

KNOWLEDGE MANAGEMENT FOR FINAL DISPOSAL

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ABSTRACT

In order to manage the available information and knowledge in the field of final disposal a knowledge management system for final disposal issues has been developed. This system takes into account the various processes relevant for the planning of a repository for radioactive wastes. I. a. these processes concern waste management issues, operation of repositories, concepts for final repositories, set up of repositories, licensing procedures, post closure phase, politics and disposal concepts, guidelines, site investigation, site characterisation, closure and other questions.

These processes are considered by a suitable categorization of the distinct documents stored in the knowledge management system. In addition the documents can be characterized by a wide range of properties. For enquiry purposes a powerful search-engine has been implemented which allows any combination of search criteria.

The system has been installed at March 2003. Within a period of six month a basis pool of app. 4.000 documents has been entered in the system. Following this phase normal operation has been started. By using the system the amount of documents will be increased and the information about the documents will be improved. Up to the end of 2003 app. 5.000 documents are stored in the system, of which one tenth are categorized.

The system with the described pool of documents has been proved as a powerful knowledge management tool on the field of final disposal. Complex queries can easily be posed, and the adequate result set is immediately provided.

INTRODUCTION

A comprehensive planning of a repository for radioactive wastes has to take into consideration many distinct processes. I. a. these processes concern waste management issues, operation of repositories, concepts for final repositories, set up of repositories, licensing procedures, post closure phase, politics and disposal concepts, guidelines, site investigation, site characterisation, closure and other questions. Each process contains several sub-processes, and all processes and sub-processes interact.

Since the early eighties of the past century a lot of research activities took place regarding these processes, and thus, a huge amount of information arose. In order to get an optimum use of this information a computer based knowledge management system for topics of final disposal issues should be made available.

With this knowledge management system information should be systematically collected, processed, stored and evaluated.

Data processing work is carried out by GRS, the use of the system is provided for the German Federal Environment Ministry.

DESCRIPTION OF THE SYSTEM

Requirements

Main purpose of the knowledge management system is the provision of a fast access to published documents in the field of final disposal. A professional evaluation of a part of the documents and a categorization by GRS-experts provides criteria for the assessment of the scientific quality of the documents.

A large number of various types of published documents shall be registered in the knowledge management system. I. a. reports, journals and proceedings have to be taken into consideration. All documents stored in the knowledge management system have to be indexed. The pool of documents has to be grouped in an adequate tree structure, a part of the documents has to be categorized, see paragraph description of the documents.

It is assumed that app. 10.000 to 50.000 documents should be registered with an average size of some 100 KByte per document. The system shall be installed at three locations (Cologne, Garching near Munich and Bonn). Queries shall support full-text search as well as the search in document properties (e. g. author, country, date of publication). After getting the result set of a query a direct access to the respective documents has to be available. The knowledge management system is designed for a number of app. 50 users.

Regarding the data processing infrastructure both the infrastructure of the Federal Environment Ministry and the infrastructure of GRS have to be taken into consideration.

Technical Solution

Regarding the above mentioned requirements an evaluation of commercially available knowledge management systems as well as proprietary developments results in the Microsoft SharePoint Portal Server as an optimum solution. SharePoint is a server based platform consisting of three basis elements:

- a configurable portal
- a document management system with a database and
- an indexing and search component

The portal serves as a common entrance for user accessing the knowledge management system by use of an internet browser. The document management system contains the document database with version control and access management. The indexing and search component can index local and external data sources and consists of full-text search, the search for Meta data and the search in categories. Any Meta data can be defined for specific search purposes.

The SharePoint Portal Server with the document database and the indexes is installed on a powerful server. As operation system Windows 2000 Server is used. The data can be accessed by use of the intra

net (over TCP/IP with http). A common Internet browser (e. g. IE 6.0) can serve as client for the access to SharePoint.

Figure 1 shows schematically the network infrastructure of the knowledge management system, in which server and clients are embedded.

