them.

Systems that provide solutions for these goals are distributed, have homogenous user interfaces with components like text processing, data administration, presentation software, etc.

2.2 Groupware

Computer supported cooperative work supports the collaboration of groups with common tasks without providing any control for these tasks [5, 11]. Groupware systems

- support cooperation in an unstructured, ad-hoc manner,
- provide information for all members of the group under a variety of access points,
- allow the possibility of simple data exchange, and
- allow various ways of collaboration.

This results in the following requirements for groupware systems:

- modern database management systems with efficient storage capabilities for a variety of data types, e.g., graphics, sound, video, text
- replication mechanisms to calibrate distributed database systems and guarantee consistent data
- differentiated access mechanisms for different group members, to provide individualized information needed for a certain user group
- integration of traditional office information systems and import of their data
- powerful communication systems tailored to groups as well as to individual needs, e.g., e-mail, attachments, fax, chat rooms, news groups.

2.3 Workflow Management

In contrast to more unstructured processes, it is the goal of workflow management systems to control the workflow among all members of a group that are involved in a certain business process. It is completely based on available procedures and, thus, only qualified for activities, which are well structured and standardized, i.e., routine activities with high manual effort.

Workflow comprises a chain of processing steps that belong together and have to be taken care of within a certain period of time, across departments, according to well-defined rules with known information needs, and by people with certain abilities [5]. Therefore, basic requirements to workflow management systems include:

- the possibility to map sequences of activities to proper process models
- the storage of process models of involved departments with appropriate access rights and substitution rules of any staff member
- the demonstration of mutual dependencies of individual processing steps
- the transparency of appointments and deadlines for the finishing of procedures
- the provision of secure transaction mechanisms to avoid undefined processing states, e.g., processes must not be identified as being finished before any subprocesses have been finished
- the assignment of responsibilities and control mechanisms
- the display of current process states

These concepts are being applied already within companies in various domains and departments. What we still lack is the utilization of these concepts across companies. Information and communication systems based on open and platform independent architectures are able to overcome geographic boundaries of workplaces and allow the foundation of virtual enterprises.

2.4 Virtual Enterprises

Virtual enterprises are temporary networks of independent companies, which cooperate on a short-term basis for a certain task (project) and are perceived to be a single unit from outside. Internally the companies act as partners and bring in their core competences in a synergetic way [11]. The following properties characterize virtual enterprises:

- Legally independent enterprises, institutions and/or individuals carry out a cooperation. The legal form of the cooperation depends on national or international circumstances and is not of interest in this context.
- All members share a common business understanding.
- Integration of core competences of all members is one of the primary goals.
- There is only one face to the customer, i.e., the virtual enterprise appears to be a single company.
- The institutionalization of centralized functions is being avoided as much as possible.
- A common mission or project idea holds together the member companies.
- Coordination is accomplished by a highly developed information infrastructure, in order to tie member companies even if distributed across long distances.

Virtual enterprises need a system with the following basic requirements:

- open, platform independent communication with different media,
- storage of documents and documentation of communication activities,
- realization of groupware and workflow concepts.

As a basic principle, the creation of economically independent organizations to a virtual enterprise is done on a project basis. Thus, an information and communication system is needed that allows distributed project management across various companies with project based access rights.

2.5 Web-based Project Management & Communication

Project management means the continuous and goal oriented planing, supervision and control of all relevant project parameters [7, 9, 10, 11]. In this context, a project is a nonrecurring, complex, and new intention with scarce resources and defined deadlines. It is performed under the participation of various departments or companies [7]. Projects can be viewed as a sequel of logically linked and time consuming procedures that result in state modifications. They can be divided into phases which are described by major milestones at the beginning and at the end of a phase [2].

A web-based project management and communication system has to fulfill various requirements in order to integrate the concepts of groupware as well as workflow management and distributed project management.

- Scalability, modularity and simplicity have to be regarded due to technical reasons as well as due to reasons of acceptance. Minimal requirements on clients are necessary (web browser, platform independence) to allow mobile project monitoring and processing.
- Communication has to enable a simple exchange of documents (pdf, doc, xls, xml, etc.) as well as group communication like chat rooms, message boards and video conferences.
- It is a must to integrate shared folders and notification functionality (e.g. pagers), unified messaging systems (e.g. j2 ™ [6]) as well as internet telephony and web cam presentations.
- Both project deadlines and the composition of project teams has to be transparent at any time, especially as assignments will be temporary only with possibly frequent changes over time.
- Project specific access rights and identification of team members via login procedures are a necessity for security reasons.
- Document management has to be done on the server to allow the archiving of project relevant documents as well as the reporting of any logins and communications.
- Project calendars with the possibility of individual adaptations are needed to avoid the missing of milestones.
- Such calendars may also be used to support the determination of project costs.
- Responsibilities of all project phases have to be transparent any time with easy access.
- Evaluation of projects has to be supported.

