

Using Wiki as a Collaboration Platform for Software Requirements and Design

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Abstract Wiki is a collaboration platform allowing building a corpus of knowledge in interlinked web pages created and edited by different users. Wiki has been applied in different domains and usage contexts in business and education. This paper reports on an exploratory study conducted as a part of an ongoing research regarding the use of wiki in software development projects. The objective of this study was to capture the perceptions of users regarding wiki as a collaboration platform. Specifically, we aimed at understanding what hinders and what motivates users' contribution to documents constructed within the wiki environment. Based on data obtained via interviews with wiki users we found, among other things, that they do not perceive wiki as a stand-alone communication and collaboration tool, and tend to conduct off-line discussions prior to changes made in the wiki. We also identified several wiki features, which, if improved, may enhance wiki usage.

Keywords Wiki · Collaboration · Software development · Design · Requirements · Knowledge creation · Knowledge capture

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1 Introduction

Wiki is a platform that allows different users to collaboratively build and share body of knowledge [2, 9, 13, 20]. It has been applied in different domains and usage contexts including the most commonly known and used Wikipedia, educational wiki applications, and various business-related wiki-based collaboration systems.

Wikis are Web2.0 applications used in various settings for supporting collaborative processes. One such setting is in schools and colleges (e.g., [6]), where their effectiveness is measured according to qualitative post experience attitude surveys, showing pitfalls of integrating wiki in educational context. Wikis are also used to enable business interactions. For example, Graupner et al. [11] report on a wiki for consultants, using specific document template-based pages for projects, which make it difficult to implement in other wiki settings. The use of wikis in a corporate context (e.g., [11]) incorporates the two concepts of technology and management, without which, the process cannot fully succeed.

In our ongoing research [4], we focus on wiki as a collaboration platform in software development, and specifically for developing requirements and design documents. Using wikis for improving software documentation [7], managing documentation of a software project [1], supporting collaborative requirements engineering [8] and as a basis for development environments [15] have been suggested in the past. When using wiki for design and requirements, overcoming cultural issues should be considered [5], otherwise these wikis become inactive after a short period of time [3].

In a previous research [4], we analyzed users' actual behavior as recorded in the wiki log, such as instances of accessing the wiki per user, pages visited, changes made in each visit, and more, and identified accordingly changes in behavior correlated with changes in different parameters. While finding differences in actual users' behavior in different circumstances, a general impression was formed that project stakeholders tend to avoid changing wiki pages, even when they are engaged and collaborative in other aspects, e.g. reading wiki documents, actively participating in team meetings, contribute to discussions via email, etc.

In this study we explore this phenomenon by investigating the perceptions of wiki users in software projects using wiki as a collaboration platform. Furthermore, we aim to understand what motivates users to be more engaged in projects via wiki usage and what hinders their engagement, and to contribute to the corpus of knowledge built in the wiki environment. An earlier report on this study can be found in [12].

The next section briefly describes the wiki platform and its existing and potential benefits as a collaboration tool. Next we present the settings of the exploratory study, followed by its preliminary results. We discuss and analyze our findings and, finally, we conclude and discuss future work.

2 Wiki Collaboration Platform

A wiki is a set of linked web pages created through incremental development by a group of collaborating users [13]. The first wiki was developed by Ward Cunningham in 1995, as the Portland Pattern Repository, to communicate specifications for software design. The term wiki (a Hawaiian term meaning “fast”) gives reference to the speed with which content can be created.

Wiki is defined as “a system that allows one or more people to build up a corpus of knowledge in a set of interlinked web pages, using a process of creating and editing pages” [9]. The wiki system is designed to increase collaboration and poll of ideas, as a centralized system designed to increase efficiency and reduce uncertainty [20]. Since the first wiki in 1995, wiki has been used in many contexts: in the public domain, most notably, the online encyclopedia Wikipedia project; in education applications [18] and in the business context [16]. Wiki use was found successful and increasing in the software development industry because it is an excellent means to collect asynchronous contributions from a group of distributed people in a centralized repository of textual artifacts [14]. Wikis are particularly valuable in distributed projects as global teams may use them to organize, track, and publish their work.

