

(Process) Ontologies as context for (Wiki-) Communities

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Abstract: This article discusses the integration of a community support into work processes. We show the realisation of a community support with the help of the Wiki-approach for co-operative knowledge generation and problem solving. We discuss requirements and present our concept for integrating Wiki-Communities in process-oriented knowledge structures (ontologies) by creating an adequate interface. We describe the prototype realisation of the concept in a brief case study.

1 Introduction

The knowledge to handle concrete, practical tasks in the work process often exists already in IT systems, e.g. codified in information systems, documents and community applications. This knowledge which is existent in the company should be transparent and available throughout the organisation. For this purpose process structures are suitable in particular, because it is easier to establish a relationship between the own work process and the available knowledge carriers (e.g. persons, documents etc.). Thus, knowledge carriers that are relevant to work processes or to specific activities can be found and used easier. Technologies and tools of the process-oriented knowledge management can provide support for such a structured supply of knowledge. An example for such a tool is the APO-Pilot [FMF03].

In knowledge-intensive work processes it can be necessary to develop new knowledge ad hoc and in cooperation with other people. Therefore the so far available IT solutions of the knowledge management are not adequate. These IT solutions make the already familiar knowledge, e.g. in form of documents, along inflexible knowledge structures (ontologies) available relating to the context.

Knowledge intensive tasks respectively knowledge generation processes are non-linear, dynamic and socially imbedded [BDC89]. Especially the workflow of the processes as well as the required knowledge cannot be determined and made available completely in advance. In contrast, communities support communication that is essential for the exchange of knowledge and experiences. Communities allow thus processes for the cooperative knowledge generation and for the solving of problems. But knowledge, which is generated in and explained through communities is often characterised through a chaotic structure, an enormous size and fast growth. A technical support of communities like a wiki must cope with the challenge to make a context-based access possible to the explained knowledge of the community.

In this paper a concept to support the cooperative knowledge generation in Wiki-communities in knowledge-intensive work processes and a tool, which is based on this concept will be presented. The central idea is the integration of Wiki-communities with process-oriented knowledge structures. Therefore a community support was designed which refers to the work process as a context. Furthermore, it is oriented on the tasks and problems that can occur there. On the one hand, technology supports the context-based access to the knowledge of the community. On the other hand, it supports the flexible generation and conservation of new knowledge and experiences in the community alongside knowledge structures. The weakness of today's community applications, at which a context-based access to the chaotic generated knowledge is not possible, will be overcome.

The requirements for a software tool that can be used in the outlined problem situation will be described in chapter 2. We show that the Wiki concept is an adequate approach to meet the requirements for a cooperative generation of knowledge (chapter 3). Thereafter, a concept for the integration of Wiki-communities into process-oriented knowledge structures will be developed. For this purpose, an interface is designed that realises process and context specific views on the knowledge of the Wiki-community (chapter 4). With the help of this interface synergies of the connection of Wiki-communities and the process-oriented knowledge structures will be developed. The implementation of the concept is shown (chapter 5).

2 Connection of Process Structures and Communities

To accomplish knowledge-intensive work processes, knowledge supply as well as (cooperative) knowledge generation is needed. In order to assure this, technologies of the knowledge management must be connected with tools for the support of communities in an appropriate way [FSW03]. With the integration, the continuous development of the provided knowledge in a cooperative process must be reached. Therefore, a tool meeting the following additional requirements must be created:

Context-related (process-oriented) access to the knowledge network respectively. The individual situation provides the context on the basis of which available information is interpreted. This context in turn can be used to enable the creation of a process-specific perspective of the knowledge network.

Cooperative generation and conservation of knowledge in the community without a restriction of the social, self-organised knowledge generation process of the community by given process-structures. This basically means that an extension of the community knowledge can also be operated in a process-spanning way, making an (explicit) allocation to individual process-steps unnecessary.

