A Better Practice of Knowledge-based Collaboration with VKC

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C-LAB Report

Vol. 6 (2007) No. 2

Cooperative Computing & Communication Laboratory

ISSN 1619-7879

C-LAB ist eine Kooperation der
Universität Paderborn und der Siemens AG
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C-LAB Report

Herausgegeben von
Published by

Dr. Wolfgang Kern, Siemens AG
Prof. Dr. Franz-Josef Rammig, Universität Paderborn

Das C-LAB - Cooperative Computing & Communication Laboratory - leistet Forschungs- und Entwicklungsarbeiten und gewährleistet deren Transfer an den Markt. Es wurde 1985 von den Partnern Nixdorf Computer AG (nun Siemens AG) und der Universität Paderborn im Einvernehmen mit dem Land Nordrhein-Westfalen gegründet.
Die Vision, die dem C-LAB zugrunde liegt, geht davon aus, dass die gewaltigen Herausforderungen beim Übergang in die kommende Informationsgesellschaft nur durch globale Kooperation und in tiefer Verzahnung von Theorie und Praxis gelöst werden können. Im C-LAB arbeiten deshalb Mitarbeiter von Hochschule und Industrie unter einem Dach in einer gemeinsamen Organisation an gemeinsamen Projekten mit internationalen Partnern eng zusammen.

C-LAB - the Cooperative Computing & Cooperation Laboratory - works in the area of research and development and safeguards its transfer into the market. It was founded in 1985 by Nixdorf Computer AG (now Siemens AG) and the University of Paderborn under the auspices of the State of North-Rhine Westphalia.
C-LAB's vision is based on the fundamental premise that the gargantuan challenges thrown up by the transition to a future information society can only be met through global cooperation and deep interworking of theory and practice. This is why, under one roof, staff from the university and from industry cooperate closely on joint projects within a common research and development organization together with international partners. In doing so, C-LAB concentrates on those innovative subject areas in which cooperation is expected to bear particular fruit for the partners and their general well-being.

ISSN 1619-7879

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1 Introduction

How many of us still receive e-mails with huge documents attached – often enough sent to a long list of recipients? Most of us tend to keep those "e-mail dinosaurs" stored in ever growing mailboxes or somewhere in our exploding file system space: *Maybe I'll need it some day*. When that day finally comes, we cannot find the well saved document. *It must be somewhere, I know it is*. This is only one example of common "worst practice" with regard to documents – or "knowledge" in general – in a community of collaborating people.

Some more questions in this context are: Where is this bit of information that I need? – What is the current version of this piece of work? – Is there some other related material that should be considered? – Is there something new I should know?

We will see in this report that Virtual Knowledge Center (or VKC in short) provides smart and easy-to-use answers for these questions and a solution for many similar challenges of today's collaborative work. VKC is a Web-based solution for document and knowledge management and for collaboration of distributed teams.

Chapter 2 presents two practical examples of VKC use from C-LAB and from research project VirtOweB. Chapter 3 complements the presented examples with a more detailed view on VKC features from the users' perspective. In chapter 4 the technical aspect of VKC is summarized. The report closes with some thoughts on the target market and future directions in chapter 5. A list of references is provided in chapter 6.

2 Examples of VKC Use

2.1 A Collective Memory for C-LAB

In the first example, we will concentrate on VKC as a Web-based knowledge repository maintained by and for the same group of cooperating people, the employees of C-LAB.

2.1.1 The Roots of VKC

Internal use of web features began in C-LAB with a common web server under administration of the C-LAB computing center. Different directories in the web server's data area were given to the different workgroups as work spaces. It turned out that information on the web server was quite easy to access – just by web browser – but was rather tedious to create, to structure, and to manage due to the lack of supporting features in basic web server software. As a consequence, web server content was often incomplete or out of date. It was difficult to share content between workgroups due to complicated management of access permissions. There were no common functions to annotate documents by keywords or descriptions or to search the local web server comfortably.

One of the C-LAB workgroups was doing research in document management, information retrieval, and search engines[1]. They summarized the requirements of the C-LAB Web community based on experience gained with the bare web server and developed a first version of Virtual Knowledge Center (VKC) in the year 1999. Their objective was to enable easy and efficient sharing of documents and knowledge among employees of C-LAB and possibly also with cooperating partners elsewhere. The following sections illustrate how this goal was achieved.

2.1.2 Document Dissemination and Retrieval by VKC

Electronic documents and e-mail transmission to multiple recipients once superseded the distribution of paper copies as well as the habit of printed circulars that had to be passed on according to an attached distribution list. That was an improvement that saved natural resources and increased productivity. Today, nobody within the C-LAB community needs to attach big documents to e-mails anymore.

The originator simply publishes the document with all relevant additional information in a suitable VKC category. The access control list of the category can be adjusted easily to match the desired audience and the appropriate degree of confidentiality. Furthermore, the author may send a short e-mail to inform the intended readers about the newly published document and its web link in VKC.

Readers use their web browser and the provided web link to access the document. There is often no need to draw local copies. Automatic document format conversion enables the reader to choose whether to view the original document format or a derived HTML or plain text representation. If one wants to access the document later on again – perhaps without remembering the web link – it can easily be retrieved by means of the advanced search feature. People within C-LAB add important and frequently needed documents to their personal lists of favorite documents. Just as bookmarks in a browser, favorite documents (and categories, analogously) are accessible through that list directly.

Other than the sending of documents to a predefined distribution list, the VKC mechanism enables additional interested readers to get notice of new documents quickly and thus encourages and enhances knowledge sharing.

Hence, it is easy to be aware of all new material in the VKC repository. There is a flexible notification mechanism that is under full control of the individual user. Categories, documents or advanced search queries can be registered to trigger notification by e-mail. A category trigger watches for new documents in the category and optionally in subcategories. A registered document causes a notification, whenever a similar document is published. When the user decides to enable notifications, the minimum frequency is adjustable gradually from instant to monthly notifications.

[1] Another recent result of this research is the master's thesis of L. Werner [5].

If readers prefer to look for new documents by themselves, they may directly check the “latest additions”. The documents considered can be restricted from publication for a user-defined period of time. Documents may also be restricted from publication in given category and its subtree.

Dissemination, storage, and retrieval of documents by VKC proved to be a powerful and flexible mechanism for C-LAB on various levels: on organization level for C-LAB as a whole, on group level within the permanent workgroups, and on project level within temporary project teams.

2.1.3 VKC as Article Repository

Using VKC to maintain research articles reveals the true power of a knowledge-based document repository. In principle there are two ways to structure document collections: Traditionally the user can create a structure of categories which seems suitable for clustering such articles, for instance by conferences or by topic. VKC offers a clustering function that suggests a clustering of documents based on their content. Similar documents are put into the same category. However, usually a mixture of user-defined and VKC-provided clustering is useful. Especially if a category is over-boarding with articles, VKC can offer a first content-based recommendation for a suitable substructure. Since a document does not change its access handle in VKC when it is moved between categories, all references to documents remain intact even after a complete restructuring.

