ICKEwiki: Requirements and Concepts for an Enterprise Wiki for SMEs

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ABSTRACT

Extensive empirical studies of the use of Web 2.0 applications in small and medium-sized enterprises, together with requirements analyses among pilot users, served as the basis to compile requirements for a wiki knowledge and collaboration platform. This experience report discusses the requirements and their implementation in a new wiki engine (ICKEwiki). Initial field experiences with the ICKEwiki implemented among three pilot users are analyzed and potentials for the use and refinement of the platform are presented.

Categories and Subject Descriptors

H.4.3 [**Information Systems**]: Communications Applications − *Enterprise Wiki, requirements, concepts*

General Terms

Management, Measurement, Design, Verification.

Keywords

Experience Report. Enterprise Wiki, Requirements, Concept.

1. INTRODUCTION AND MOTIVATION

Web 2.0 applications and technologies in general and wikis in particular are reputed to have potential to improve corporate communication, collaboration and exchange of experience internally and externally [8]. Communication, collective content

generation and user networking in the Web 2.0 often function without specified structures and central control and are largely self-organized, distributed, participative and voluntary. These principles of the Web 2.0 are not readily transferred to enterprises [28].

Nonetheless, wikis are also increasingly being implemented in enterprises for varying purposes [27], e.g. information storage, project management and cross-group communication, and in very different domains [35], e.g. knowledge documentation and work [9] and internal and external information exchange with suppliers, partners and customers [5]. The differences between small and medium-sized enterprises (SME) and large enterprises affect the use of wikis. One obvious example is the number of potential users that might be activated. In total, more wiki users can be reached in large enterprises that transfer the principle of voluntary participation to internal wikis than in SMEs with a maximum of 250 employees. Studies have demonstrated that the use of wikis is more widespread in large than in small enterprises [13]. Company-wide use is more pronounced among companies with more than 500 employees [26]. In addition, cultural differences often exist: SMEs are often organized very patriarchally and shaped by their owners. If they have limited knowledge of IT, Web 2.0 technologies are often viewed with skepticism and given correspondingly low priority (cf. [5]), although recent studies indicate that the pace of Web 2.0 introduction in enterprises is currently accelerating [7].

The use of and requirements on wikis, specifically in SMEs, have hardly been researched and there is hardly any validated knowledge about special wiki configurations for use in SMEs. Consequently, there is great demand for experience with and sound knowledge about specific requirements for wiki use in SMEs so that SMEs can take advantage of the wikis' potentials.

This experience report presents the key findings of the project ICKE 2.0 intended to develop an enterprise wiki for small and medium-sized
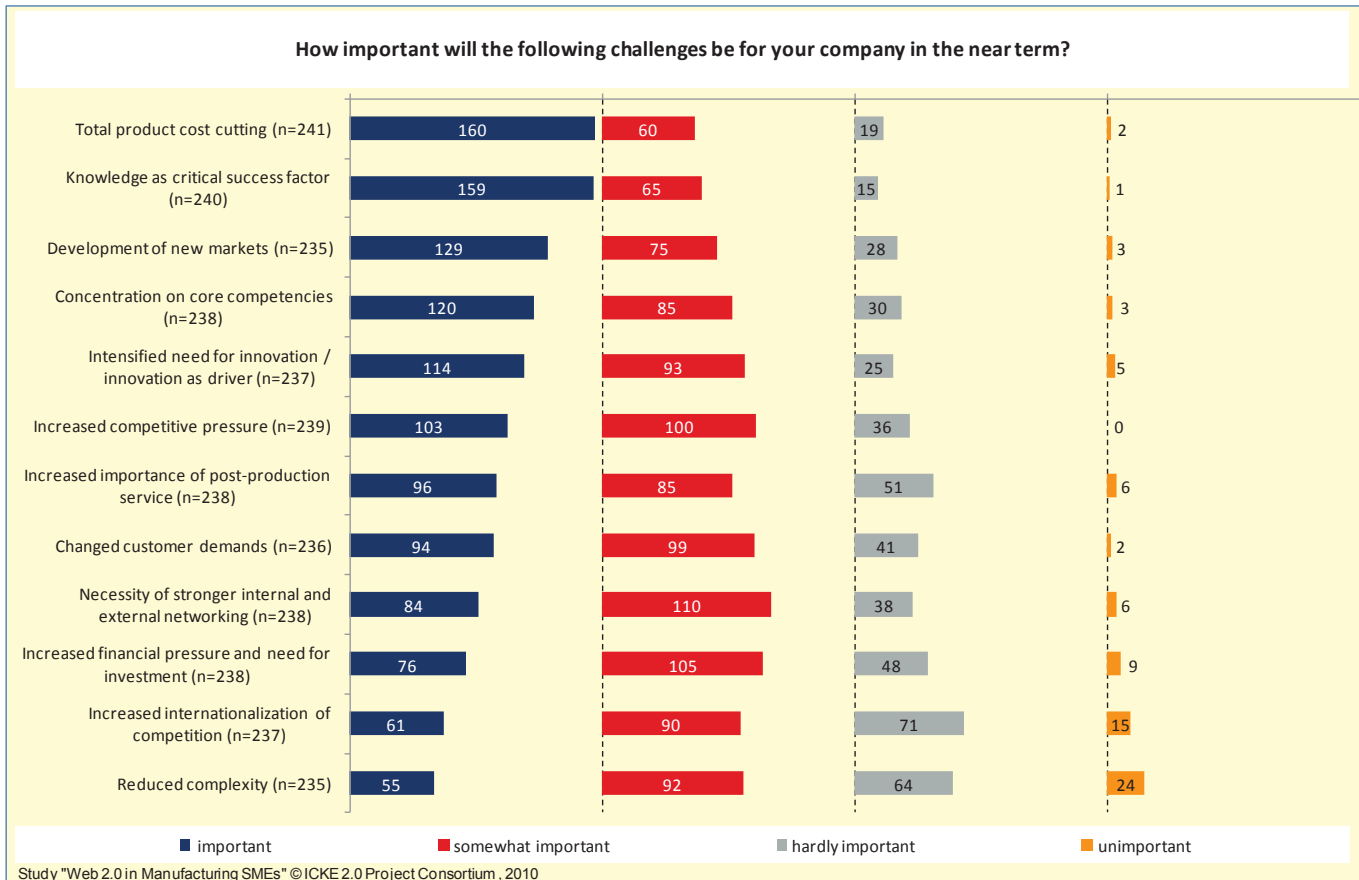
How important will the following challenges be for your company in the near term?