A possibility to (loosely) associate knowledge components. The process-spanning construction of the knowledge network leads to a situation where the relevance of network components that are not directly linked with a process-step does not automatically become clear. This missing reference to the work process (context) may lead to a diffuse structure disabling the user to orient and find his way in the knowledge network. Thus, the context (i.e. reference to the individual operations in the work process) of any component in the network must be retraceable.

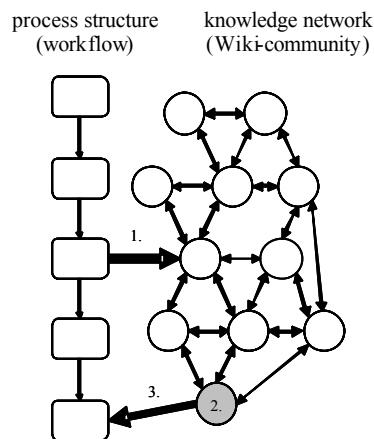


Figure 1: Connection of communities with work processes

3 Cooperative Knowledge Generation with the Wiki Approach

The Wiki approach seems to be an adequate community solution to meet the requirements made for the IT support of the cooperative knowledge generation. Ward Cunningham developed the software „WikiWikiWeb“ in 1995. The word “wiki wiki” derives from the Hawaiian language and means “fast” [LC01]. The word “Wiki” is used to name special documents (Wikis), to name the common concept of these documents (Wiki) or to name the used software (Wiki-Server, Wiki-Engine) [Cy05]. A “Wiki” is an open authoring tool to create and maintain web pages within a community. In a „Wiki“ information can be collected and links to further Wiki pages can be stored. Wiki software offers a fast and simple possibility to create and edit web pages online.

The pages of the Wiki can be commented, modified, supplemented and even deleted from all users. New pages can be created easily and they can be linked to already existing pages. A Wiki-Web is mainly characterised by a simple interaction and navigation on the web pages. In this manner the boundaries between the (active) author and the (passive) user of contents are repealed. In doing so, a big chaotic formation of linked Wiki pages is built fast (knowledge network). All users or a limited group of users have central access to the Wiki-Web. That's why the Wiki-Web is suitable for the execution of projects, the development of documentations or the joint production of concepts. Furthermore, it can be used as a discussion forum. In the field of the knowledge management the Wiki-Web offers a special potential for the knowledge development. The provided knowledge can be changed and extended immediately without any big efforts. Thus, an integrated, interdisciplinary and cooperative knowledge base is the result.

The popularity of this approach is based on different factors [Hu02]. Wikis have a very low usage barrier, because of their flexible structure and the realisation of a very simple handling. The Wiki is very fast in building up the web pages, because it works without any graphical elements and complex layout structures. Thus very low resources are required. Wiki-Engines are available as open source solutions, so they are free of acquisition and licence costs. A Wiki can be installed and administrated easily, because of its extreme low complexity (available from 170 lines of source code). In the fast growing pool of easy accessible information a full-text search can be done.

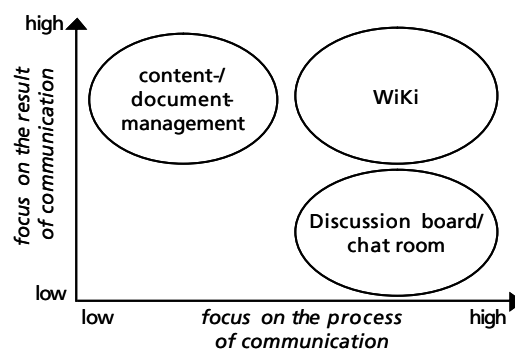


Figure 2: Communication-oriented classification

A Wiki can be used for different scenarios, e.g. as a content management system, as a discussion forum or as other forms of group ware. But the special characteristics of a Wiki have to be taken into account. New gained knowledge can be collected easily with the help of a Wiki and it can be integrated into the already existing knowledge base through the user himself. The specific advantage of the Wiki approach compared to other forms of the cooperative knowledge exchange and generation is that the process of communication as well as the result of the communication is focused. Content and document management systems have their focus rather on the exchange of the results of the cooperation. The result of communication processes for that document are difficult to handle, e.g. through the annotation on or in documents.