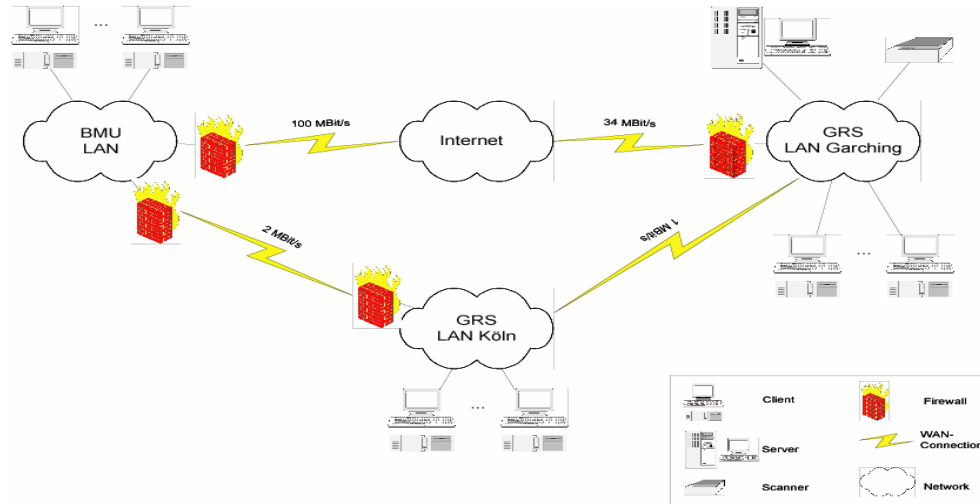


Fig. 1 Network infrastructure of the knowledge management system

CATEGORIZATION, DATABASE STRUCTURE AND QUERIES

In order to gain optimum benefit from the knowledge management system the documents and information stored in the system are to be structured in accordance to suitable criteria. The knowledge management system presented here use two main criteria:

- categories representing the various final disposal processes
- a directory-structure which is relevant to type and origin of the respective documents

The categories used in our knowledge management system are shown in the screenshot in Fig.2. From the viewpoint of a political decision maker (in Germany) they cover any relevant aspect regarding the development of a sustainable disposal strategy. The documents assigned to a distinct category give an overview and a useful collection of the knowledge of the respective issue.