Challenge	important	somewhat important	hardly important	unimportant
Total product cost cutting (n=241)	160	60	19	2
Knowledge as critical success factor (n=240)	159	65	15	1
Development of new markets (n=235)	129	75	28	3
Concentration on core competencies (n=238)	120	85	30	3
Intensified need for innovation / innovation as driver (n=237)	114	93	25	5
Increased competitive pressure (n=239)	103	100	36	0
Increased importance of post-production service (n=238)	96	85	51	6
Changed customer demands (n=236)	94	99	41	2
Necessity of stronger internal and external networking (n=238)	84	110	38	6
Increased financial pressure and need for investment (n=238)	76	105	48	9
Increased internationalization of competition (n=237)	61	90	71	15
Reduced complexity (n=235)	55	92	64	24

Study "Web 2.0 in Manufacturing SMEs" © ICKE 2.0 Project Consortium, 2010

Figure 1: General challenges in SMEs

enterprises.[1] The project deliverable, the ICKEwiki based on the successful DokuWiki (www.dokuwiki.org), meets key requirements for the use of wikis in SMEs, especially for development projects in manufacturing SMEs. The requirements were identified by a large-scale survey with 245 representatives from manufacturing SMEs as well as in the analysis phase among three pilot users [22]. This experience report is structured as follows: First, the key findings of the requirements analysis are presented (section 2). Then, the concept developed to meet these requirements and its implementation in the ICKEwiki is discussed (section 3). Finally, the results of the evaluation with the pilot users (manufacturing enterprises) are described (section 4) and a look at further development is ventured (section 5).

2. REQUIREMENTS: FINDINGS OF AN EMPIRICAL STUDAY OF WEB 2.0 USE IN MANUFACTURING SMEs

2.1 Background
Although some studies of the Web 2.0 and wikis are available (e.g. [3], [27], [4], [25], [26], [7], [13]), they have little relation to the subject of this research: Previous studies have not focused on

manufacturing SMEs, hardly differentiate the actual penetration of tools (e.g. whether looking up relevant terms on Wikipedia constitutes an application of wikis in enterprises) and fail to deliver data on applications in specific, i.e. organizational (projects, domains, communities) and operational, contexts [14].

Therefore, further qualitative and quantitative empirical studies were conducted in the ICKE project. The qualitative study focused on three pilot users (German SMEs in the electronics sector). Application cases for the ICKE collaboration platform were defined in several workshops before the concrete requirements for the platform were identified in detail in process analyses.

In parallel, German manufacturing SME were surveyed about the use of, assumed benefits from and existing barriers to Web 2.0-application classes. This study [16] was intended to identify cross-company requirements from the field for the development of the ICKE platform.

The survey was conducted online, and the link to the survey was distributed over mailing lists for key industry personnel, via scientific online information portals and services and via professional magazines (in print). The survey was conducted anonymously. No information that would have allowed identifying individual respondents was stored. Representatives of 245 companies took part in this online survey conducted as part of ICKE 2.0. Out of these, 175 answered the complete questionnaire, whereas 70 respondents either skipped single questions or aborted

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[1] "ICKE 2.0: Integrated Collaboration and Knowledge Environment Based on Web 2.0 Technologies for SMEs", www.icke-projekt.de.

the survey before completion. The respondents come primarily from small and medium-sized enterprises (82.5% are SMEs; 95% have <500 employees) and from various manufacturing industries (80.9% from the manufacturing sector). The majority of the respondents work in management (75% from upper and middle management).

2.2 Key Findings

In an initial stage, the most significant challenges manufacturing SMEs in Germany are confronting were identified. The respondents named "cutting total product costs" (66.4%) and "knowledge as a critical success factor" (66.3%). Approximately half of the respondents also view the "development of new markets" (54.9%), "concentration on core competencies" (50.4%) and "intensified need for innovation / innovation as driver" (48.1%, 114) as important challenges. The most significant challenge in small and medium-sized enterprises is cost cutting, closely followed by knowledge management (see Figure 1).

The most significant benefit of the Web 2.0 is seen in its support of knowledge management, communication and knowledge work, a core challenge for manufacturing SMEs. In detail, greater benefit is expected to "improve communication" (71%), "simplify information procurement" (68%), "improve collaboration" (64%) and "use knowledge more efficiently" (62%). However, hardly any potential benefits were expected for the most significant challenge (cost cutting). A mere 47 respondents (29%) see great benefit here. Thus, the Web 2.0 is perceived to contribute to knowledge management but less to cost cutting.
The barriers to the Web 2.0 are primarily economic and cultural-organizational (information glut, unclear benefits, excessive time demands, unclear potential uses and distraction of employees from their actual work). Very clear requirements for corporate Web 2.0 tools can be derived from this. The applications must be easy to use (time-saving) and may not constitute an additional information glut. Instead their use must replace or consolidate information and communication channels.

In principle, great potential for "company-wide" use of the Web 2.0, above all wikis and instant messaging, is seen on all organizational levels. Respondents saw potential uses primarily for social networking and discussion forums in companies and especially blogs in individual projects. The wiki application class was considered to have the greatest potential for use. All in all, potentials for all Web 2.0 application classes were identified – for different application scenarios on organizational levels and in operations. This is interpreted as evidence of a need to integrate the individual applications' differing functions in one knowledge and collaboration platform.

