INTERNATIONAL CONFERENCE ON ENGINEERING DESIGN, ICED'07
28 - 31 AUGUST 2007, CITE DES SCIENCES ET DE L'INDUSTRIE, PARIS, FRANCE

WIKIS AS A COOPERATION AND COMMUNICATION PLATFORM WITHIN PRODUCT DEVELOPMENT

Albert Albers[1], Tobias Deigendesch[1], Moritz Drammer[1], Claudia Ellmer[1], Mirko Meboldt[1], Christian Sauter[1]

[1]Institute of Product Development, Universität Karlsruhe (TH), Germany

ABSTRACT

Knowledge and information management gains growing importance especially in industrial product development processes. This contribution presents two concepts for structured information storage and access that also can be combined: Wikis and the Continuous Idea Storage. The objectives of Wikis and the application in product development process are discussed. Further on, the approach of the Continuous Idea Storage is introduced. All ideas, no matter if selected for realization or rejected, generated during product development are stored and annotated by additional information, e.g. why the idea was rejected. Finally, the contribution presents the application of both concepts in product development by student project teams in the context of the Karlsruhe education model for product development (KaLeP).

Keywords: Wiki, continuous idea storage, information management, knowledge management, collaborative product development, education

1. INTRODUCTION

Knowledge management is of increasing importance in today's information age. Many approaches of computer-aided knowledge management systems, as some databases and expert systems, did not succeed. There is still a great demand for effective knowledge management systems, which meet with specific requirements of product development. Being a novel system, such called Wikis (Wiki = Hawaiian: quick) as open content management systems gained massively in importance during the latest years. Initial concerns that every user can act as an author were not confirmed, instead, many advantages of these systems could be shown. Prime example for the resounding success is the free encyclopaedia "Wikipedia", which developed to a respectable encyclopaedia since its foundation in 2001. The journal "nature" compared the English version of Wikipedia with the "Encyclopaedia Britannica" [4]. In a peer review process, fifty experts were asked to verify research entries. Surprisingly, the average article in Britannica included around three inaccuracies, Wikipedia four.

Based on the success of Wikis, the investigated question was, in what way this potential could be successfully transferred to an application as a knowledge management platform for communication, cooperation and documentation within product development processes.

Further on, within the student development project "Integrated Product Development", an empty Wiki was set up, which was open to be used by all project participants. The objective was to investigate usability aspects of these systems within a product development context.

2. BOUNDARY CONDITIONS AND REQUIREMENTS ON SOFTWARE FOR KNOWLEDGE MANAGEMENT

This chapter discusses boundary conditions in organizations and requirements which need to be considered in the design or selection process for a software tool for supporting efficient knowledge management in the context of collaborative product development. They are derived from experience, observation and analysis of the information flows in a collaborative multidisciplinary development project.

Organizations use different types of software and hardware infrastructure. If new tools or functions are to be added to this infrastructure, the old systems need to be extended or replaced. In case of an