Gonzalez-Reinhart [10] describes the three generations of wiki support tools. The first generation wikis were open-source wiki pages used for conversational knowledge management solutions, based on group participation and voluntary social connections. These wiki platforms became favorable due to their reasonable economical and technological demand. However, since it was an open-source solution, the companies were neither supported by a specific provider nor had any content propriety guarantee. In order to solve these problems, the second generation wikis were developed by companies that offered the product as well as support services and guaranteed the firms’ content propriety. Next, the third generation wikis were developed as application wikis, intended mainly for corporate use. Application wikis provide functionality beyond features provided in the first and second generations of wikis, such as improved editing, improved files’ attachment management, and improved collaboration, allowing anyone who can type the ability to edit pages.

Using wiki as an intranet and content management system in a company holds benefits and challenges [21]. For example, a previous study of the use of wiki at IBM showed that it was simple for the creation of information artifacts and for access and use of shared information, resulting in better overview of a project’s status [17].

3 The Empirical Study

3.1 *Settings and Method*

The objective of the exploratory study was to identify the perceptions of wiki users in software development projects regarding the wiki as a collaborative platform. The participants in the study were software developers from four different software development projects in IBM, exhibiting multiple case studies [22]. In these projects, the wiki platform was used mainly for the requirements analysis and design stages. The software development team members in these projects were globally distributed, spread over three different continents, and from a wide range of managerial roles and seniority. Eleven local team-members participated in the current study.

The use of wiki for maintaining all project requirements and design documents was enforced in all projects participating in the study. The wiki was also used to monitor the project status and highlight the main requirements and design issues agreed upon. The wiki hosted informative documents such as requirements and design documents, and presentations. All the wiki pages were available to all the users for viewing and changing, according to the “wiki way” [13].

The use of the wiki incorporates automatic wiki-based characteristics:

- Data is visible to all, and always online and available.
- Changes are automatically visible to all as soon as they happen.
- Notifications are sent to stakeholders when changes are made.
- Wiki usage is logged and monitored (this was common knowledge to the users).

Our research method was based on the grounded theory approach [19] employing semi-structured interviews as a data collection tool. The interviews included questions regarding the usage of the wiki in general, specific usage behaviors, and about opinions regarding exiting wiki features, for the purpose of probing for parameters that may explain user behaviors and attitudes toward the wiki. The collected data underwent an inductive analysis, in which the transcripts of the interviews were divided to segments, followed by their analysis including open, axial and selective coding [19], in which categories emerged from the data. These categories will be presented next.

3.2 *Findings*

Tables 1 and 2 summarize the emergent categories regarding the usage and perceptions of wiki as a collaboration platform, and proposed improvements.

Our analysis was aimed at understanding the aspects of wiki that may hinder wiki usage. Therefore, the categories presented in Table 1 and 2 are focused specifically on these aspects. Moreover, these categories are not independent, and

Table 1 Categories of usage and perceptions of wiki as a collaboration platform

Main category	Sub-category	Comments/Examples
General usage of wiki	Frequency: several times a month	This was also validated by monitoring the users' actual behavior (log)
	Action: mostly change existing material	Some users have never inserted new material
Communicating via wiki	Perceived as a waste of time	"Wiki is an un-needed overhead"
		"Wiki is used in addition to other communication means, thus doubles the efforts"
	Prefer F2F or email discussions	"We discuss issues in 1:1 meetings or emails"
		"Using comments blocks the page; so using an off-line communication tools is better"
Only few respond to wiki email notifications	Several interviewees indicated that they never respond to wiki notifications	
Attitude towards changing text within wiki	Only following an off-line discussion	"If a page is owned by someone, I would not change it without discussing with them first"
	Writing notes or highlight changes rather than erasing/changing	"I would add but not erase or overwrite [...] I would mark with a different font [to indicate suggestions for change]"

Table 2 Required improvements for the wiki platform

Main category	Sub-category	Examples
Wiki user interface features to be improved	Personalized view	"Automated user-specific view: see what is meant for you first"
	Editor	"Word processor is much more convenient"
	Visual representations	"It's easier to draw UML diagrams in a UML tool"
	Attachment	"Using attachments is not comfortable"
Wiki communication features to be improved	Notes writing	"More comfortable commenting is needed"
	Reducing the overwhelming number of notification	"The notification mechanism should be personalized, so that notifications will be sent only to the specific users interested in the change made"
		"Filter pages I receive notifications on"
Accessibility	Should be included in single sign-on	"An additional login is not comfortable"

specifically, some categories in Table 1 (the current state) are directly linked to categories in Table 2 (possible improvements). For example, "Using comments blocks the page; so using an off-line communication tools is better" explains both—the current reluctance and the proposed improvement to enhance wiki as a communication tool by adding notes.