Nevertheless, the key functionality that has proven very handy is to find related articles which deal with the same topic. This exploits the strength of the VKC keyword and topic extraction.

Another way to organize articles is to employ dynamic document attributes. By assigning such attributes to a document, categories based on queries for such attributes can be defined which allow for a flexible multi-structuring of the article repository.

At C-LAB, articles from conferences are kept and maintained in VKC and structured according to major research topics. This establishes the collective knowledge pool accessible for every C-LAB member. Especially the option to quickly navigate to “related documents” proves to be invaluable for scientific work.

Beyond those two application scenarios described above, C-LAB plans to extend the use of VKC towards project support. Project-related features have been introduced with version VKC 4.0 in the year 2006. The origins thereof have been developed in research project VirtOweB. Read more about it in the following chapter.

2.2 Supporting Virtual Teams in Knowledge-based Biotechnology Processes

This second example of VKC use concentrates on the ability to support collaboration between distributed partners of possibly different enterprises. The related features have been developed and explored first in research project VirtOweB (see [3], [4] for further information).

Project VirtOweB dealt with knowledge-based biotechnology processes that were realized by collaboration of innovative small and medium-sized companies. The vision of this project was to achieve a significant improvement of the typical interactions between distributed partners during their participation in joint projects.

One concrete goal was to develop and implement a working base for collaboration. As a result of requirements analysis, VKC was chosen as the basic system that should be extended and adapted to meet the needs of VirtOweB. The following sections provide more details about the special requirements of the project and how they were met by the augmented VKC version.

2.2.1 Specifics and Requirements of Biotechnology Companies

Today's biotechnology companies are driven by individual customer requirements that have to be fulfilled by innovative solutions. Following the trend of "one-stop-shopping", potential partners and clients prefer complete solutions through one single company. Since complexity and specialization are growing, biotechnology companies are pushed to establish strategic cooperation and alliances with other institutions to act as a single solution provider. Beside the heterogeneity of the partners with regard to internal structures, products, and portfolio, there is furthermore the challenge to develop and implement appropriate concepts for communication and global collaboration.

Another important aspect to consider in biotechnology companies' proceedings is the obligation to follow the guidelines of "Good Laboratory Practices" (GLP) that have been developed by the U.S. Food and Drug administration[2]. The implementation of the guidelines is under responsibility of the individual company. The GLP guidelines form the basic rules for interaction with partners and clients. GLP and further regulations of other public authorities result in a great amount of formal procedures in addition to the core research and development activities.

[2] http://www.fda.gov, part of the U.S. Department of Health and Human Services

2.2.2 Requirements for the Collaboration Base

Support of collaboration was the major objective of project VirtOweB. Distributed business processes should be enabled and improved mainly through capabilities of information and communication technology. Technology was expected not only to help overcome spatial and temporal distances between the involved collaborators but above all to significantly increase the efficiency of cooperation.

In the requirement-phase, the participating biotechnology companies underwent a strong review of their processes with regard to setup and handling of projects as well as everyday work tasks. The results that were most important for the development of the collaboration base are summarized in the following paragraphs.

Employees in biotechnology companies assume different roles. Some of them are involved in projects which have been set up through an assignment of clients (in biotechnology called “sponsors”) and others perform cross-project or cross-divisional functions like quality management or financial controlling.

Different roles with their specific responsibilities should be accommodated by corresponding views. Each view should be limited to the needs of the associated tasks. This concept reduces complexity and error rates and thus increases efficiency.

It was an additional challenge to realize different views without introduction of document redundancy. The same document should be visible for persons with different roles within their specific context.

Another finding was that similar projects share the same types of content. Depending on the type of a project, it is possible to predefine the layout of documents and a typical folder structure. This typical project and document structure should be created automatically when a new project is initiated.

During the analysis of requirements, it turned out that in addition to the features of a project document repository, features for project monitoring were necessary, especially in projects for sponsors. Project plan and progress should be documented by a sequence of project steps with corresponding start and end dates. Project steps should be checked off after processing by two different persons. The project status should be reported as a short overview of the number of project steps in states “active”, “processed”, and “checked”. It was important to keep these functions “small and simple” to avoid unnecessary administrative overhead.

2.2.3 Design and Implementation

The analysis of requirements was followed by a user-centered design process that delivered the specification for the user interface of the project collaboration base. It was implemented as an extension of the existing VKC version.

In the collaboration base for project VirtOweB a project leader can initiate a project of a selectable type which is associated with a predefined project folder and file structure. During setup or later on, the project leader has to define the project steps with time frames as well as the members that are going to participate. Project leader and project members maintain the project status by marking completed project steps as “processed” and signing off processed steps as “checked”.

For the project document repository a matrix view to information has been employed. Project members can see only documents of their own projects. They use the project-oriented view, or “project view” for short. People with cross-project management responsibilities can access documents of their needs and interest according to their access privileges over project barriers in a task-oriented view, also called “functional view”.

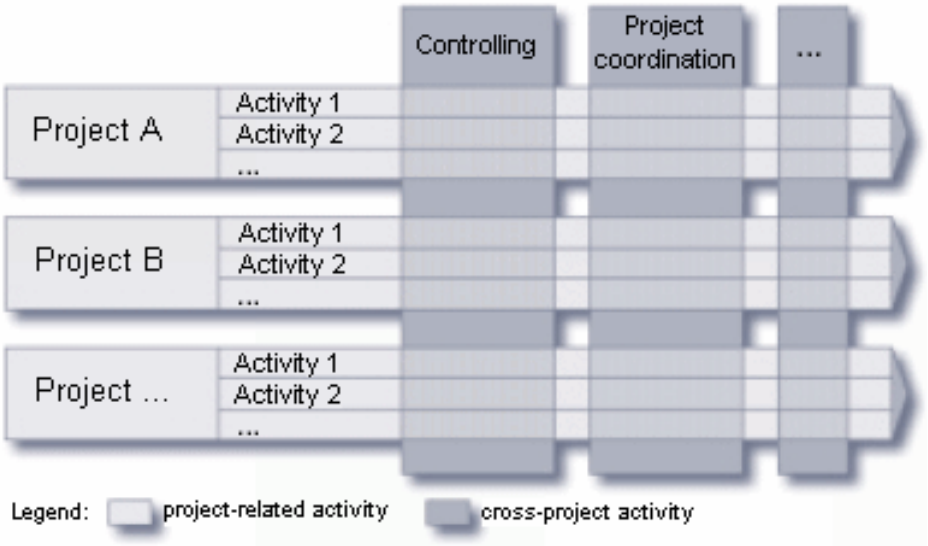

Fig. 1: VirtOweB matrix information architecture concept

Different views are realized without document redundancy by a special VKC feature called “virtual documents”. Virtual documents are results of a predefined query for documents with given properties like publisher, publishing date, or keywords. The query is attached to the individual view and is submitted when the user accesses the view. Access rights of the person requesting the view are checked to prevent any unauthorized access.