The identified potential for operational improvements varies among the different types of business operations. Potentials for the Web 2.0 are chiefly in the primary, specifically customer-oriented operations (marketing, sales, service).[2] In the overall analysis, the greatest potential for using Web 2.0 in SMEs is seen in marketing (522 responses).[3] This refers to four application classes: blogging, podcasting, social sharing and rating. The greatest potential for use in sales is attributed to social networking and DMS, whereas the greatest potential for use in research and development is attributed to wikis and discussion forums. The least potential for Web 2.0 is seen in the secondary operations of environmental management (235) and human resource management (276). These were the only operations with less than 300 positive responses and the potential for use was ranked lowest for all surveyed application classes. However, with the exception of wikis, no great potential was ascribed to Web 2.0 applications for business operations. In real application, they trail considerably behind applications such as DMS and web conferencing.

2.3 Conclusions / Requirements from the Results of the Survey and Analysis at Pilot Users' Facilities

The authors have drawn the following conclusions from which they then derived requirements for a knowledge and collaboration platform based on the Web 2.0:

2.3.1 Make Benefits a Priority, Non-technical Features; Take Analyzed Potentials for Concrete Improvements as the Starting Point

In practice, the use of the Web 2.0 is frequently geared toward the potential options of the individual application classes of the Web 2.0 and social software (e.g. wiki, weblog) and the expected benefits. Technology is driving the search for potential applications for the new systems. The literature also contains examples of implementation methods, which take the potentials of IT systems as their starting point (e.g. [32]). However, the problem actually to be solved and the capability of Web 2.0 applications to provide a solution to the problem is frequently not examined critically. The implementation of the Web 2.0 and social software ought to be oriented toward the needs – the challenges and issues – of a certain field of application rather than the technologies and application classes [21]. "The first step in any Enterprise 2.0 effort should be the formation of a consensus about its goals." [28] p. 180

However, SMEs in particular lack the knowledge and experience needed to realistically assess the potentials of Web 2.0 applications in regard to the identified challenges [1]. Therefore, methods for the analysis of requirements for Web 2.0 and social software are needed which are customized to needs of SME in particular.

Within the ICKE project, the potential of Web 2.0 technologies to support internal collaboration in SMEs was assessed with feedback from pilot users. Feedback was obtained by conducting workshops with RTD personnel, as well as IT and operational managers. The benefit was collectively identified and developed

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[2] The operations "marketing" and "production" are somewhat outside the raster. The greatest potential is ascribed to marketing, a secondary operation, and relatively less to production. However, this can be explained by the high association of Web 2.0 applications with the marketing milieu

(communication with customers) and the relatively low penetration of computer workstations in production.

[3] Multiple responses were possible. The number given indicates the aggregate number of positive responses for all Web 2.0 tools that have been analyzed.

and presented to the management, which granted approval to continue the work in the ICKE project after a critical review.

The significance to improve communications between managers, developers and end users can also be inferred from the study: After "information glut" (44%, 72), respondents considered "unclear benefits" (39%, 64) as a serious barrier to the use of Web 2.0 in enterprises. This data is also corroborated by other literature, e.g. [10] and [4]. The "insufficient technical maturity of Web 2.0 applications" (14%, 22 as serious barrier) is considered the least significant barrier. Apparently, SMEs do not expect to obtain additional technical features through new Web 2.0 applications, which constitute a significant refinement of the tools developed in the ICKE project. Hence, Web 2.0 providers should emphasize the anticipated benefits of such features for the end-user more clearly than just presenting the new features to their customers.

2.3.2 Support Primary Business Operations and Map Corporate Structures in the Wiki

Potentials were identified mainly in primary, customer-oriented business operations of the companies. However, in practice, Web 2.0 support for these operations is quite sobering. The study primarily investigated the degree to which individual application types have penetrated business operations. Analyzing all business operations and application types, the most frequently used type of social software are wikis, with 69 respondents in total[4], and with a particular focus on research and development where 52% of respondents (36) used this tool. Least mentioned application types were social networking (25 respondents), social rating (17 respondents) and podcasting (17 respondents). Experience with social networking and sharing was lowest in all application fields in the enterprise, directly followed by podcasting. On the other side, potentials for wiki use were identified in every operation of the enterprise.

If they are to become established and create value added in companies, future Web 2.0 applications will have to start precisely with the support of concrete primary business operations. Therefore, the cases of application among the pilot ICKEwiki users were also focused on primary business operations and support product development, for instance. For one of the pilot users, the "project and product portal" application crystallized into a supporting scenario. Concrete customer inquiries would also be processed collaboratively and better documented over the platform. As the positive outcome of an inquiry, every project would be given its own site with key information and links, which can be used to map the project phases transparently. Products, in turn, are the outcome of projects and every product would also be given its own site with key information and links. The authors consider not only support for but also mapping of corporate structures, e.g. business operations, in Web 2.0 applications to be essential [15], [12]. These requirements are key findings from the analysis of the pilot users' requirements. Employees need structures in which they work in the Web 2.0 environment, orient themselves and compile information as needed, and collectively develop knowledge and access past experiences.

This underscores the underlying importance of structure for an enterprise wiki for SMEs and the ICKEwiki. The ICKEwiki ought to be able to map corporate structures so that employees are able to navigate and properly work with it.

2.3.3 Prevent Information Glut

Company employees are confronted by a vast amount of information, which they have to filter for relevance [31]. Email swamps over half of all the respondents with irrelevant information. The relevance of information from the Intranet is also difficult to assess. [4]

A new information medium such as a wiki constitutes another source of potential information flows. The survey, as well as focus group interviews with test-users, identified a potential information glut as a serious barrier to the implementation of Web 2.0 applications in companies. Wikis must also supply information based upon need. A balance must be struck between "being up-to-date on any relevant changes" and "not being bothered by too much information".

2.3.4 Reduce Time Consumed by Use

The survey identified two other important, substantively similar barriers: "too time consuming" and "distraction for employees from their actual work", revealing the stress on SME employees from work. The establishment of Web 2.0 applications in SMEs will necessitate either integrating applications in an operation to such an extent that no additional stress is produced or making tools so easy to use that they demand hardly any additional time. Integration in existing information systems is hardly any less important than integration in existing business operations. After all, social software adds a number of new applications to the tools already in use [2].

Web 2.0 applications in general and wikis in particular are only effective when their contents are managed and kept up to date. At first, they are only an additional corporate tool that must be used. New systems must have intuitive designs in order to introduce users to them. Ideally, the system will independently guide and support users.