extension, complex adjustments may be necessary. Replacing established software and migrating existing data may be laborious.
The time frame for a cooperation project needs to be considered. If a longer cooperation is planned, more time and money can normally be spent on establishing a common infrastructure. If a series of consecutive projects is planned with only small changes from project to project, project times can be added. The number of involved persons, groups and organizations influences collaboration and the requirements on good knowledge management. Professional skills, established working methods and personal strengths and weaknesses are also relevant. Mutual trust increases the willingness for cooperating and sharing knowledge. The higher the level of trust is, the less needs to be thought about safety aspects and more knowledge is shared. Greater trust in computer systems avoids that people prefer working manually to working with offered software functions. For the design of information and knowledge management, it is very important to know how knowledge and sharing and distributing knowledge are valued in an organization. It is essential for the successful introduction of new information technology methods, that all involved persons are open-minded towards new technologies. A high transparency of the ratio of benefits to effort must be aimed for by the corporate management.
The following requirements should be fulfilled by computer applications for supporting efficient knowledge management. The criteria below only apply to software. Aspects like project management, motivation of involved persons and organizational design are also relevant. These aspects are not discussed in this article.
Knowledge brought into or created in a system must be protected from unauthorized access. This includes unauthorized access from outside an organization as well as access to knowledge, which should remain exclusively with one project partner. Users should not be flooded with information. If too much irrelevant or unimportant information is offered, needed information is hard to find, however the offered information should be complete. Computer programs and system components must be suited for project work and should be usable for different projects and new requirements. It should be possible to reuse data and computer programs completely or partially for new projects, ideally also for projects with different cooperation partners. Computer programs and data and knowledge bases ought to be extendable with new functions. It should be possible to add new data even if it does not come in the same data format. Software systems and their components need to be compatible with the most common or most widely used software products in the cooperation network. Service and maintenance need to be easy, fast and possible at short notice. Software should be easy and intuitive to use, also for inexperienced users and if new functions are added. Effort for familiarization should be as small as possible. Experienced users should have the possibility to customize the application according to their personal needs. A comprehensive and concise help function should be provided. System components may not fail and need to deliver correct results. In distributed projects, data connections with sufficient bandwidth need to be available. Access to information should not only be possible from a limited number of predefined workplaces, ideally it is accessible from anywhere. Knowledge should be stored in such a way, that the coding or implementation specific influence is as small as possible. This ensures long-term reusability. Used systems need to be well documented. This includes a good user manual as well as a detailed description for experts. Incomplete documentation blocks the possibility to change or update old systems. Computer systems need to provide good user administration functionalities. Users should be informed automatically about changes and updates. The used terminology should be consistent, easy to understand and clearly documented. Quality assurance is needed. This includes monitoring the up-to-dateness of the content of the knowledge management system.

3. WIKIS

Wikis are systems for easy online publishing, editing and discussion. Wikis are software tools for computer supported collaborative work (CSCW) [12] and as an internet technology which relies heavily on user collaboration, they are considered an element of the Web2.0 [13]. A Wiki is a collection of internet pages based on Hypertext. Like portals, most Wiki systems are internet-based, but they have a different underlying concept of collaborative editing. In principle, pages can be edited by any user who is authorized to access a Wiki. In order to avoid misusage it is possible to restrict editing rights. Wiki systems also provide tools for logging changes or discussion forums for controversial entries.

Term and Origin

The term Wiki was used for the first time for the software WikiWikiWeb in 1995 by Ward Cunningham. Wiki is an abbreviation of wiki wiki, which means “fast” in Hawaiian. Pages can easily be created and changed. Neither programming skills or HTML skills nor special computer programs are needed for editing the contents of a Wiki. A Wiki is set of interrelated pages, a single page is called Wiki-page and the computer programs operating in the background are called Wiki engine or simply Wiki software.

In the late 1990s the concept of Wikis became increasingly popular for creating public and private knowledge bases like the probably best known Wiki, the free Encyclopedia Wikipedia. After the turn of the millennium, Wikis were introduced in businesses and other organizations in order to improve collaboration between individuals and teams. In some organizations, Wikis have already replaced the intranet, for example at the state and university library of the Saarland. Meanwhile Wikis are used in large and well known companies in the fields of computing and software, the aerospace industry, automotive industry or finance. The main problems that occur when Wikis are used, are a lack of participation of the target users and low overview in large and poorly structured Wikis. The main advantages of Wikis are increased communication with a high ratio of output to effort and discussion, automatic simultaneous documentation as well as small costs and easy implementation.

Functionality

A Wiki is based on key terms. Every page is associated with a key term. If one of these key terms is used and syntactically marked, a cross reference to the page of this key term is created automatically (Hypertext). The editing of pages is done with e.g. a simple markup language called Wikitext, a simpler HTML for example, which can be typed directly into the browser. The syntax may vary depending on the used Wiki software. The output format of the pages is HTML, so no special computer program is needed for viewing, creating or editing. A normal browser is sufficient for using a Wiki. The author of a page only has to take care of the contents and design of a page. All remaining things like cross referencing are done by the Wiki software. Version management allows access to older versions of a page. This is important for correcting mistakes and makes changes comprehensible. Vandalism can be prevented by requiring users to register before making any changes and previous states can be restored.