Simple interfaces for the integration of existing systems is unalterable. In addition, state of the art security and encryption mechanisms are of utmost importance.

3. WORM

We have developed a web-based project management and communication modelling kit WORM (we offer real modularity). Subsequently, we describe WORM's functionality, provide an example of its use and also give some information about the implementation.

3.1 Functionality

WORM offers the following functionality:

- *Master data*. Information about companies, agencies, clients and employees are saved centrally.
- *Project structure*. Multi-hierarchic project structures can be set up, wherein each project serves as a container for project specific information, so that all data is presented in the context of the current project. Projects can individually be provided with the assignment of user rights. Homogeneous data, i.e., time data, public offerings can be accumulated across multiple levels of the hierarchy through specific input and output interfaces.
- *Grouping of team members*. Employees of companies, agencies and customers can be grouped to project teams and assigned rights to a specific project. A previously determined project leader has the privilege to assign these rights.
- *Digital documents*. Drafts or project results of any type can be brought into the projects by uploading these files. They are kept on the server in the project's context and access will be granted to all project members with corresponding user and project rights.
- *Version management*. Each document is denoted with an automatic version number. So even if the document is uploaded with the same name as before the previous file will not be overwritten.
- *Resource management*. Project resources like persons, facilities and other devices can be allocated to projects and centrally administered.
- *Message centre*. Project members can communicate via an integrated e-mail client that automatically administers e-mail addresses and correspondences for ongoing projects. These messages can either be exchanged in the framework of the application or be sent via "real world" e-mail.
- *Discussions*. Within projects discussion forums can be initiated, in which agency and customer can contribute their opinions regarding certain topics. Moreover, live chats can be initiated and supported by web cams.
- *Form editor*. For poll and workflow purposes, free customizable forms can be created using the form editor. With these forms a workflow-process can be initiated following a determined user transaction order until completion. It also can be used for raising polls among company or customer employees.
- *Event agent*. The event agent shows the most urgent tasks and the latest changes and updates related to your projects. Thus, an overview and control of projects is given at a single glance.

- *Notification agents*. Changes and updates of project related data can be linked with notification agents that inform project members via e-mail or pager.
- *Workflow management*. WORM allows the generation of workflows by linking task contents with a sequential set of project members responsible for these workloads.
- *HTML editor*. An applet-based HTML editor is provided for designing platform independent documents that can be viewed without any additional software in a browser.
- *Team calendar*. A project based team calendar allows tracking meetings, milestones and other events. When inserting events, the calendar scans existing schedules for available dates.

3.2 Example

WORM can be used for various forms of project collaboration, e.g.,

- business-to-business (b2b) project management between companies organized as virtual enterprises,
- vertical hierarchic b2b project management between a prime contractor and its legally independent subcontractors, or
- business-to-consumer project management between companies and clients creatively interacting in the process of developing a customized product, see below.

To implement the principles described previously has been the objective in developing WORM. The main focus has been on supporting middle-class marketing and photography agencies that both easily wanted to present their drafts and project progresses to their customers and wanted to give them the opportunity to be integrated in the process of the project by providing feedback to the agency.

WORM's modular structure allows customization of layout, offered functionality, menu options and company interaction. Thus, the user interface can be restricted to a subset of functions depending on the organizational relation among interoperating parties. Each involved project member will be faced with an application screen that had been designed by the organization responsible for the project. Additionally, companies can be embedded in the project structure in any level of the hierarchy. Thus, they may not see projects and companies that are higher up in the hierarchy. Based on this flexibility it is possible to realize different project management setups. We use an implementation of a b2c application within a marketing company as project proprietor as example. The agency's view,

see Fig. 1, and the client's view, see Fig. 2, provide different customized menus for each side on the top of the screen, which allows the agency to restrict the client's possible operations.