The work required to maintain a wiki's structure is often underestimated. After a period of proliferation, entire sites or even namespaces may have to be restructured. This consumes a great deal of time, above all when manual lists, e.g. all project or product sites, must be managed and updated. Such experiences were made especially by pilot users who had worked with "conventional" wikis before the start of the project.

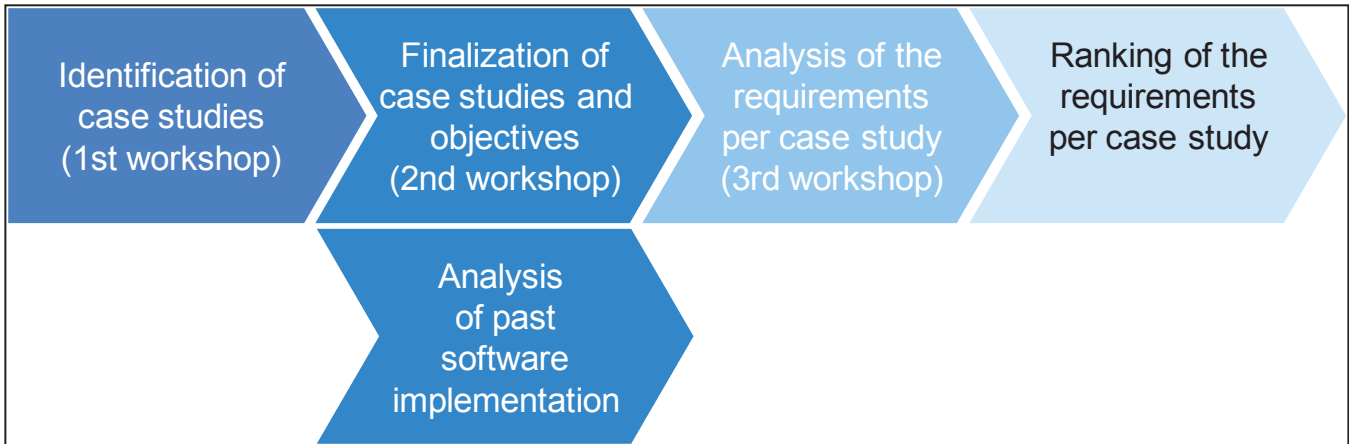[4] Total (multiple) responses about operations.

Figure 2: Approach to the analysis of requirements for Web 2.0 applications

2.3.5 Integrate Differing Web 2.0 Applications Expediently

Great potential for use is generally ascribed to Web 2.0 applications, but in widely differing cases of application, i.e. organizational levels or business operations. Every application type has its own specific strengths and weaknesses, which come to bear in each application context. While companies primarily utilize wikis, some also effectively employ "more exotic" applications such as social networking and podcasting. For instance, Opel reported on effective use of podcasting for advanced training, IBM uses the social network XING to interconnect employees with one another and former employees, and LEGO takes advantage of the strength of communities for its public relations and customer communication among other things [21].

These authors believe that Web 2.0 applications unfold their true potential only when their strengths are combined and they are integrated. For instance, a wiki not only ought to collect corporate content but also simultaneously facilitate employee (social) networking and, where applicable, synchronous communication about contents (e.g. by instant messaging).

2.3.6 Eliminate Barriers in Implementation

Web 2.0 applications face a variety of barriers. Many of the barriers cited in the survey can be eliminated by well-structured implementation. Barriers include "unclear benefits", "too time consuming", "unclear potential uses", "distraction for employees", "requires cultural modification", "security concerns", "employee willingness to use it too low" or "insufficient know-how for use". Therefore, the analysis and implementation phase is especially important. The foundations are laid in the analysis phase (see section 1) in which, for instance, the potential use is specified and potential benefits are elaborated. Implementation must bring employees "on board" and enable them to use Web 2.0 applications. This includes the appropriate supporting communication. Companies ought to rely more on management's support as well as the integration of applications in employees' daily routine [23].

3. CONCEPT AND IMPLEMENTATION

Taking the requirements derived from the empirical study and the analysis at the pilot users' facilities as the starting point, the ICKE platform was designed and implemented in collaboration with three pilot users. Based on the requirements established in section 2, the design and implementation of the six selected points is described below.

3.1.1 Make Benefits a Priority, Non-technical Features; Take Analyzed Potentials for Concrete Improvements as the Starting Point

In the project, a method based on need and case of application was developed to analyze requirements for Web 2.0 and social software, which is especially tailored to the needs of SMEs. The method is intended to identify (with creativity techniques and an evaluation raster) company-specific potentials for use of the social software application (especially wikis) as well as potentials for improvement and to derive concrete requirements. (For details, see [22].) Figure 2 summarizes the methodology's most important steps.

3.1.2 Support Primary Business Operations and Map Corporate Structures in the Wiki

The pilot users identified customized product development as a case of application. The requirements were mapped in a wiki. It was important to concretely adopt milestones and stages of the process as important structural elements. Automatically appearing sub-navigation based on a template was established. Whenever new product development is initiated by a wizard, templates generate namespace and site structures (see Figure 3 "sub-navigation in the namespace").

These structures can be configured easily using wiki syntax. When a namespace contains a certain wiki site, the wiki site is read and the links it contains are displayed as sub-navigation.