Due to their manifold, yet easy to use functions, Wikis are a technology which is very suitable for creating, enhancing and preserving a knowledge base for organizations, groups or individuals. Every member of a group can contribute or discuss controversial entries. This knowledge base can be changed and extended, which makes it possible to create an integrated, interdisciplinary and cooperative knowledge base.

A unique point of Wikis compared to other systems for creating and communicating knowledge is that they focus not only on the communication process itself but also on the result of the communication process. Content and document management systems are well capable of administrating knowledge, but it is not easily possible to create and to discuss knowledge collaboratively. With electronic discussion forums, a group of people can create and discuss new knowledge, but the result of this process needs to be post-processed after the end of the communication process. Wikis offer not only the possibility to store knowledge, but also to question, discuss, extend or update store d knowledge.

It is possible to cross-link Wikis with content and document management systems. Already existing knowledge, which is stored in data files can be integrated into Wikis without reformatting and can then be reused. At the State and University Library of the Saarland [6], such a combined system could be introduced successfully and meanwhile it is well accepted by its employees and used regularly. It seems interesting to couple Wikis and PDM/PLM systems. But so far suppliers of these systems have not yet integrated Wiki functionalities into their systems.

Even without a direct coupling to PDM/PLM systems, Wikis are well suited for use in multidisciplinary product development projects. Additional advantages to the previously mentioned ones are easy implementation and use as knowledge base. Common use of this database is independent of the organization of product development and therefore simplifies cross-organizational and interdisciplinary collaboration. The dynamic and discussion friendly character of a Wiki makes it useful tool for building a mutual understanding and common terminology for the involved domains in a multidisciplinary project.

Ideally all members of a group or organization enter their knowledge into a Wiki when it is newly set up. At first there is no obvious benefit for an author as he only gives away parts of his knowledge, but if this person is looking for certain information, they rely on the input of other authors and the utility of a Wiki increases with the level of involvement of the other authors. If too few authors participate in the beginning of a Wiki project, the Wiki will not be very useful for the active authors and in return their motivation to contribute further to the knowledge base will decrease due to a subjectively bad ratio of effort to benefits. If a new Wiki project is initiated, it should be ensured that authors are aware of the potential and advantages of such a system and that they are therefore motivated and willing to contribute their knowledge. An efficient means to increase the use of Wikis is to migrate information from an existing system to the new Wiki and then to disable the original system.

Semantic Wikis

Wikis can be extended with semantic functionalities. The contents of a semantic wiki can be additionally structured with the help of metadata which can be interpretated and "understood" by a computer. This makes it possible to process "real", complex questions, not only simple queries for words. Ontologies can be included or can be created from existing Wikis by using semantic links. When the online encyclopedia Wikipedia is semantically extended, the contained knowledge can be processed automatically in other applications. New knowledge may be generated by the possibility to ask "real" questions, which otherwise would have to be collected by hand and then documented.

Wikis – Pros and Cons

The following chapter first describes the main advantages of Wikis followed by drawbacks. Wikis have become increasingly popular in the last years due to a number of positive qualities which can be grouped in the following categories: improved communication collaboration and creativity, simultaneous documentation, flexibility, easy participation and involvement of users, low requirements on resources and infrastructure, security as well as easy accessibility.

Wikis offer an easy and efficient possibility for a group of people to pool and exchange their knowledge and ideas, to create new knowledge by cross-linking existing content and by providing inspiration for new ideas. People can share ideas and form something new in a Wki together. Decentralized groups can collaborate in one shared virtual environment and establish a common understanding of problems or topics by discussion. Every participant has access to a current version of the Wiki and the established common opinion at any time. Wikis therefore speed up and facilitate communication and increase its effectiveness compared to parallel back-and-forth communication like Email. Using hyperlinks allows users to understand interactions and underlying concepts more easily.