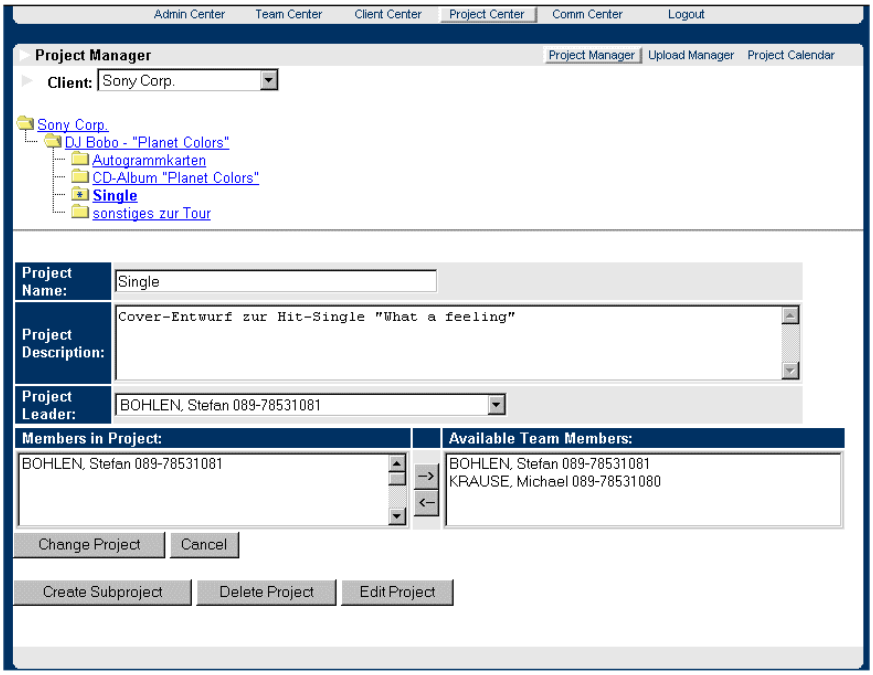

Figure 1: Agency's view

Setting up a project structure is as easy as it can get. Like in Microsoft Windows Explorer we can create a hierarchic project structure using the "Create Subproject Button" in the "Project Manager", see Fig. 1, and following issue the according project rights for all client user in the "Client Center", see Fig. 3. This results in a restricted access project structure for the client as you can see in Fig. 2.

3.3 Implementation

WORM has been written as a pure server-sided Java-based web application running both on UNIX and WINDOWS© servers. It is compliant to SUN's Model 2 architecture [12] by separating presentation and business logic using 3 servlets , about 50 JavaBeans and currently 37 JavaServerPages with an overall size of about 2.5 MB without resources. The system requirements for a client include internet access, a monitor resolution of at least 800*600 pixel and a browser that supports JavaScript, i.e., MS Internet Explorer version 4 or later respectively Netscape Navigator Version 4 or later.