In addition to being mapped, the structures primarily need to contain the key information objects. Product development operations revolve around "projects", "products" and "customers". These information objects also have to be mapped
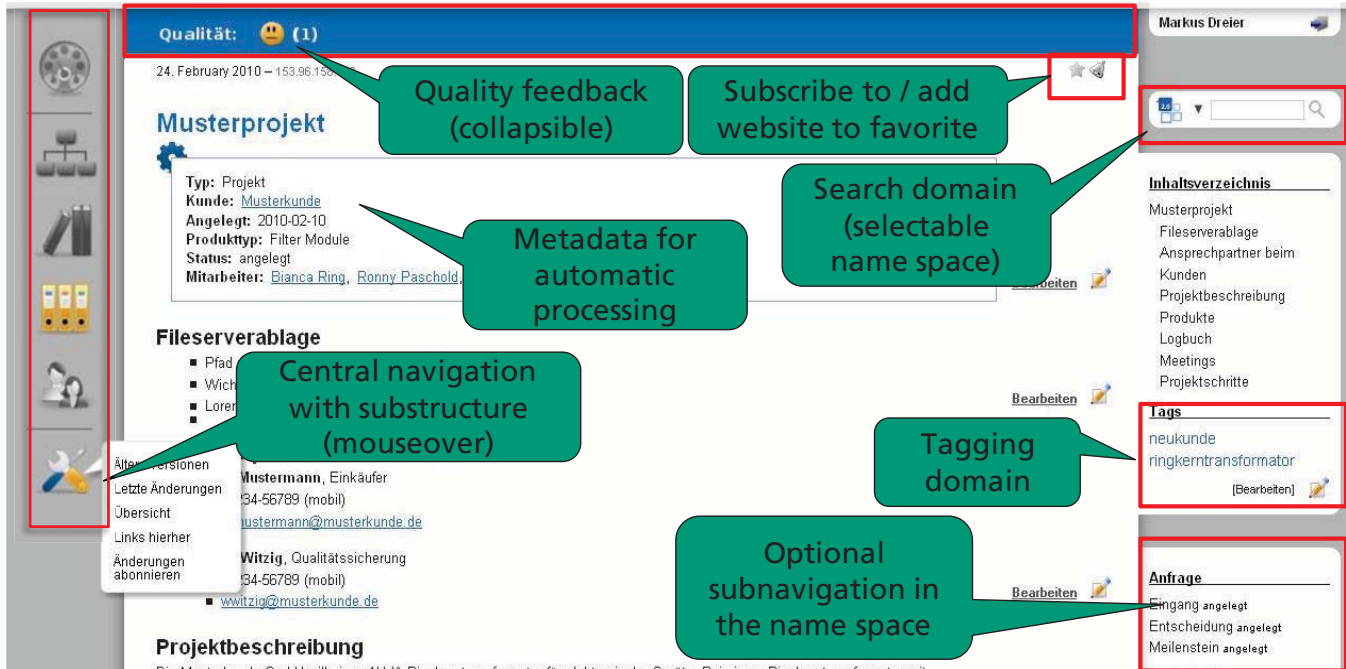
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Figure 3: ICKE platform (screenshot)

and logically linked in the wiki. To do so, the wiki sites are provided with metadata, which can be linked automatically (see Figure 3 "metadata"). This metadata can be used to map extremely complex structures. In a pilot installation, project sites were always linked with product sites (project deliverables) and customer sites (project motivation). These functions can be tested in a demo version on the ICKEwiki website (http://demo.ickewiki.de).

3.1.3 Prevent Information Glut

One of the greatest barriers to the use of Web 2.0 in small and medium-sized enterprises is the fear of an information glut. Wikis constitute an additional information system with a vast quantity of information, including the option of notification of events by RSS or email. The option of email notification of site modifications was also created in the ICKEwiki. In addition, all important information is accessible through the personal dashboard. On the one hand, the automatable dashboard can list all sites with metadata, which apply to an individual. For instance, it can list all projects in which an individual is involved. On the other hand, the dashboard can store all other personal information. It can produce an individual structure with wiki sites and self-assigned tags and display saved favorites automatically. Altogether, the ICKEwiki attaches great importance to rapid access to information. The different aforementioned mechanisms are conducive to this:

- mapping of corporate structures by optional namespace sub-structuring

- graphic main structuring of the wiki's most important domains with substructures as a mouseover menu

- saving of favorite sites in the wiki dashboard

- personal tagging displaying personal tags in the dashboard and incorporating them in a search

- automatic linking of information objects linked by metadata and automatic listing

3.1.4 Reduce Time Consumed by Use

The eliminated information glut and other aforementioned points cut the time required to use the ICKEwiki. This effect is supported by the improved user friendliness of the editor, including:

- special editors for metadata and tables (including drag and drop),

- link wizards to navigate and search the wiki structure in order to link the right site quickly,

- improved media manager for image and file uploads and

- optimized syntax editor handling.

Moreover, great importance was placed on improving the quality of wiki sites' structures. The potential creation and editing of content on a topic by non-experts led to the assumption that correctness might suffer and make information useless in the enterprise content [6]. However, recent studies on Wikipedia showed that wikis can show a very high level of correctness, completeness and currentness [18], [24]. The quality of content in Wikipedia is mainly maintained by the large number of authors and the ensuing review and correction process. Enterprise wikis usually lack such mechanisms and are reliant on various technical and sociopolitical mechanisms instead, e.g. well-defined responsibilities and work flows, article standards, user roles and authorization.

Another problem stems from many new users' lack of experience in writing and structuring texts. The use of wiki syntax should simplify matters since it shifts the emphasis from text formatting (as in common word processing) to structuring and focusing on content. Nonetheless, novices often introduce bad practices

learned, e.g. from word processing, to wiki editing, e.g. the use of forced line breaks or bold formats instead of headlines [19]. In addition, different methods of wiki organization and structuring develop as the number of pages and users grows and especially when users are not daily computer users as is the case in the manufacturing industry. This causes various structural problems (cf. [34]).

To help users edit wiki pages, a tool should automatically check texts (wiki pages) against certain rules. Since the quality of the content itself it virtually impossible to judge, such checks have to be structural and statistical. Judgment of the content will be left up to individuals. Automatic wiki quality checks necessitate certain metrics that can be examined and compared with reference criteria. Visualized results of the comparison will enable users to interpret the values and make appropriate changes to improve the quality. While a large number of possible metrics have been proposed and may be used to analyze the quality of wiki content (cf. [33], [11]), the relevant metrics have still not been defined with any finality. Some approaches attempt to reduce the number of relevant metrics by providing categories, i.e. [33]. Another approach focuses on the aims of the wiki stakeholders to select the relevant metrics. A large number of metrics, which can be referenced to evaluate the quality of wiki sites, were analyzed in this project [17]. A quality check plug-in (QC plug-in), which delivers to users direct feedback on the wiki site's quality and structuring once it has been saved, was implemented in the ICKEwiki [20]. In addition, red, yellow and green smileys (see Figure 3) also identify "structural irregularities" for which points were deducted.