3.3 Discussion

The most salient finding from the interviews is that the interviewees *do not perceive wiki as a stand-alone collaboration tool*, in which they are able to communicate with their peers, discuss the issues at hand and accordingly update the knowledge constructed in the wiki. This drives them to communicate in other means prior to making changes in the wiki environment, which in turn facilitates their perception of the wiki as an inconvenient and redundant overhead rather than an enabler of collaboration.

One reason for this perception may stem from the lack of understanding and embracing the “wiki way” [13]: no individual owns a wiki page, but rather all involved users have a mutual responsibility to develop it and keep it up to date. An additional obstacle is the technical limitations inherent in the specific wiki environment used in the investigated projects. In this environment, communicating with peers in order to discuss required changes is perceived as inconvenient and restricting, making the users reluctant to change text inserted by their peers without preceding off-line discussions. Once the discussion has been conducted and decisions have been made, documenting it in the wiki seems to be documentation-related overhead rather than a collaborative construction of knowledge. This, again, is not in line with the wiki way where knowledge is constructed in the wiki environment rather than merely documented.

Many advantages of the wiki are relevant in the settings of this research. For example, wiki is known to be beneficial in the workplace for groups requiring a collaborative medium, with relatively small number of participants who are geographically distributed, as is the case of software development projects [14] such as those participating in this research. Nevertheless, we found the above documented obstacles that prevent realizing the full potential of the benefits of wiki.

The findings of the current research may explain previously reported results regarding the lack of long-term continuity in wiki usage (e.g., [3]). Furthermore, our findings lay the foundations for possible future enhancements of the wiki platform in order to motivate its usage and augment its benefits. These enhancements can be implemented and then evaluated utilizing social network analysis for analyzing users’ actual behavior, combined with qualitative perception analysis.

While this paper focuses on qualitative, interview-based data, our on-going research includes data collected via additional qualitative and quantitative methods, providing further findings and validation. Nevertheless, some limitations are to be taken into consideration. The study was conducted with the participation of team-members in four distributed software development projects in IBM. The specific wiki platform configuration used in these projects was selected, and its use was guided, by IBM personnel. As in any case study, the findings of this study reflect the setting of the specific cases investigated, and generalization of the conclusions should be done cautiously, taking the factors reported here into consideration. Additional case studies in various contexts are needed for further validation and generalization of the results.

4 Conclusion

Wiki is a collaboration platform that allows different users to collaboratively build and share body of knowledge. Wikis are used in various settings and contexts for supporting collaborative processes. This research examined the use of wiki in distributed software development projects, and specifically in the requirements analysis and design phases. Our aim was to explore the perceptions and attitudes of software developers using wiki in this context towards the collaborative nature of the wiki environment, and specifically to identify what hinders users from exhausting the full potential of the wiki as a collaborative platform.

Our findings suggest that the wiki environment as implemented in the IBM software development projects participating in this study is not perceived as a stand-alone communication and collaboration tool, and that its users tend to conduct off-line discussions prior to changes made within the wiki. We also identified several wiki features as well as cultural aspects, which, if improved, may enhance wiki usage and its benefits. Future research will examine the long-term usage of the wiki in the firm of the investigated case studies. In the future we plan to develop and implement enhancements for the wiki environment according to the findings of this study, and evaluate their contribution.

This research is based on multiple case studies from a single organization. Generalization of the findings is limited, however possible, in cases where similar implementation of wiki is observed. Further research may examine additional cases of wiki usage in software development, to further validate and generalize the identified factors and stemming perceptions hindering the usage of wiki as a collaboration platform.

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