Discussion forums rather focus on the process of the cooperation between the participants. Opinions can be changed and a common understanding will be created. But the result of the discussion mostly stays implicitly in the discussion contributions and has to be extracted and compressed later on. Wikis in contrast allow a discussion as well as the work on a common result at the same time. The above mentioned requirements on a tool to support the cooperative knowledge generation are largely fulfilled through the mentioned characteristics of a Wiki. In a Wiki the separation of author and reader is repealed. That's why the cooperative generation of contents is realised especially effectively.

4 Integration of Knowledge Networks into Process-Oriented Structures

The concept of the integration of knowledge networks into process-oriented knowledge structures (ontologies) will be developed below. For this purpose an interface will be designed, which makes it possible to realise process and context specific views on the knowledge network. The developed integration concept is based on the idea that the knowledge network should not be developed detached from the process structure. Instead of that the process structure should be included as design criteria. The assumption, that the user of the knowledge network executes one of the known processes while a knowledge gap occurs, is a big clue for the design of the network. The situation of the user inside the just now executed process creates a context, in which the provided information will be interpreted. This context again can be used to make a process-oriented view possible on the knowledge network. This view can be used determining the context-specific relevance for each element of the network. A result of the developed integration concept is the description of the cooperation between the process model, the knowledge network and the corresponding interface.

Facilitating a process-specific perspective of the knowledge network, an object associated with the corresponding process (step) must be anchored in the knowledge network. This object creates a one-to-one connection between a defined process-step on one side and network components on the other side. Figure 3 explains the structure of this interface model. In the lower part of the picture the processes P1 and P2 are illustrated as a section from a knowledge-intensive process. Both processes are each subdivided into two sub-steps (activities) T1 and T2. The arrows connecting the processes with their sub-steps show the sequence of their execution. The picture shows an example with two hierarchy levels. In principle, any number of levels is possible. The arrows connecting the processes (sub-steps) with the components of the knowledge network represent the actual interface. Every part in knowledge-intensive processes can be matched with a one-to-one network component. With the help of these connections the process structure in the network can be automatically reproduced.

Besides the referring links for illustrating the process structure, the network components contain predominantly links to those knowledge components on the net relevant for the respective processes. The development of such knowledge components and the creation of corresponding links are part of the change operations by the user.

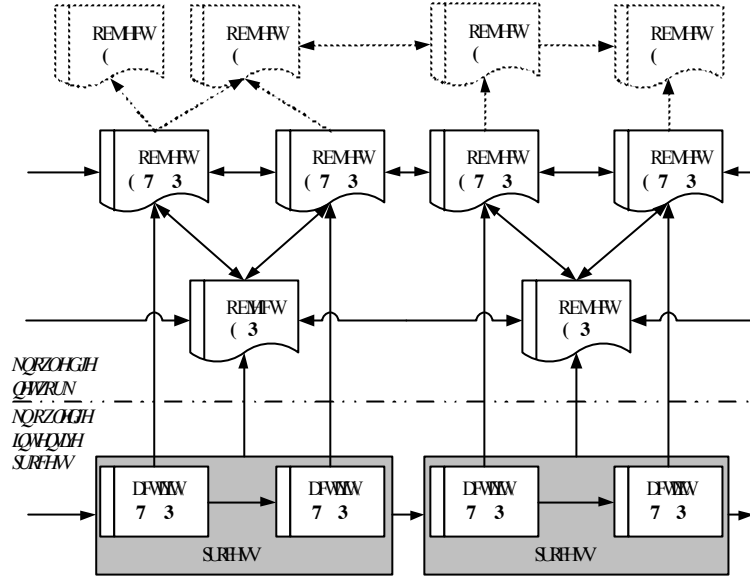


Figure 3: Interface modelling between process model and knowledge network

5 Realisation of the Prototype

In this chapter, we will introduce a tool meeting the above described specifications. This implementation consists of three components. First, the APO-Pilot is used as a process-oriented, global knowledge base. Second, the PmWiki will serve as the Community-Support-System supporting the process of cooperative knowledge generation. In addition to that, an interface according to the above-mentioned concept was implemented between the APO-Pilot and PmWiki. First, the APO-Pilot is shortly introduced. The implemented interface will be presented in greater detail subsequently.