The QC plug-in uses a renderer to analyze page structure and stores the results for later use (Figure 4). The implementation of a general renderer enables DokuWiki syntax plug-ins to supply additional quality check tests to the QC plug-in. This makes the plug-in easily adjustable to the special DokuWiki set-ups in different companies. Since rendering and analysis can be time consuming, they were decoupled from the normal page display by integrating the results as an image.

The plug-in supplies users additional support that enables them to improve quality concretely. However, form-based wizards and templates have the greatest effect on reducing service life: Based on user inputs from prestructured templates of entire namespaces or simple sites, wizards create complex wiki structures and fill them with user-specific input. Thus, in this application case, complex project structures can be produced with the push of a button. Notably, rather than having to modify wiki source codes, both wizards and templates are themselves wiki sites editable by

wiki syntax. However, given the complexity, this is intended for wiki gardeners or administrators rather than normal users.
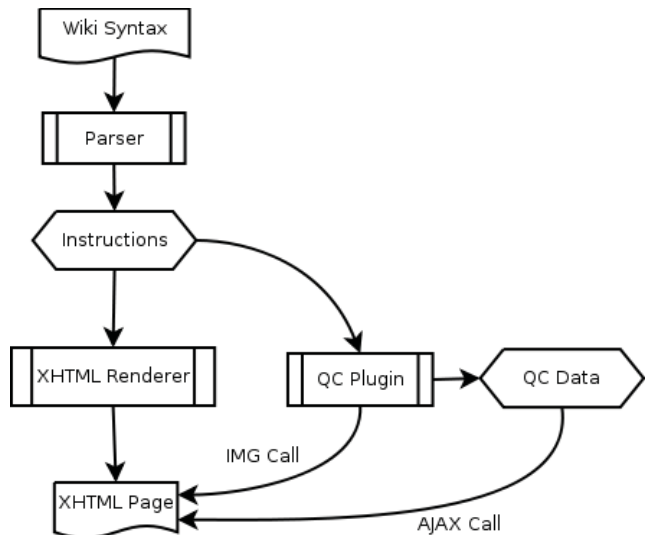

Figure 4: Rendering process

3.1.5 Integrate Differing Web 2.0 Applications Expediently

In and of itself, a wiki only constitutes an application class, albeit probably the most important one for SMEs (based on the survey's findings). The Web 2.0 represents a networked unit of content, individuals and structures. Thus, its actual potential only becomes apparent when different Web 2.0 tools are integrated. For instance, the integration of a wiki, (micro) blogging (focusing on content), tagging (focusing on structure) and interpersonal social networking or communication by means of instant messaging seem expedient. Microblogging, which allows using wiki syntax ({log}) to incorporating a microblog on any wiki site, was integrated in the ICKEwiki. Then, the wiki site contains an input field for short status messages (Figure 5), which are saved chronologically at the push of a button and also specify the authors. Basic social networking functions were also implemented. Thus, anywhere individuals have used metadata and inserted a wiki site, links to their particular profile sites appear automatically. The primary contact data (email address and telephone number)
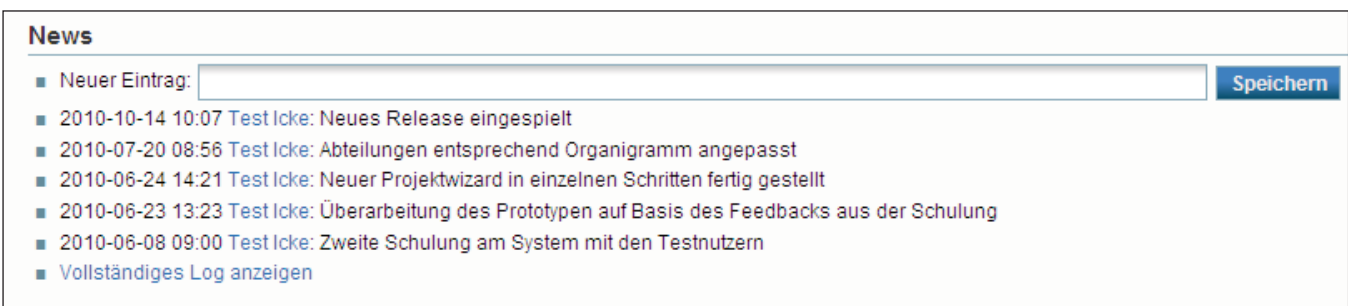

Figure 5: Microblogging on a wiki site on the ICKEwiki

appears immediately when the link is moused over. The specified metadata and automatic lists can be used to easily implement contact directories for a wide range of applications. Company-wide contact directories are just as conceivable as directories of specific customers or product lines. As mentioned, tagging was implemented. The integration of instant messaging has been engineered but not yet implemented since it has low priority among the pilot users.

3.1.6 Eliminate Barriers in Implementation:

The analysis methodology selected (see section 1) is intended to reduce existing barriers to implementation. Moreover, the ICKE project supported the concrete implementation of the wiki. For instance, a management game was developed, which supports employee system training. The management game facilitates active assessment of work with the wiki. Role playing (project manager as sales employees and so on) increases understanding of other colleagues' work and operations. Furthermore, supporting communication actions were planned and implemented among the pilot users. These included such simple things as management training, identification of postulated benefits, short reference to the wiki with the most important functions or wiki posters for internal marketing.

In addition, a help consisting of wiki sites is integrated in the ICKEwiki, which, for instance, also provides screencasts that describe more complex correlations. The initial help sites are contained in the download package and companies can modify them for specific structures, needs or upgrades.

In addition, the freely available demo version allows first testing of the functions on a kind of "playground" without any worries that the wiki structure or contents could be damaged in any way because the demo system is reset to its initial state daily.

The quality feedback functions already described actively support users when they are structuring their wiki sites. Thus, users are given an aid intended to allay reservations and provide suggestions for improvement.