When all project steps have been processed successfully, the project leader decides when to close the project and, later on, when to archive a project.

2.2.4 Summary of Achievements

The following improvements could be achieved in project VirtOweB through the use of an augmented VKC as a project collaboration base for virtual teams in biotechnology projects:

- A common repository of electronic project documentation replaces the former redundant and inconsistent paper-based documentation. The repository is accessible by all project partners simultaneously and thus enables location-independency.
- The permanent availability of documentation through electronic files and folder structures increases transparency for every member of an individual project.
- Traceability is supported by the VKC versioning mechanism that allows storing subsequent versions of a document. The exact history of a document can thus be restored easily.
- Transparency and traceability are further increased by electronic monitoring of the project status.
- Project templates for different project types facilitate setup of new projects and ensure compliance with rules and regulations. The templates describe structure and initial content of a project of a given type.
- Access to documentation is guided by GLP principles and uses access control lists for individuals with given roles. That prevents unauthorized access to documentation.
- VKC user management allows assigning users to multiple groups reflecting both permanent and temporary team assignments in parallel. User and group accounts can be tagged with a limited period of validity to simplify administration of temporary team structures. These capabilities allow for access management with the required degree of confidentiality.
- Documents are presented in a project-oriented view for persons who participate in projects and in functional views for persons who have cross-project responsibilities. These are task-oriented views of a common document base that minimize redundancy of documents and increase productivity.

After completion of project VirtOweB most of the features have been integrated in a new VKC version 4.0. The next chapter provides some more information about this version.

3 A Closer Look from User's Perspective

In this chapter more detailed information on the current VKC functionality will be presented.

For using VKC, somewhere in a computer network the VKC server software and database must be installed and operational[3]. The VKC web URL has to be entered in the web browser to get to the login page. It is necessary to login with an individual user account because the user must be identifiable to enable access management[4] and to load the corresponding user profile.

VKC offers three views[5] to accommodate different user needs: category view, project view, and functional view:

- The category view concentrates on the hierarchical category structure of the document storage. (An example of the category view can be seen in figure 2.)
- The project view is best suited for a project-related repository with additional project management functions. (See figure 7 for an example of the project view.)
- The functional view is designed for users with cross-project responsibilities that require access to a selection of documents presented in a category structure that reflects a special purpose like quality management or financial accounting. (Figure 9 shows an example of a functional view.)

The initial view of a user after login and the capability to switch views is configurable by the VKC administrator. The following sections illustrate typical usage patterns of the VKC views.

3.1 Discovering what is stored in VKC

3.1.1 Navigation Principles and Document Access

There are different ways to explore the contents of the VKC document storage. Although examples in this section are taken from the category view, the VKC navigation principles apply to all views with little variations only.

In the category view, the content of one VKC category is shown. (See figure 2 for an example of a category view.) It is not necessary to enter the category hierarchy at its root; any convenient category can be defined as the "home category" in the user's personal profile.

[3] For some experimenting, the C-LAB demonstration site will do. Try: http://vkcdemo.c-lab.de
[4] Only very restricted access is possible for guest users if they are permitted by configuration.
[5] There is an additional view for VKC administrators, which is not explained in this report.

The name of the current category and its place within the hierarchy are represented as a path of categories leading from the VKC root to the current category. That path can be found directly below the VKC functional tabs. The “hyperlinked” names in the path can be used to navigate to the upper level categories directly.

Further down, the category view shows a list of the subcategories, indicated by folder icons, and of the documents in the current category, indicated by file icons. Clicking on a category name loads its category view; clicking on a document title leads to its detailed document entry in the same view.

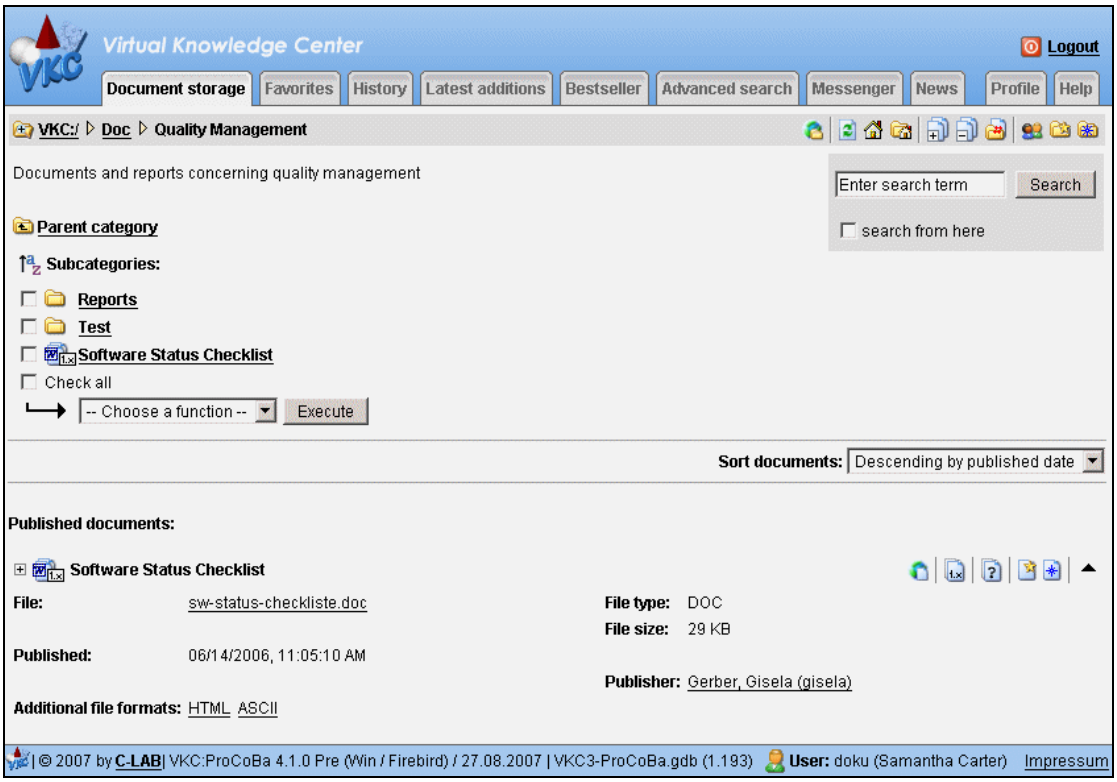

Fig. 2: Example of VKC Category view

Document entries display additional information about the document, also known as “document properties” or “metadata”, for example: keywords, description, file type, or author. See figure 3 for an example of an expanded document entry with all document properties[6]. These properties help the reader to decide how relevant a document is without the need to open it.

[6] Additional properties can be introduced as „dynamic attributes“ on different levels of customization (globally for an installation or even user-defined).