5.1 The APO-Pilot: A Process-oriented knowledge base

Working in knowledge-intensive work processes requires knowledge tied to the activities in the work process. With the APO-Pilot, a tool accompanying the work process was implemented that consistently follows the aspect of process-orientation. The APO-Pilot supports the process of generating knowledge in the work process and facilitates the backflow of new knowledge acquired by applying available resources, reflecting the work process and making practical experiences. The APO-Pilot facilitates a process-oriented navigation through the modelled work processes of a company. Working as an assistant without an active control, it visualises the run of the process as event-driven process chain and supports the structuring of the work process.

Besides the supply of knowledge to supply the run of the process, every process-step and every activity is provided with different knowledge carriers helping the employee to cope with his tasks. These sources of knowledge, commonly distributed in different IT systems and independent from work processes are now integrated and structured in a uniform, process-oriented view. Every process-step and every operation will be provided with documents or other adequate learning material (e.g. from the intranet; domain “library”).

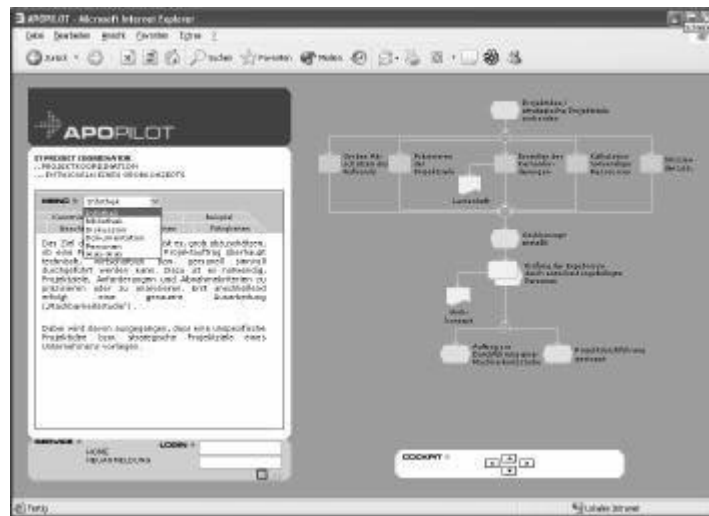


Figure 4: APO-Pilot

Appropriate persons as competence carriers (experts etc.) are suggested with available means of communication (mail, telephone, video etc.) in the domain “people”. In the “discussion” domain, discussion boards are supplied for exchanging experiences, perspectives and opinions as well as trouble shooting. In addition to that, an access to a Wiki will also be supplied for a process-spanning support of a cooperative knowledge generation.

5.2 Cooperative Knowledge Generation: The PmWiki

To realise the Wiki for the APO-Pilot the PmWiki, which had been developed by Patrick R. Michaud [Mi05], was used. The PmWiki is a small Wiki which is written in PHP. Adaptations regarding the content and the layout were necessary. On the one hand, the PmWiki was used because of its usability based on the GNU Public Licence. On the other hand, it is easily adaptable because of its implementation in PHP. Furthermore, the PmWiki has some characteristics which are unusual for Wikis, but necessary in connection with the use of the APO-Pilot. One of the characteristics is the possibility to organise documents in groups and to provide them with access authorization. Another important feature of the PmWiki is its expected continuous further development whereby a stable basis for the future development of the here introduced prototype is given.

5.3 Functionality of the Interface

The APO-Pilot, as an example for a knowledge base structured by processes, supplies every process-step or activity with an access to the Wiki. Starting from the current process, in this case „developing a basic concept“, the corresponding Wiki-site can be addressed immediately or the entire Wiki is searched for a specific term (e.g. „requirements specification“, see figure 5).



Figure 5: Wiki access page

The direct call of the Wiki leads to the invocation of the correlating process-specific interface-document in a separate browser window. This Wiki-site can be edited, new sites can be created or the Wiki can be „navigated“ through (see figure 6).