4. EVALUATION

The ICKEwiki was implemented operationally and evaluated at three pilot users' facilities. Test users and responsible management and IT staff were surveyed. The survey of test users took the form of focus group interviews (cf. [29]), while semi-structured interviews were conducted with responsible management and IT staff. All in all, the outcome of the evaluation of the ICKEwiki was very positive (Figure 6).
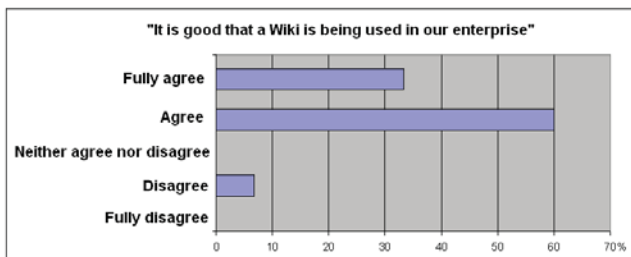

Figure 6: Evaluation of wiki use in SMEs by test users

Most of the test participants want to use the wiki. The intensity of use ranged from more passive-receptive use of the ICKEwiki as

an "information archive" to active creation of content, use of numerous additional functions and use of the ICKEwiki as a structuring and communication medium. All in all, test users felt that use of the ICKEwiki improved documentation practices, including the documentation of solutions and approaches, information tracking throughout a project's history, communication of a project's history to third parties and documentation of agreements and decisions. The additional functionalities of the ICKEwiki were evaluated very positively.

The ICKEwiki gives most employees a value added (better exchange, faster information search and process completion). In return, the employees are also willing to accept documentation that entails somewhat more work. Since the majority of test users were first-time wiki users, they will presumably see the additional work they perceived in the test phase differently as they accumulate user experience.

The focus groups intensively discussed the notification functions implemented in the ICKEwiki. In particular, notifications of changes turned out to harbor potential conflicts of interest between information producers and consumers. While wiki authors wanted to inform users rapidly about significant, i.e. not just editorial, changes, wiki users more on the receiving end feared an information glut by unduly frequent notifications of changes. Reaching a consensus acceptable to everyone involved will necessitate a suitable concept and rules of prioritization.

The interviews with responsible IT staff and responsible management primarily dealt with (a) identifying the goals aimed for with the implementation of the ICKE and (b) establishing the work required to implement a wiki in a company.

Management's priority when implementing the ICKEwiki was to intensify the information exchange among different company units and to document employee knowledge. While the concrete, long-term value added from knowledge documentation is not yet foreseeable because the pilot phase was limited, the test users already reported better cross-job and interdepartmental networking in their companies.

Hence, the technical complexity of wiki implementation remains manageable. The respondents are relying primarily on internal concepts with selective external support to train their employees (training of IT staff who then act as multipliers in the company). Employees resolved simple problems on the working level informally by word of mouth.

The role of external IT providers in open source solutions like the ICKEwiki is envisioned chiefly in the domain of customizing (mapping internal process structures in the wiki). External providers additionally play an important role in second tier support and during initial training.

5. OUTLOOK

The evaluation results will enter into the further development of the ICKEwiki. In parallel, work is already being done to refine the ICKEwiki. Among other things, this includes the development of a modular WYSIWYG concept for sites and complex structures (metadata, wizards and templates) and the extension of the quality mechanisms for the entire wiki, the redaction of site analyses of entire namespaces and the filling of structures.

The ICKEwiki is available online as a downloadable demo system for the general public (www.ickewiki.de). Screencasts on the website briefly introduce how to use the ICKEwiki.

6. ACKNOWLEDGMENTS

7. REFERENCES

[1] Alpar, P., Blaschke, S., and Keßler, S., Eds. 2007. Web 2.0. Neue erfolgreiche Kommunikationsstrategien für kleine und mittlere Unternehmen. Hessen-Media 57. Hessisches Ministerium für Wirtschaft Verkehr und Landesentwicklung Geschäftsstelle Hessen-Media, Wiesbaden.

[2] Bächle, M. and Ritscher, J. 2010. Enterprise 2.0 - Social Software im unternehmensinternen Einsatz. Akademische Schriftenreihe V158046. Grin Verlag.

[3] Bartel, T. 2006. Wikis in Enterprises. Collaborative Working in Enterprise Environments using Wikis. Diplomarbeit, Universität zu Köln.

[4] Berlecon Research im Auftrag der Coremedia AG. 2007. Enterprise 2.0 in Deutschland. Verbreitung, Chancen und Herausforderungen, Hamburg, Germany.

[5] Blinn, N., Lindermann, N., Faecks, K., and Nuettgens, M. 2009. Web 2.0 in SME Networks. A Design Science Approach Considering Multi-Perspective Requirements. AMCIS 2009 Proceedings, Paper 402.

[6] Buffa, M. 2006. Intranet wikis. Proceedings of the IntraWebs Workshop 2006 at the 15th International World Wide Web Conference WWW 2006. http://www-sop.inria.fr/acacia/WORKSHOPS/IntraWebs2006/Buffa_In trawebs2006.pdf. Accessed 7 March 2011.

[7] Bughin, J. and Chui, M. 2010. The rise of the networked enterprise: Web 2.0 finds its payday. A McKinsey Global Survey. McKinsey Quarterly , December 2010.

[8] Burg, T. and Pircher, R. Social Software im Unternehmen. Wissensmanagement 8. Jg, Heft 3, S. 27-29.

[9] Danis, C. and Singer, D. 2008. A wiki instance in the enterprise:. opportunities, concerns and reality. In Proceedings of the ACM 2008 conference on Computer supported cooperative work - CSCW '08. ACM Press, 495–504.

[10] Döbler, T., Ed. 2007. Social Software in Unternehmen, Stuttgart.

[11] Ebersbach, A., Krimmel K., and Warta, A. 2007. Auswahl und Aussage von Kenngrößen innerbetrieblicher Wiki-Arbeit. In Web 2.0. Neue erfolgreiche Kommunikationsstrategien für kleine und mittlere Unternehmen, P. Alpar, S. Blaschke and S. Keßler, Eds. Hessen-Media 57. Hessisches Ministerium für Wirtschaft Verkehr und Landesentwicklung Geschäftsstelle Hessen-Media, Wiesbaden, 131–156.