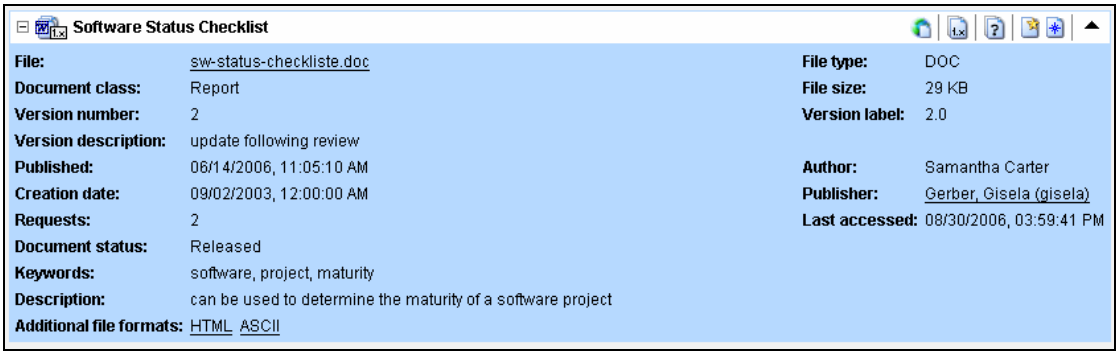

Fig. 3: Expanded document entry with all document properties

If a document looks interesting by its properties, the user might want to have a quick look at its content. For most of the file types, which need special applications to be opened, additional file formats, usually HTML and ASCII, are created by VKC through automatic conversion. Clicking on the corresponding hyperlink in the document entry displays the HTML page or plain text in a separate browser window or browser tab without much delay. Often enough this format is sufficient for the reader to grab some information before turning to the next document or to some other task.

In few cases it might be necessary to open the original document file. This can be done by clicking on the filename provided as a hyperlink just below the document title. Depending on browser configuration the file would then be opened by the associated application or the user might save it to its local disk. A local copy of the document can always be drawn by right clicking the filename and selecting the appropriate action from the context menu.

3.1.2 Advanced Search

So far we have seen how navigation through the VKC document storage can be achieved by hyperlinks and how documents can be accessed from the category view. Performing an index search is another way to discover the contents of VKC. The category view (see figure 2) provides a basic search facility already. One may enter a simple term that shall be found in “any field”, that is in the document properties or in full text. Results are thus not very specific. They are presented as a list of matching documents below a detailed search form that can be used to refine the search.

The same form will be loaded directly by clicking on the “Advanced search” functional tab in the category view. See figure 4 for an example. In the upper section of the form search terms for all document properties can be specified. They are combined by logical AND in the resulting search query. The first entry “any field” is special because it includes all document properties and the full text. Multiple strings in one field are combined by logical OR by default.

The number of results can be restricted further by limiting the publication date range, by requesting a specific file type, and by choosing a category other than the VKC root to start the search. Only documents below the chosen category path will be included in the list of results.

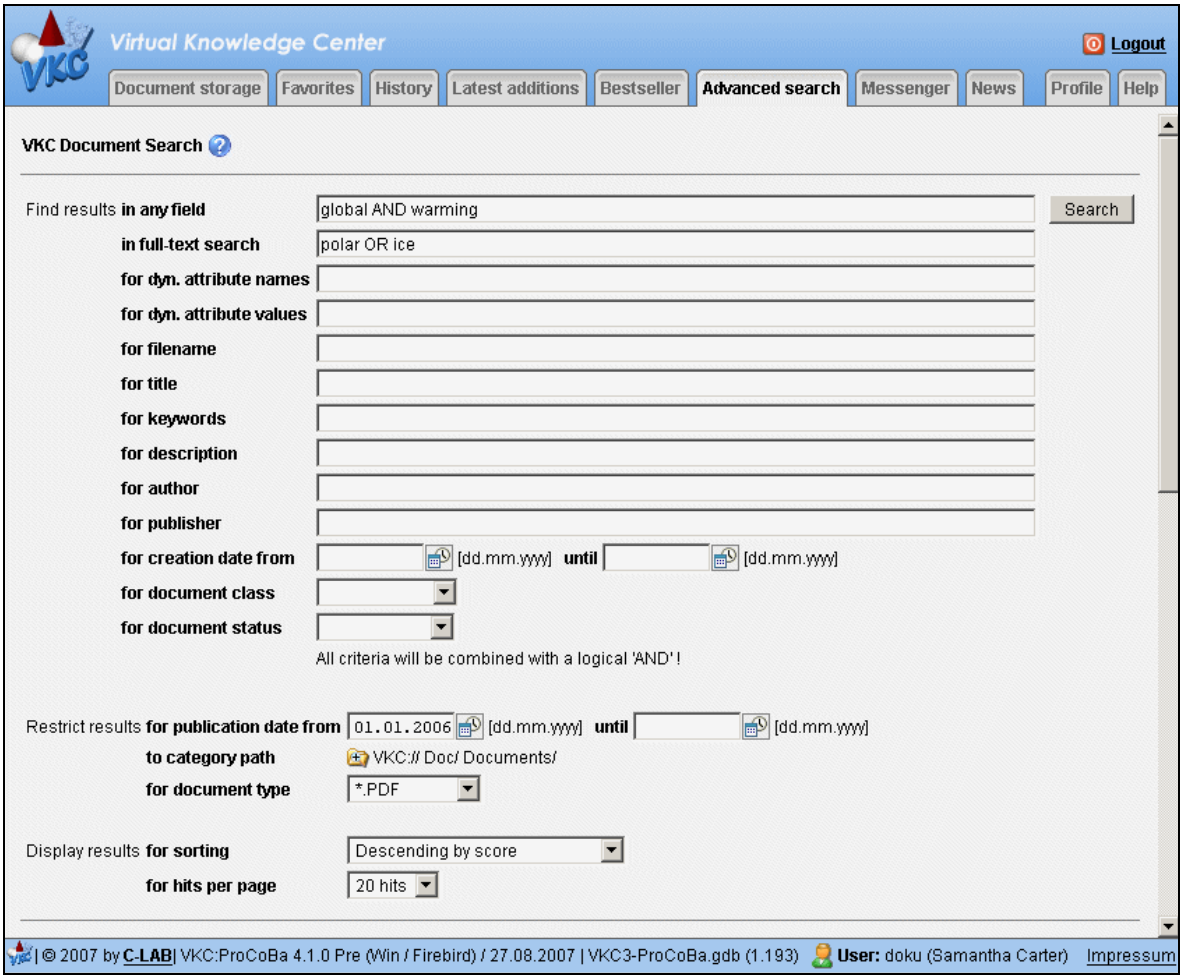

Fig. 4: Advanced document search form

The example in figure 4 (see above) searches for PDF format documents below category path “VKC>Doc>Documents” that contain “global” as well as “warming” somewhere in the document properties or in their full text and contain the strings “polar” or “ice” (or both) in their full text. Furthermore, they must have been published in the year 2006 or later. Figure 5 shows a sample list of search results for this query.