Documentation is of special importance not only in engineering. Wikis are easy to use and they do not emphasize graphical visualization which often causes formatting effort for users. Wikis focus mainly on the current state of content, usually the result of a common understanding finding process, but the history of a page is normally included. Changes are saved and previous states can be tracked or restored.

Wikis offer a high degree of flexibility. Access to and participation in a Wiki project is possible from every place in the world with an internet connection. In some applications it may be useful to prescribe a certain structure for the contents of a Wiki but often Wikis feature flexible structures which aren't predefined but evolve over time according to the needs and interests of the user group. Besides an internet browser no additional software is needed for using Wikis as they are platform independent internet applications.

The obstacles that users need to overcome if they want to contribute to a Wiki are small. No programming skills are needed for creating new pages or editing contents and almost anybody can do it. Editing is normally done with Wikitext, a simple markup language and relatively easy. Some Wikis offer What-You-See-Is-What-You-Get (WYSIWYG)-functionalities. So there is a very small hindrance level for participation and involvement of the intended target group is an important factor for the success of a Wiki.

Requirements on resources for a Wiki are comparatively small. All that is needed are one or more web servers, depending on the size of the Wiki and the labor time needed for setting up and maintaining the Wiki engine. Wiki software is normally open source and open access.

Security of Wikis is a topic often discussed. After a period of time, the contents of a Wiki should represent the common opinion of the user group as a result of a peer reviewing process. If an

individual tries to manipulate or willingly delete contents, not much damage is done as previous versions of a page are saved and change in Wikis is reversible. If content of a Wiki is considered confidential, access to a Wiki and editing rights can be restricted gradually for registered users only with different restriction levels.
A significant advantage of Wikis is that they can be accessed from any place in the world with an internet connection. Wikis are a two-way form of communication over the internet and facilitate global collaboration.
Even though Wikis have become very popular, they also have few disadvantages, which if seen from another point a view are also advantages of Wikis. Most concerns about Wikis can be assigned to one of these categories which will be explained more in detail: Security, quality of contents, communication, participation and involvement of novice and technology averse users, structure, authorship and intellectual property as well as resources and infrastructure.
There is a risk of vandalism as users can modify the content of a Wiki by adding, deleting or modifying entries. Soft security measures like peer review and change tracking help to reduce effects of manipulation attempts. Restoring original content is possible but unnecessary effort. This can be partially avoided by limiting editing rights for registered users. In order to detect possible manipulation or vandalism, Wikis are often actively monitored by users which causes additional effort. When content is added to a Wiki, legal issues like intellectual property or privacy rights must be considered.
Quality of Wiki content is also a common concern. Open editing gives also non-experts the possibility to contribute to a Wiki. This might bring inaccuracies and mistakes into a Wiki. Again the peer review process may help to compensate for this. Wikis contain common ideas, perspectives and opinions of a certain user group, so it cannot be guaranteed that a Wiki represents an objective point of view. Wikis can be biased.
Even though Wikis are an effective way to communicate, it is probably not the most effective one. Wikis are an indirect form of communication an still less effective than direct personal interaction. The process in which Wiki content evolves leads to one common opinion. For good decision making pros and cons of alternatives need to be traded off. Merging different views into one common one does is not helpful for good decision making.
Even though only few technical skills are needed for working with Wikis, these may be a reason which make new and technology averse users reluctant to adopt this technology. Using Wiki mark-up rather than WYSIWYG-functions may reduce the motivation for new users to participate and can reduce the effectiveness of a Wiki. The concept that everybody can edit a Wiki lets new users be sceptical about the quality of the content. It may be hard for new users to get an overview of a large and established Wiki. New users are often concerned about making mistakes. Means for guiding and reassuring new and potentially technology avers users should be provided.
Wikis follow the concept content-over-form. For some this is a drawback. Wikis are not intended to deliver presentable material as an output so often the options for adjusting the graphical design or visualization in general are limited. Some early Wikis had a puristic design. Some users may have the impression that Wikis are boring and ugly.
Wikis are not compatible with a traditional understanding of authorship and related intellectual property rights. Authors who contribute to a Wiki must accept that their text may be changed or even deleted if this represents the commonly established opinion of the community. Potential authors who could contribute valuable knowledge might feel uncomfortable about this and other aspects of public writing.
In most cases only few resources are needed for setting up a Wiki. However depending on the chosen Wiki engine software, the installation may be demanding. It may also be necessary to set up new web servers if a Wiki grows faster than expected.
The current popularity of Wikis leads to the conclusion that for most users the advantages seem to outweigh the disadvantages. When Wikis are to be considered, it must be kept in mind that there are certain drawbacks.