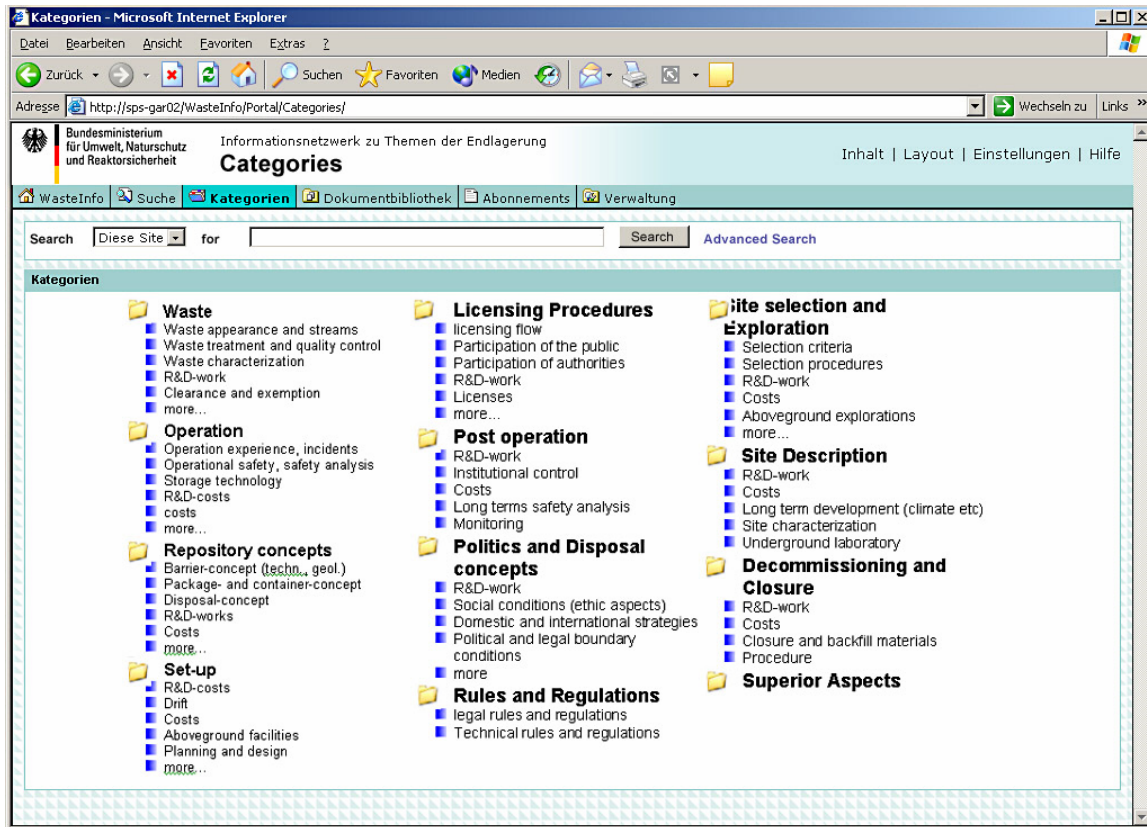


Fig. 2 Categories used in the final disposal knowledge management system

The number of items in the distinct categories represents an indicator of the available knowledge in the respective process. Only few or even no document in a category is an announcement that further information has to be collected or that there is a necessity for additional work in the considered field.

An assignment of one document to many categories is possible.

All documents are stored in a database which is located in a web folder. The web folder is structured as a tree directory. The respective subdirectories give information about type and origin of the documents, see Fig.3. Four main sources of documents are considered, which represent the up most level of the tree:

- proceedings
- periodicals (journals)
- publications
- reports

Proceedings consist of talks and publications presented at conferences or symposia. The directory proceedings is further subdivided in common types of conferences, such as Kontec or DisTec etc. Each of these directories contains subdirectories with the year of the conference.

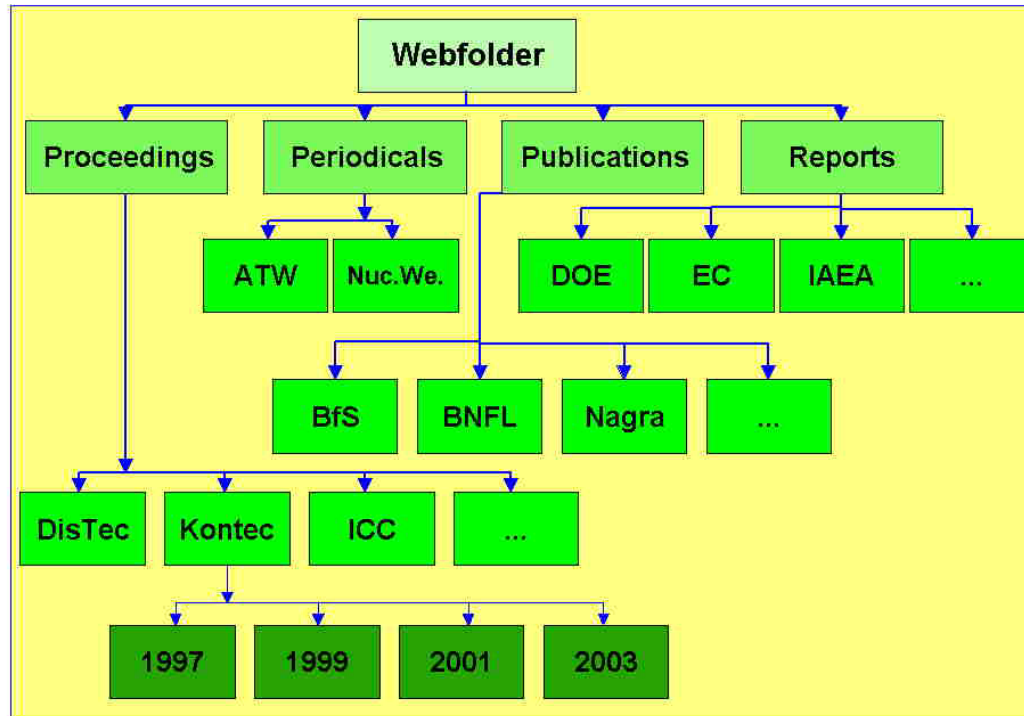


Fig. 3 Directory structure of the database of the final disposal knowledge management system

In the main directory *periodicals* disposal relevant articles from technical journals are collected. The directory *Publications* is foreseen for publicly available documents, particularly from domestic or international organisations, such as safety series or Tecdocs. *Reports* contain results of scientific and technical R&D work. The structure of these main directories is arranged the way as described for proceedings.