Results are presented as a list of document entries similar to those of the category view. Additionally, a score indicates the relevance of each document with regard to the search query.

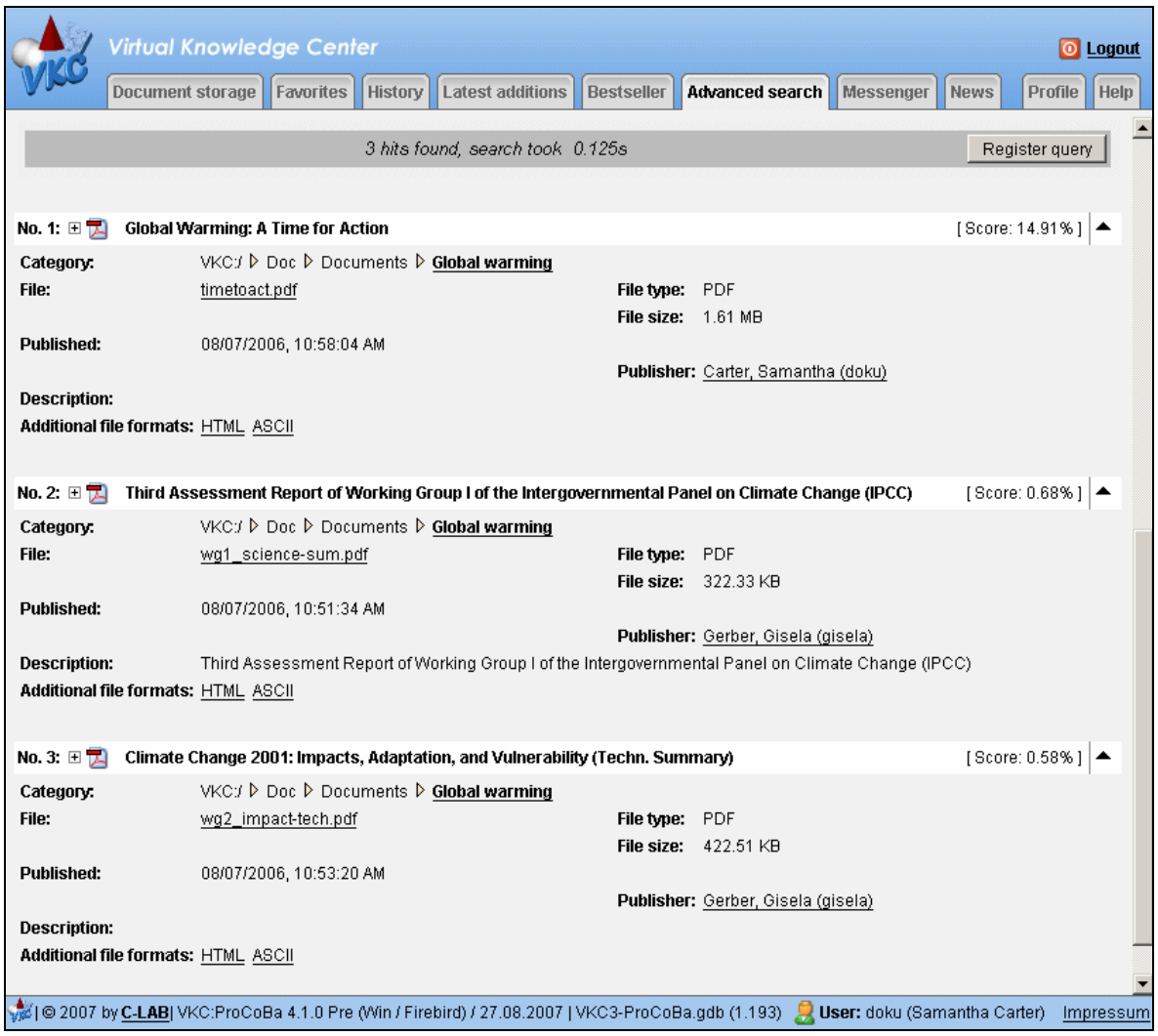

Fig. 5: Advanced document search results

A search query that has been performed once can be registered in the personal VKC Messenger. Whenever a document that matches the query is published, the user will be notified by e-mail automatically. More about the notification mechanism can be found in section 3.5.

All features for discovering the contents of VKC that have been explained in this chapter can be used by anyone who has permission to read VKC categories.

3.2 Publishing documents

It has been shown already that the VKC document storage is a hierarchical tree of categories with document files of arbitrary format as leaves of the tree. Adding a new document means to publish it in an existing VKC category. If a suitable category is not available yet, one may create a new one as a subcategory of some other category. Please keep in mind that operations like creation or deletion of categories and addition or deletion of documents are controlled by access control lists. VKC takes care to offer a user only functions that are permitted according to the access control list of the current category.

Documents can be published in every VKC view that shows the contents of a category. (See an example of a category view in figure 6.) Icon in the category's toolbar represents the function "Insert document" (if permitted for the user). One may either navigate to a suitable category that permits insertion of a new document or one may use the VKC automatic classification that suggests possible categories for the document to be published. One of the suggested categories may then be selected by the user. Besides classification, VKC supports the extraction of title, keywords, and description by automatic analysis of the document's contents. Analysis and classification are both available in the dialog form of the function "Insert document".