Integration of Wikis into a Knowledge Management Concept

Wikis have become very popular as easy-to-use and low cost tools in knowledge management. They are suitable for supporting different aspects of knowledge management, but they are not a universal all-cure for all knowledge management problems. Probst, Raub and Romhardt suggest a model for the

core processes of knowledge management [1] consisting of eight, so called building blocks which are necessary for establishing a knowledge management control loop. Wikis can be helpful in all eight building blocks, but the main application scenario consists of three core processes: Sharing and distributing knowledge, using knowledge and preserving knowledge. Easy editing and platform independent, nearly worldwide accessibility through the internet facilitate the sharing and distribution of knowledge. Powerful search functions and the use of hyperlinks help users to find relevant knowledge. A common understanding of topics and problems is important for effective problem solving. Wikis support this process with collaborative authorship and discussion. Peer reviewing, change logging and active monitoring preserve knowledge by improving the quality and up-to-dateness of the Wiki content.

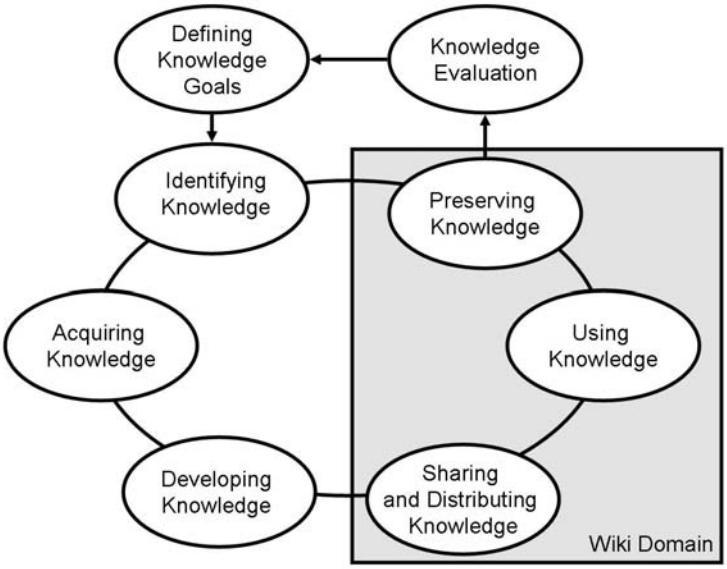

Figure 1. Building Blocks of Knowledge Management [1] and Wikis

4. CONTINUOUS IDEA STORAGE

Fifty percent of an engineer's working time in a daily business context is used for finding information. Especially inquiry and screening of relevant information out of a sizable knowledge base is very time-consuming. This phenomenon of information inquiry and provision is assignable to problem solving processes. For an efficient problem solving it is reasonable to file information systematically and to document it within an "information storage". This is confirmed by Kepner and Tregoe [7], Dörner [9] und Grabowski/Geiger [8]. Sell [5] mentions the enrichment of the current standard of knowledge by more information and domain-specific knowledge as one possibility for improving problem solving. Kepner and Tregoe describe it as a necessity to completely document the single solving steps for technical problems. Dörner's study describes the importance of a good information base in situations being "ordinary" and being pressed for time. In contrast to a deficient information basis, a good one causes always better results. The empiric survey of Grabowski and Geiger presents the relevance and the advantage of information transfer to product development. Analyzing existing problem solving methods it was noticed that there is no proceeding or systematic filing in the field of information transfer, i.e. acquisition and provision.