Figure 6: Interface page

Looking for a search item in the Wiki, all the sites of the Wiki are searched. With the help of distance classes and distance class-depending frequency of reference of the chosen process-step, the hits will be screened, evaluated and presented according to their process-specific relevance (see figure 7, left-hand side).

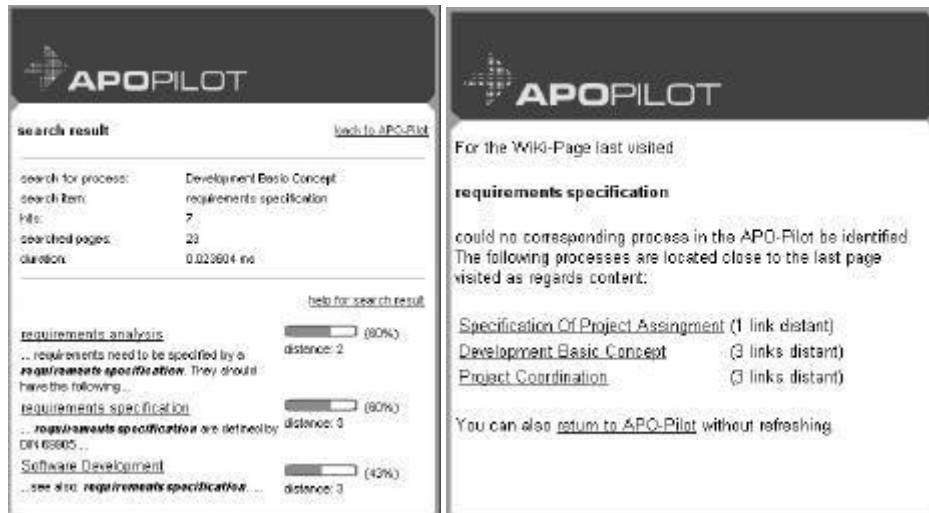


Figure 7: Process-based searching result, Return to the process model

Beside the relevance, graphically expressed by a green bar as well as in percentage, the result also contains features of the correlating distance class („distance“). Furthermore, the name of the site and the context of the search item are presented. Clicking on the name of the site, the Wiki is opened in the corresponding place. The head of the site shows general information of the result of the query, particularly the process the query was conducted for. This piece of information is important since a query with the same search item for another process would have lead to a completely different result.

The return to the APO-Pilot is possible from every Wiki-site (see figure 7, right-hand side). If the current site is an interface-site, the corresponding process-step will be opened in the APO-Pilot. In case of finding no matching site, all those process-steps with the shortest referential distance compared to the chosen Wiki-site are determined. Simultaneously, the user is provided with a facility to return to the APO-Pilot.

6 Summary

Knowledge-intensive processes are characterised predominantly by problems that cannot be anticipated, containing beside a process-related supply of available knowledge sources also processes of cooperative problem solving. Due to a high complexity of problems, cooperative problem solving requires a process-spanning exchange of knowledge. It became clear that knowledge communities can highly contribute to increase the intrinsic motivation for sharing knowledge by creating a platform for Communities of Practice. The Wiki approach was introduced as a technological means to realise a knowledge network like this. With the help of the Wiki the classical roles „author“ and „recipient“ are removed.

Creating synergies in combining knowledge networks and process-oriented knowledge structures was described by the integration concept. The core piece of this concept is an interface that facilitates process-specific perspectives of the knowledge of the community (knowledge network) on the basis of the referential distance and the distance class-depending frequency of reference of a document. In conclusion, a prototype implementation could be presented and executed on the basis of an integration concept (Wiki into APO-Pilot). With the prototype-implementation of a Wiki in the APO-Pilot, we managed to develop a tool for a cooperative knowledge generation while considering the afore-mentioned requirements. The particularly low usage barrier due to the easy and intuitive usability of the Wiki as well as the improvement of the information retrieval process in the knowledge network by using process structures serve as examples for that.

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