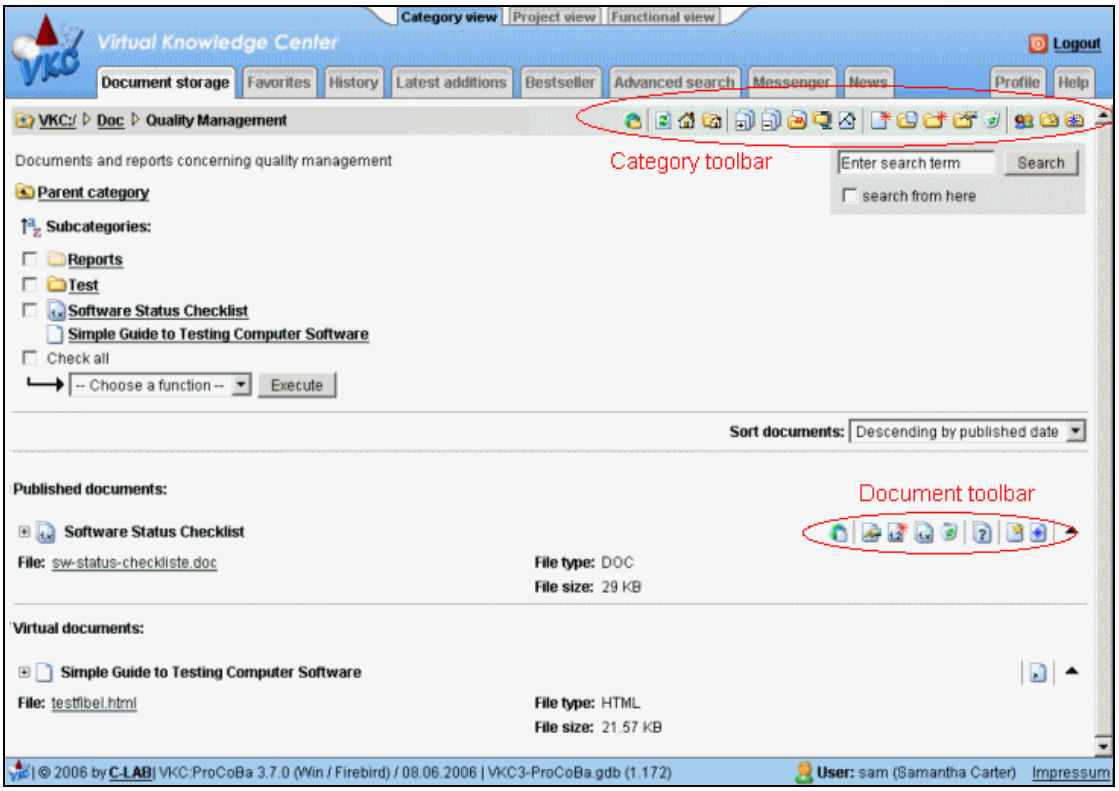

Fig. 6: Category view with toolbars

If the document to be added is a new version of a document that has been published earlier, VKC can keep track of these versions. Instead of simply inserting the document in the same category as the former version, function "Add new version" should be used. It is represented by icon in the document's toolbar which is part of the document entry. (See an example in figure 6.) Function "Show all versions", represented by icon, can be used to get information about all earlier versions of the document.

The described functions for publishing documents are available in the project view as well as in the functional view.

If a great number of documents or complete folder structures with documents shall be inserted in VKC from the file system, this can be simplified by means of the WebDAV protocol that allows using VKC as a web folder with file system copy and paste functions.

3.3 VKC as a Project Repository

VKC as a "general purpose" document repository does not predefine criteria for the creation of a category structure. The semantics of categories and subcategories are defined by the users and can be written down informally in the category descriptions. The category view is the general tool to access those user-defined category structures.

In many operational VKC environments, there is a need to create category structures that represent projects. There are typical additional expectations associated with categories that are used as project repositories. Therefore, the VKC "Project view" has been developed which offers more than just hierarchical document storage. An example of the project view can be seen in figure 7.

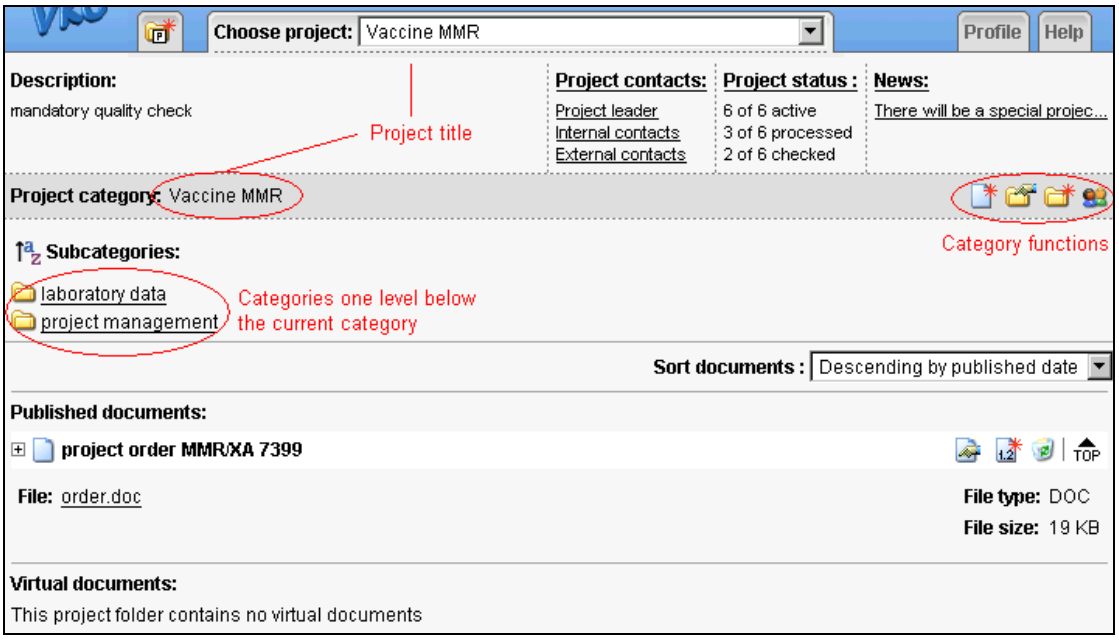

Fig. 7: Example of VKC Project view

There is a special operation for the creation of a project. A project gets a name that can be used for quick access of the project by means of a selections list without navigating through the complete VKC category hierarchy. During creation, the project leader may choose a predefined project type, a so-called “project template”, to establish an initial folder structure according to the appropriate project standard automatically. The project template may also include predefined access control lists and initial documents that shall be copied to the project folder.

The project folder structure can be accessed just as other VKC categories with category functions, document entries and associated document functions.

Special project-related functions of the project view are:

- “Project contacts”: a list of internal and external project participants
- “Project status”: a tool for planning and controlling project steps
- “News”: a kind of message board for the project members

Especially function “Project status” is very helpful to keep track of the project progress. An example can be seen in figure 8. The project leader has entered the planned project steps. Then the responsible project members check off the completion of their tasks. The project leader or another designated person has to check whether the results of a project step meet the requirements.

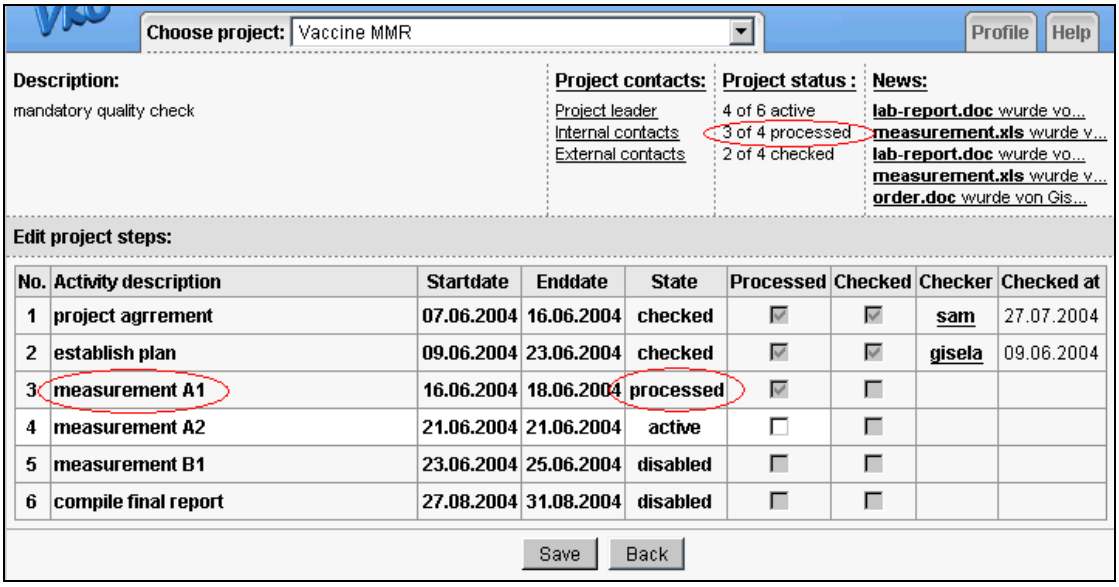

Fig. 8: Example of Project status

When all project steps have been performed successfully, the project leader may close the project to lock it against further changes. A closed project can be opened again, if changes should be necessary, or otherwise it can be archived and removed from the document storage. The archive is an offline copy of the project folder and the associated project information. It can be unpacked into a file system and examined by any HTML browser.