An approach to ensure the lasting application of ideas for product development is, to introduce a Continuous Idea Storage (CIS). The objective is to prevent the loss of ideas, which is not only the loss of ideas, but also the wastage of resources that were mobilized for generating those. Within a CIS all ideas, concepts or designs that are generated during product development, no matter if successful or deselected, are filed. This collection of ideas is augmented by not only sketches, illustrations or descriptions, but also by the criteria, why the idea was followed up, respectively was rejected. By using this instrument consequently during product development, engineers and designers can take a step backwards if necessary, check the former ideas and continue in another iteration loop.

CIS can be established by using standard office software or even Wikis.

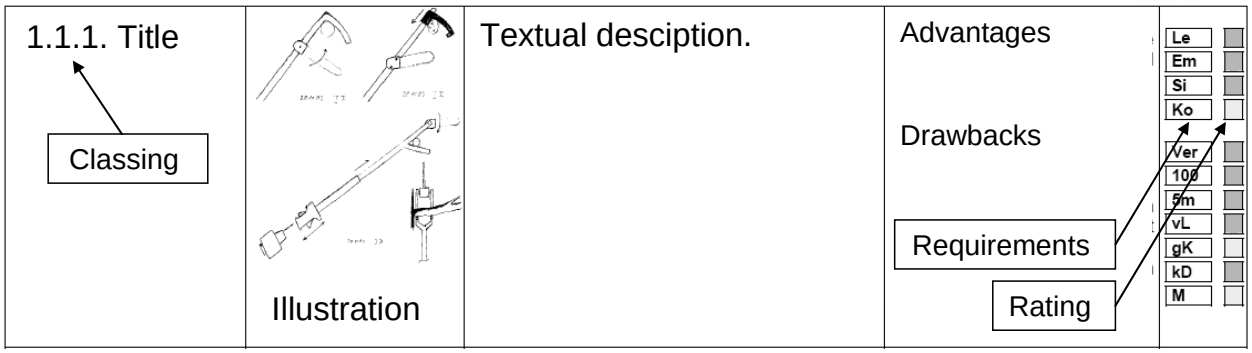

Figure 2. Extract of a Continuous Idea Storage

5. INTEGRATION OF INFORMATION MANAGEMENT TOOLS INTO PRODUCT DEVELOPMENT

The Karlsruhe Education Model for Product Development

The objective of academic education of mechanical engineers is to generate the competencies and to impart the knowledge being necessary for an efficient product development in an industrial surrounding. For starting their career, graduates need to have key abilities, since industry is looking for "problem solvers" and "sources of creativity". In an inquiry of the Association of German Engineers [3] 55% find fault with the social competence of entrants, 47% are dissatisfied with the personal competences, but only 13% parted with entrants due to alack of professional competence.

Thus, engineers do not only need technical skills, but also social competence, management skills and have to be "team players". For meeting these requirements already in academic education, the Karlsruhe education model for product development (KaLeP, cp. [2]) was developed at the Institute of Product Development Karlsruhe (IPEK). Basically, the model consists of three components: lectures, practice/workshop and project work. Theoretical matters can be taught efficiently and application of these theoretical contents is done by example and practice. The project work enables the students to work on a realistic topic within a realistic environment like in industry. This tripartite approach is used as well in the pre-degree course "Mechanical Design" with 800 students as well as in the major subject "Integrated Product Development" (IP) with chosen 30 students. In the workshops and projects, the students are continuously assessed with respect to not only their professional competence but also to four other soft skill fields. With this approach, the students reflect at a very early stage both about their professional competence and also about their other competencies fields and have therefore the possibility to improve their single competence fields in the course of the studies. In every course of mechanical engineering design teamwork is required and supported. All tasks for the students reach such a high level of complexity that the task can an only be solved in a team, by a systematic division of work.