For query and filter purposes the standard *SharePoint* search module had to be modified to a *Google* look and feel search engine, see Fig.4.

This search engine consists of 4 parts. The first part is a simple full text search option. The second part represents an advanced full text search with the common *Google* full text search option. Thus users familiar with internet services can easily use this advanced search option. The third part is a search for properties, in which categories represent a specific property. In a query any choice of categories can be selected. In the fourth part a time slot for the query can be set.

Fig. 4 User interface of the search module for the final disposal knowledge management system

The last three parts can be used in combination. With this, any requirement for queries is covered.

The result set of a query is a list of documents matching the query. Apart from the title the list contains additional properties such as dates, author, rating score etc. By clicking on the respective document it is completely downloaded and available for the user.

AVAILABLE INFORMATION

Any document stored in the knowledge management system has to be publicly available and should represent a scientific or general academic contribution. Up to the end of 2003 app. 5.000 documents have been registered. Main source of the documents are proceedings from domestic and international conferences (more than 80 %). Another important source is the internet with official or quasi official publications describing national and international disposal policies, e.g. <http://www.radwaste.org>.

Technical periodicals are of minor importance at the moment, because due to organisational reasons only very few periodicals could be taken into account. E.g. five volumes of the German ATW have been evaluated with seven contributions per year in average.

Reports are of minor importance at the moment, too, because most of the reports are not publicly available and in any case copyright aspects have to be considered.

Apart from registering the distinct documents any document of the knowledge management system has been edited as to adding main properties such as title, author, country and dates. The categorization is more complex, and up to the end of 2003 only app. 500 documents have been categorized.

The distribution of the categorized documents to the categories including their subcategories is shown in Table I. This distribution seems to reflect reality: a lot of waste and many politics and rules and regulations, but only few ascertained solutions. However, the real interpretation of the table should be to fill up the categories with to few documents in order to get balanced information for each disposal process taken into consideration.

Table I Distribution of documents to main categories

Main Category	Percentage [%]
waste	70
operation	1.7
Repository concepts	1.4
set-up	0
licensing procedures	1.1
post operation	2.5
politics and disposal concepts	6.7
rules and regulations	7
site selection an exploration	2.5
site description	2
decommissioning and closure	5
superior aspects	0

OPERATIONAL EXPERIENCES

The knowledge management system has been installed with GRS at March 2003. Because the system will be used only if a lot of information is available, first of all information has to be fed to the system.

Sources for the information have been paper documents and documents on data processing media. Although MS SharePoint Portal Server supports many various data formats, we decided to use only pdf-format because of the powerful options of this format. Paper documents have to be scanned. The resulting bitmaps have been converted to the formatted text and graphic pdf-output-style. Documents on data processing media have to be converted to the same format.

The pdf-documents are stored in the SharePoint-database, where they are indexed. With this the documents can be accessed and are available for full text search. The main properties of the registered documents (author, title, dates, country, etc.) have to be added. This has to be carried out manually and can be done without having read the respective documents. More complex is the categorization of the documents. For this the documents have to be read, and up to now only one tenth of the documents have been categorized.

In six month app. 4.000 documents have been entered. These documents represent the basis pool with which normal operation of the knowledge management system could be started. Apart from enquiries normal operation means that experts use the knowledge management system for the filing and evaluation of documents. With this the document pool is permanent growing and always up to date.

CONCLUSION

More than 20 years of domestic and international r&d-work in the field of final disposal led to an unmanageable information flood. With the presented knowledge management system a tool is available with which a systematic access to this information is given. In addition this system serves as a useful document-management system for r&d-work. All documents used at r&d work will be entered in the system and will be adequately evaluated.

So documents which arose in the past as well as currently arising documents are considered. It is foreseeable, that within a period of another one to two years nearly the whole knowledge in the field of final disposal may be registered and can be adequately considered for decision and planning processes.