3.4 Cross-Project Functions

There are roles in a typical project organization that are assumed by the same person for many different projects at the same time. This could be the quality manager or a project controller, for example. These people must have access to a specific selection of documents of many projects. Instead of using the project view to visit one project after another, they may more conveniently find these documents by means of VKC “Functional views” that can be designed for any given purpose. See figure 9 for an example of a functional view.

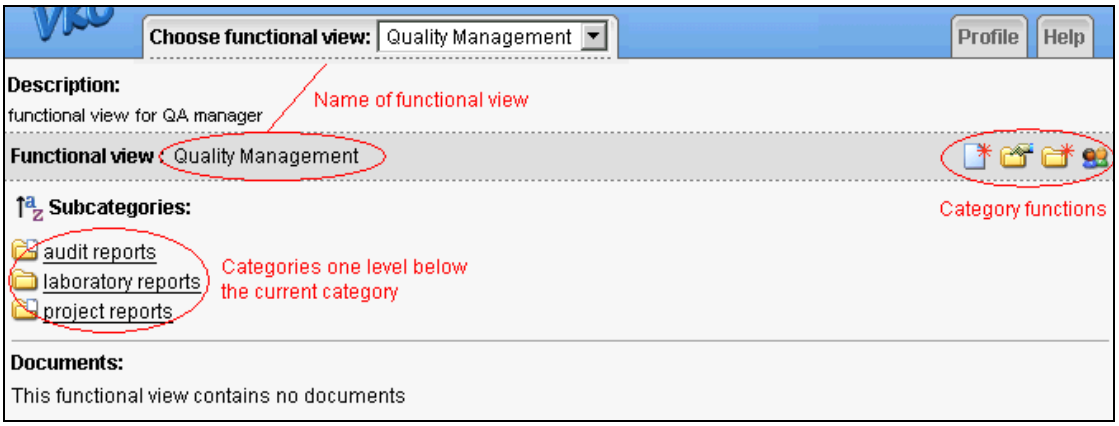

Fig. 9: Example of VKC Functional view

A functional view has a name indicating its purpose (i.e. its “function”). Just like projects in the project view, functional views can be selected quickly by name from the list of all views that are available for the current user.

The view consists of a category structure that has been designed to support the purpose of the view and the typical work processes of its users. In the first place, this structure can be used like any other VKC category structure known from the category view. The categories may contain ordinary documents that have been published in the functional view.

The full power and flexibility of functional views can be achieved by so-called “virtual documents”. In contrast to usual published documents, virtual documents are document entries that refer to documents that have been published somewhere in arbitrary VKC categories. These entries for virtual documents are generated dynamically by performing a “virtual search query” that is stored in the properties of the current category. An example of a virtual query defined for category “project reports” in functional view “Quality Management” can be seen in figure 10. Whenever the quality manager enters this category, the query will be performed on the current document search index automatically and all currently available reports that match the query will be listed. The definition or modification of a virtual query is as easy as filling out the advanced search form shown in figure 4 on page 15.

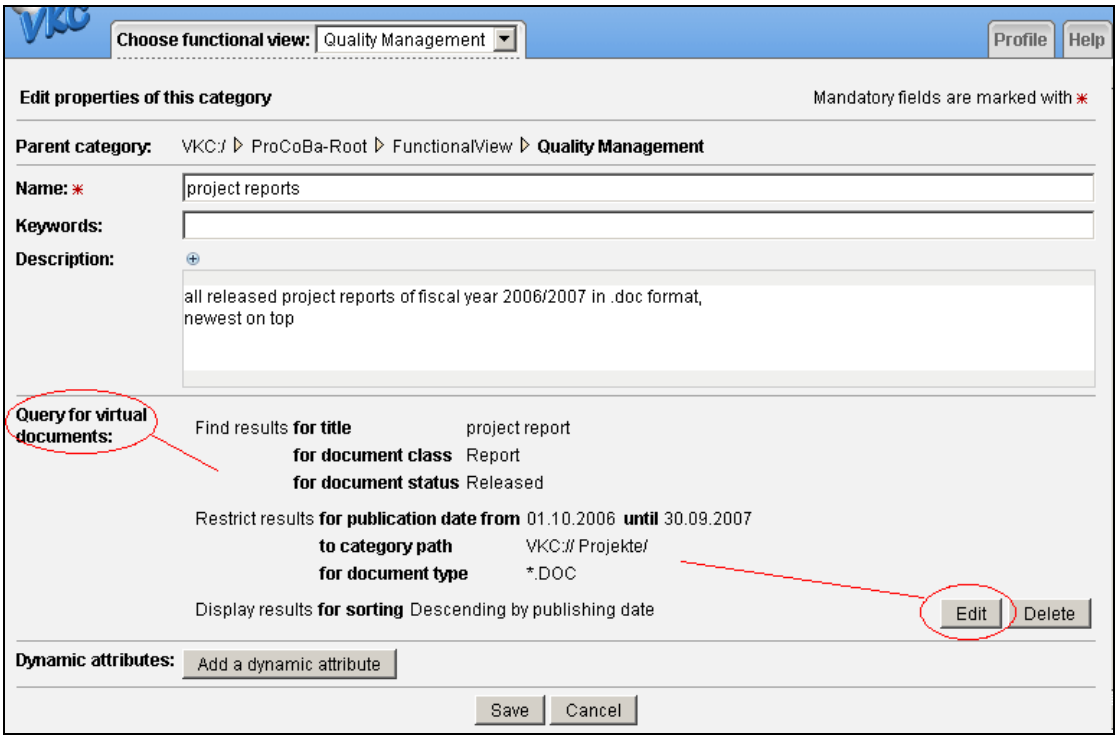

Fig. 10: Virtual query

As “functional view” and “virtual query” are concepts that are not specific to the context of projects, they can be used not only for cross-project functions but also for many other applications whenever a special view shall be presented without document redundancy.

3.5 Personalization – User Profile and VKC Messenger

In addition to its many powerful features, VKC can be personalized to accommodate individual user behavior.