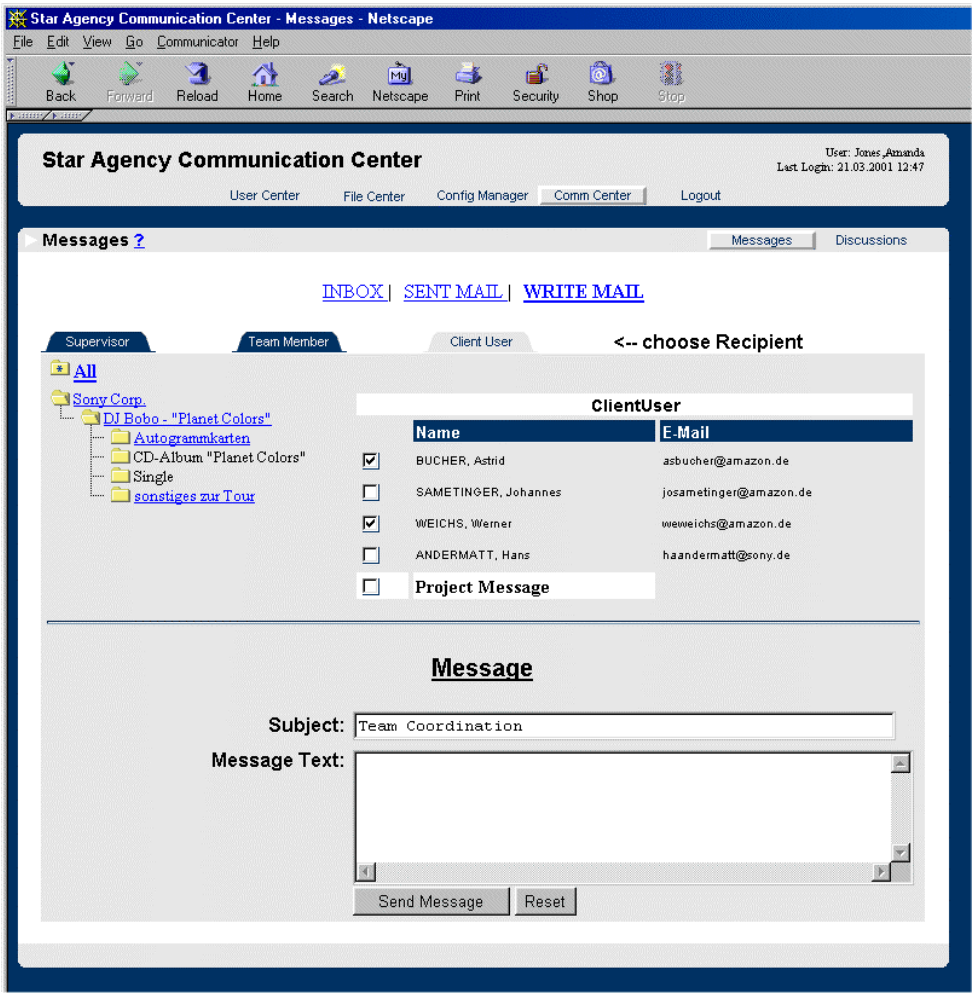

Figure 2: Limited client's view

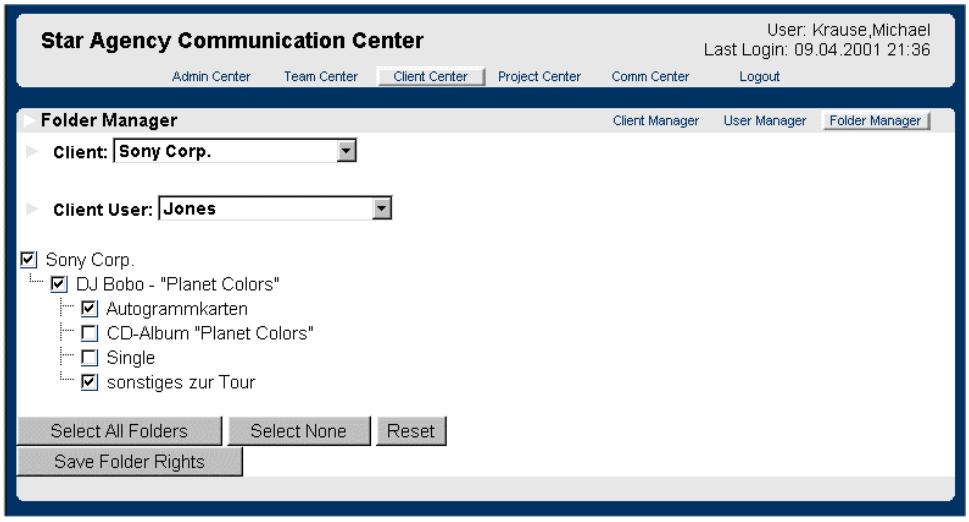

Figure 3: Folder access

4. RELATED WORK

Several products are on the market that provide similar functionality to WORM. We have chosen onProject and eRoom for comparison, because they represent the state of the art web based collaboration tools and have both been awarded several times.

- *onProject*. onProject [13] is a leading innovator of business process technology that integrates robust collaboration features into traditional project management applications. Recently, offline and online publications have touted onProject, noting superior collaborative features, such as configurable security roles and automatic, multi-tiered notification rules. onProject provides a collaborative workspace that allows to share and manage information associated with projects and their related tasks. Though it shows strength in managing project resources management, it lacks the ability to create useful online forms and a hierarchical concept.
- *eRoom*. eRoom Technology [14] is a leading provider of Internet-based software and services for collaboration among an organization's extended enterprise of employees, customers, suppliers, and other partners. eRoom provides a digital workplace for the extended enterprise, allowing organizations to quickly assemble a project team wherever people are located and manage the collaborative activities that support their complex and rapidly-changing business projects and processes. Strong communication features combined with an ease of administration makes it a useful tool in online work collaboration, but missing resource management and hierarchic inflexibility in implementing inter-organizational relationships does not qualify it for the cases of project management depicted in this paper.

5. CONCLUSION

In this paper we have given an overview of the basic concepts of office communication, groupware, workflow management and virtual enterprises. We have then presented ideas for a web-based system for project management and communication. Such a system has to fulfill many requirements like scalability, modularity, simplicity, security, encryption, identification and notification. WORM is our realization of a web-based system that fulfills these requirements. It can be used for a variety of activities over the Internet, including office communication, groupware and workflow management. This can be achieved by the simple management of meta data and other resources, as well as additional functionality like team calendars, event and notification agents, etc. WORM has been implemented as a server-side Java-based web application and can be used with any regular web

browser like MS Internet Explorer and Netscape Navigator. We have successfully used WORM for projects of a digital photography agency and a middle-class marketing agency. The next step will be the evaluation of WORM as a web based project management platform for a virtual enterprise in the domain of facility management.

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