This approach strongly correlates with novel international approaches in engineering education, e.g. the CDIO iniative [11], in which several leading engineering schools all over the world are organized.

With the help of the ten years of experience, IPEK achieved to meet today's requirements for a successful education in product development. Evaluation results and interviews with graduates clearly show that the KaLeP approach improves systematically the key qualifications. In the meantime, the education model of the KaLeP was transferred to other special fields. It demonstrates that the integration of aimed training of soft skills in a practice-near environment in combination with academic education according to Humboldt is a very successful model.

The Integrated Product Development Project

The core of KaLeP is the final year design course IP, which is based on the systematic integration of research on design methodology and management, teaching and professional aspects. The overall concept of this major course enables the students to experience independently a product development process from the definition of the development task to the design of first prototypes. During the course the students learn how to manage and handle a product development project. The participants are selected by a selection procedure, only 20 to 30 students are admitted for the project. The students are demanded a very high time commitment since the project is for the participants a four-month full time

job. This constellation is a win-win-situation for the university, the students and the cooperation partners from industry or research.
At the beginning of the project, together with the partner a company-like structure is established that integrates the student teams. The representatives from IPEK and the industrial partner form the management board. Each team is assigned a proper office in IPEK's product development center, where the teams have access to all infrastructural resources of the institute. The student teams lead self-dependently the development project, but receive intensive coaching if necessary or demanded. The results are presented to the management board at defined presentation dates (milestones). At these milestone presentations, the further proceeding is decided by the board. At the end of the project the teams present their product in a public event in front of the board of management of the partner company, which decides if the product is going to be proceeded within the company.
This product development lab acts as a basis for research on and evaluation of new development methods and process models. Within the IP development project structured and unstructured Wikis were set up and users were interviewed regarding their previous knowledge and their user behavior.
The objective was to investigated advantages and drawbacks of these systems within a product development context.

Application of Information Management Tools by IP Project Teams

Within the IP development project 2005/06 "Drinking water systems for the future" for the first time an empty Wiki was set up, which was open to be used by all participants. Utilization of the Wiki and of an additional product data management system was advised, whereas no restrictions regarding structure or filing were imposed. Eventually, the arbitrarily grown structure turned out to be difficult to comprehend for those not being directly involved in the project teams.
Based on questioning students, the authors found out that in the beginning there was some skepticism about the Wiki among the students. Not all of them believed in the advantages in knowledge management by using a Wiki. But after some days the students realized how convenient working with the Wiki really was. Soon the Wiki got accepted among the participants. All of the students used the Wiki to document the new knowledge obtained during the project. Differences in the user behaviors could be noticed. Not all of the students used the Wiki in the same extent. The Wiki was used by all students to handle the basic knowledge management. In addition some students used the Wiki as a basic work space where every single detail of their work was documented. Soon the students learned to appreciate the positive effects coming along with this preciseness in their work and the Wiki was used in a even more extensive way.
The more the participants used the Wiki as a base for knowledge management the more they appreciated the benefits they obtained. At the end of the project the students were used to the Wiki and the Wiki was accepted among all the participants. Some of the students started to work with a Wiki on their own private computers to handle their private data at home.

In 2006 the IP project teams received an empty Wiki, which already had given structured namespaces. As the authors understand product development as a fractal problem solving process, the structure was derived accordingly. Each step of the general problem solving process SPALTEN (cp. [10]) can be performed during a single stage of the product development process and thus was represented by the given namespace structure. Further on, the project teams were advised to use the Wiki for the continuous project documentation.
A questionnaire inquiry was done wherein the members of the project teams had to answer questions regarding their previous knowledge and their user behavior. Based on 30 Wiki users, 27 usable replies were evaluated. Before the project started, approximately 26% did not know the possibilities of Wikis and 44% felt skeptically regarding Wikis, but almost 90% of those having felt skeptically used it regularly. During the project 63% used the Wiki actively, i.e. as authors and only 15% did not use the Wiki regularly. Also, only 15% would not use a Wiki for documentation in future. The ease of use of Wikis is emphasized by the result, that 60% of those who had no or little experience in programming used the Wiki regularly. Of course, these results cannot be generalized, since all participants were students of mechanical engineering.