[12] Faust, D., Fuchs-Kittowski, F., Hüttemann, D., and Voigt, S. 2010. Wikis im Mittelstand - Strukturen für das Unstrukturierte? DOK - Technologien, Strategien & Services für das digitale Dokument., 1, S. 72–75.

[13] Frost&Sullivan. 2009. Web 2.0 techologies in the recession-hit europe as a solution for small and medium businesses. http://www.frost.com/prod/servlet/cio/9847-00-05-01-01/9847-64.pdf.

[14] Fuchs-Kittowski, F., Klassen, N., Faust, D., and Einhaus, J. 2009. A comparative study on the use of Web 2.0 in enterprises. In Proceedings of I-KNOW'09 - 9th International Conference on Knowledge Management and Knowledge Technologies. Journal of Universal Computer Science J.UCS Conference Proceedings Series. Verlag der TU Graz, Graz.

[15] Fuchs-Kittowski, F. and Köhler, A. 2005. Wiki communities in the context of work processes. In Proceedings of the 2005 international symposium on Wikis - WikiSym '05. ACM Press, 33–39.

[16] Fuchs-Kittowski, F. and Voigt, S., Eds. 2010. Web 2.0 in produzierenden KMU. Eine empirische und vergleichende Studie über den Einsatz von Social Software in kleinen und mittelständischen Unternehmen des produzierenden Gewerbes. Fraunhofer IRB Verlag, Stuttgart.

[17] Fuchs-Kittowski, F. and Hüttemann, D. 2009. Towards an Integrated Collaboration and Knowledge Environment for SME based on Web 2.0 Technologies –. Quality assurance in enterprise wikis. In WM 2009. 5th Conference on Professional Knowledge Management. P-145. Köllen Verlag, Bonn, S. 532-543.

[18] Giles, J. 2005. Internet encyclopaedias go head to head. news@nature 438, 7070, 900–901.

[19] Gohr, A. 2010. Automatic Quality Checks in DokuWiki. http://www.cosmocode.de/en/blog/gohr/2010-03/09-automatic-quality-checks-in-dokuwiki. Accessed 9 March 2010.

[20] Gohr, A., Hüttemann, D., Faust, D., and Fuchs-Kittowski, F. 2010. Quality Check with DokuWiki for instant user feedback. In WikiSym 2010. Proceedings of the 6th International Symposium on Wikis and Open Collaboration (WikiSym 2010), Gdañsk, Poland, New York, N.Y: ACM, S. 128-135.

[21] Granitzer, G. and Tochtermann, K. 2009. Web 2.0 in Unternehmen. Eine Fallstudien-Analyse. In WM 2009. 5th Conference on Professional Knowledge Management. P-145. Köllen Verlag, Bonn, S. 68-76.

[22] Grossmann, S., Voigt, S., and Fuchs-Kittowski, F. 2009. Anforderungsanalyse für Web 2.0-Plattformen - Anwendungserfahrungen eines. In Geteiltes Wissen ist doppeltes Wissen. CMP-WEKA Verlag, Poing.

[23] Günther, J., Pöld, B., and Ulrich, K. 2008. Online-Studie im Rahmen des Projektes „Fit-for-Web 2.0". Fraunhofer IRB-Verlag, Stuttgart.

[24] Hammwöhner, R., Fuchs, K.-P., Kattenbeck, M., and Sax, C. 2007. Qualität der Wikipedia - Eine vergleichende Studie. In Open Innovation. Neue Perspektiven im Kontext von Information und Wissen. Proceedings des 10. Internationalen Symposiums für Informationswissenschaft (ISI 2007). UVK Verlagsgesellschaft mbH, Konstanz, 77–90.

[25] IBM, I. 2008. IT- und E-Business-Einsatz im bundesdeutschen Mittelstand 2008. Eine Untersuchung der techconsult GmbH im Auftrag von IBM und der Zeitschrift Impulse. http://www.impulse.de/downloads/impulse_IBM_Studie_2008.pdf. Accessed 21 July 2009.

[26] Leibhammer, J. and Weber, M. 2008. Enterprise 2.0. Analyse zu Stand und Perspektiven in der deutschen Wirtschaft. www.bitkom.org/files/documents/BITKOM-Studie_Enterprise_2Punkt0.pdf.

[27] Majchrzak, A., Wagner, C., and Yates, D. 2006. Corporate Wiki Users: Results of a Survey. In Proceedings of the WikiSym '06. ACM, New York, 99–104.

[28] McAfee, A. 2009. Enterprise 2.0. New collaborative tools for your organization's toughest challenges. Harvard Business Press, Boston Mass.

[29] Morgan, D. L. 1997. Focus groups as qualitative research. Qualitative research methods series 16. Sage Publ, Thousand Oaks, Calif.

[30] Nielsen, J. 2006. Participation Inequality: Encouraging More Users to Contribute.

http://www.useit.com/alertbox/participation_inequality.html . Accessed 7 March 2011.

[31] Schütt, P. 2011. Die Informationsflut bzwingen: Aufmerksamkeit bündeln - aber wie? Wissensmanagement Das Magazin für Führungskräfte 13, 2, 22–24.

[32] Smolnik, S. and Riempp, G. 2006. Nutzenpotenziale, Erfolgsfaktoren und Leistungsindikatoren von Social Software für das organisationale Wissensmanagement. In Social Software, K. Hildebrand and J. Hofmann, Eds. HMD Praxis der Wirtschaftsinformatik 252. dpunkt.verlag, Heidelberg, 17–26.

[33] SONIVIS community. SONIVIS Metric Portal. http://www.sonivis.org/wiki/index.php/Metric_Portal.

[34] Treitz, M. 2007. Characterizing Proliferation in Enterprise Wikis using Anti-Patterns. Bachelor Thesis, International University in Germany.

[35] Wagner, C. and Majchrzak A. 2007. Enabling customer-centricity using wikis and the wiki way. Journal of management information systems 23, 3, 17–43.