Every VKC user has a corresponding profile that can be accessed by the functional tab “Profile”. The purpose of the user profile is not only to store data about the user account like the user’s real name, the username, the encrypted password, and the e-mail address, but also to enable the user to store some personal preferences. They include the home category after login, the menu language, and options for the customization of different VKC views. There are additional settings in the profile that are adjustable by administrators only, like group assignments, the user’s initial system view, the ability to switch views, disk quota, or session timeout.

A special connection between VKC and the user can be established by the VKC Messenger which is a powerful tool to enable and manage e-mail notifications. It is under full control of the individual user and can be accessed in the category view by functional tab “Messenger”. (See example in figure 11.) If the user decides to enable messaging, the notification frequency and the events that trigger notifications can be adjusted. In general, notifications are e-mail messages about new documents in the VKC document storage. The user may register for notification:

- categories (event: new document in the category or subtree),
- documents (event: similar document published),
- search queries (event: new document matching the query).

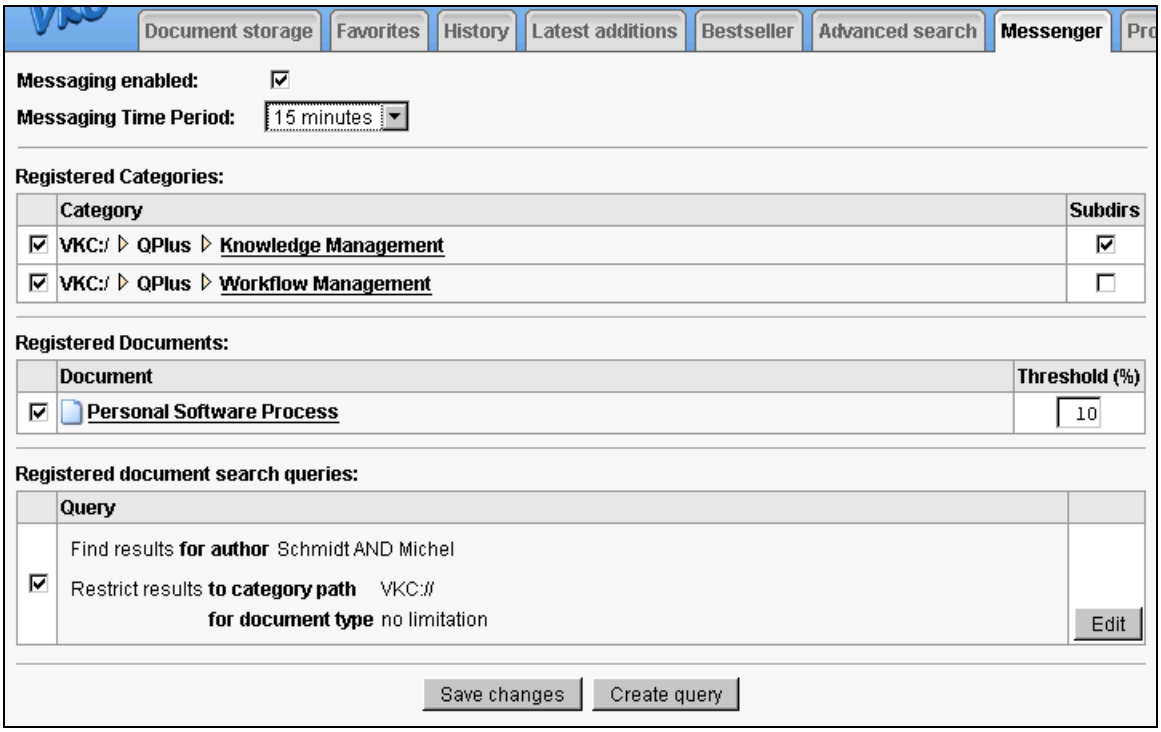

Fig. 11: Example of VKC Messenger

This chapter provided detailed information about many powerful features of VKC. The full documentation of all functions is available in the hypertext online help file.

4 The Technical Side of VKC

4.1 The VKC Core

Technically VKC is a Java web application that is executed on an application server. VKC uses the file system for the physical storage of documents and index files and an SQL database for administrative information and metadata. In order to keep license costs low, VKC works well with an infrastructure based on open source software. The current C-LAB installation is hosted on a Tomcat 5.x application server[7] and the Firebird database server[8]. It also relies on several open source utility libraries from Apache projects, especially the Lucene search engine[9] to search through the document index. Integrated in the web application is a WebDAV interface which allows efficient desktop integration for Windows and Linux platforms on file level.

4.2 VKC Extensions

Since most documents are office documents, suitable office software has to be installed to view or modify the document. VKC supports the automatic conversion of document formats using installable converters. Especially the conversion to HTML or plain text formats is very helpful, if a document just needs to be viewed from a computer where no office software is available.

VKC can interact with existing IT infrastructure like for example LDAP servers for user management. For integration in other environments interfaces have been developed that support web service calls.

5 Conclusion

5.1 Target market

The previous chapters presented a thorough look at VKC and its use in different scenarios. Though VKC has to compete with a great variety of document and knowledge management systems (see [2] for a market study), its unique combination of features should be considered as a lean but powerful solution for:

- document storage and access for collaborative projects and distributed project teams
- efficient indexing of documents with content-based search
- individual integration and feature enhancements for special application areas
- support of research teams

[7] http://tomcat.apache.org
[8] http://www.firebirdsql.org
[9] http://lucene.apache.org

VKC has been improved continuously based on the evaluation of user feedback. Today, VKC excels in usability with a clean, easy to understand interface that enables end-users to work with VKC intuitively. Administration of VKC is facilitated by a Web-based administration view and can be optimized by delegation of limited administrative privileges to regular users.

5.2 Outlook

VKC is an evolving software which is driven by end-user needs. The next version, VKC 4.1, will support migration of documents and metadata from one VKC repository to another, thus enhancing the already existing export functionality.

In addition to the document search a new category search will be offered and a number of further improvements will amplify the user experience.

Summarizing the feedback from the user community, VKC is an efficient, easy-to-use document management system which targets intra- and inter-company collaboration on document and project level. Although it is not a full-fledged project management solution, VKC supports specific views which can adapt the document-based management for projects.

6 References

[1] C-LAB VKC demonstration site: http://vkcdemo.c-lab.de/

[2] Gronau, N. (Hrsg.) / Bahrs, J. / Schmid, S.: *Anwendungen und Systeme für das Wissensmanagement: Ein aktueller Überblick.* 2. Auflage, Berlin 2005

[3] Hohensohn, H.: *virtoweb – Collaboration für innovative Unternehmen*. booklet, Paderborn 2005

[4] Project website VirtOweB (only German): http://www.virtoweb.de

[5] Werner, L.: *Typografiegewichtete Information Retrieval Verfahren in Dokumentenmanagementsystemen.* Universität Paderborn 2006, Dissertation, Fakultät für Elektrotechnik, Informatik und Mathematik