6. CONCLUSION

This paper discusses aspects of Wikis and their potential as tools for knowledge management in collaborative product development projects. Boundary conditions and requirements on computer tools in general for knowledge management are presented. These elements also need to be considered if using Wikis is planned. A short introduction to Wikis in general is followed by a more detailed description of advantages and drawbacks of Wikis. Wikis are well suited software tools for knowledge management but they cannot solve all related problems. A recommendation is given for which aspects of knowledge management according to the knowledge management process model Probst, Raub and Romhardt, the use of Wikis can be expected to bring the most benefits. The continuous idea storage is a different approach for solving knowledge problem in product development and is suitable for complementary use in combination with Wikis. The Karlsruhe Education Model for Product Development (KaLeP) takes into account that expert knowledge alone is not sufficient for good engineering problem solvers. The final year design course Integrated Product Development gives students the opportunity to gain new knowledge in lectures and to apply it in teams under realistic conditions in a challenging design project. Students were provided with Wikis for these design projects. After the project, the experiences of the students were evaluated with a questionnaire. Result was that Wikis are suitable for documentation within product development processes. Although the Wiki was accepted and well-kept by the users, outsiders had problems getting an overview on structure an contents of the Wiki.

REFERENCES

[1] Probst, G., Raub, S., Romhardt, K., Managing Knowledge: Building Blocks for Success, 1999 (John Wiley & Sons)

[2] Albers, A., Burkardt, N., Meboldt, M., The Karlsruhe Education Model for Product Development “KaLeP” in Higher Education, in International Design Conference – Design 2006, Dubrovnik, May 15-18, 2006

[3] VDI-Nachrichten: Ingenieur Karriere, VDI-Nachrichten 3/2004

[4] Giles, J., Internet encyclopaedias go head to head, in Nature Vol. 438 (2005) pp900-901

[5] Sell, R., Angewandtes Problemlösungsverhalten: Denken und Handeln in komplexen Zusammenhängen. 3. Aufl., 1989 (Springer Verlag, Berlin)

[6] Saarland University and State Library (SULB) web site: http://www.sulb.uni-saarland.de/english/

[7] Kepner, C. H., Tregoe, B. B., Entscheidungen vorbereiten und richtig treffen: rationales Management: die neue Herausforderung. 5. Aufl., 1991 (Verlag Moderne Industrie, Landsberg/Lech)

[8] Grabowski, H., Geiger, K., Neue Wege zur Produktentwicklung, 1997 (Raabe, Stuttgart)

[9] Dörner, D., Problemlösung als Informationsverarbeitung, 1976 (Kohlhammer, Stuttgart)

[10] Albers, A., Meboldt, M., A new approach in product development, based on systems engineering and systematic problem solving, in Procs. Applied Engineering Design Workshop – AEDS 2006, Pilsen, Czech Republic, October, 27-28 2006

[11] http://www.cdio.org [visited 05.06.2007]

[12] Gross, T., Koch, M., Computer-Supported Cooperative Work, 2007 (Oldenbourg, München)

[13] How business are using Web2.0: A McKinsey Global Survey, http://www.mckinseyquarterly.com/article_abstract.aspx?ar=1913&L2=22 [visited 06.06.2007]

Contact: Tobias Deigendesch
Universität Karlsruhe (TH)
Institute of Product Development IPEK
76128 Karlsruhe
Germany
Phone: +49 721 608 8063
Fax: +49 721 608 6051
E-mail: deigendesch@ipek.uni.karlsruhe.de
URL: http://www.ipek.uni-karlsruhe.de