IMPROVING KNOWLEDGE MANAGEMENT USING WIKI TOOL THROUGH EXPERIMENTAL STUDIES

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ABSTRACT
Nowadays, companies are paying more attention to the importance of knowledge creation and sharing. In this sense, the use of information systems to assist knowledge management has been widely adopted by organizations. In this paper, we present an experience report on how, by using Wiki, we were able to assist in knowledge sharing and also ease of acquiring knowledge, especially for onboarding employees. Before this study was conducted, company already used Wiki as a means of knowledge sharing. However, employees still faced difficulties in acquiring knowledge shared through Wiki, such as a lack of a definite structure for creating and sharing content. After conducting this study, we were able to define main difficulties faced by employees and propose a new solution. From results obtained, it was possible to facilitate knowledge creation and exchange among employees by re-designing how information was shared through Wiki. This work has an important contribution in how the company can rapidly accumulate knowledge capital and enhance the quality of staff, and as such, enhance its competitiveness.

KEYWORDS
Transfer Technology, Sharing Technology, Wiki, Experimental Studies

1. INTRODUCTION
In current technological market environments, knowledge is a valuable resource for competitive advantage of an organization. Despite companies’ efforts to retain employees, in recent years, the number of job offers for professionals of any field is increasing (Bauer et al. 2010). It is common that from massive demands on software projects, there is the need to incorporate new team members. In this scenario, companies that able to properly manage knowledge and become cost-effective or innovative can survive in the long run. For this reason, companies have been giving great importance to knowledge generation and sharing, using social media technologies in parallel to training and education (Zanatta et al. 2017). However, newcomers usually need more time to become acquainted with projects.

Although training can be the fastest and most effective way to improve employee performance, newly hired usually still encounter difficulties such as process misunderstanding, low learning curve, and other issues that cause expectation breakdowns (Mansour et al. 2011). The onboarding period needs to be most effective to improve new employees’ performance aiming to acquire job skills as fast as possible.

In this context, Wiki usage, as social media technology approach, has introduced an effective way of collaboration, communication, and knowledge sharing, especially in distributed environments (Cunha et al. 2020). Due to collaborative features, Wiki technology can offer users the opportunity to deconstruct and reconstruct expertise in a manner that allows for organic knowledge growth and self-correction (Biswas, et al. 2017). Furthermore, the social engineering principles of Wiki combined with training can reduce onboarding period, reduce costs and mistakes, and maximize productivity.
Inspired by this, we present how we improved the knowledge management and sharing process through experimental studies from our Sidia Institute of Technology, using Wiki. At first, we executed an exploratory study to identify difficulties and usability issues faced by newcomers during interaction with Wiki. Afterward, we conducted an observational study to identify learning process of newcomers and we use their feedback to group by knowledge categories during re-designing the wiki’s structure. The aim of this paper is to share how we re-designing of Wiki pages used by our team by grouping knowledge in categories that we believe can have a direct and indirect effect on participation of newcomers on collaboration process. We hope this experience report can encourage companies to adopt social media technologies to improve the knowledge management process and also to contribute to a better onboarding process.

This paper is structured as follows: Section 2 provides some related works and description of our company Sidia. Section 3 describes studies realized to identify improvements and understand users’ interaction with wiki. In Section 4, we present results achieved and re-designing proposed using the new Wiki version. Section 5 concludes and shows some future directions.

2. IMPROVING WIKI THROUGH EXPERIMENTAL STUDIES

To some extent, newcomers usually need to learn social and technical aspects by themselves, exploiting existing information in mailing lists, source code repositories, and issue managers (Mahmood, 2015). Furthermore, newcomers may not receive enough training or may not have intimate knowledge of the practices they are normally trained to follow (Heredia et al., 2017). In this context, tools are essential for collaboration among team members, enabling communication, and knowledge management with more effectiveness (Kanakis, 2019). For this reason, some tools can support as much communication, coordination, documentation as knowledge management, especially in Global Software Development (GSD) environment.

In this sense, several investigations have focused on understanding how tools can improve collaboration, communication and knowledge management. Due to cost reduction, companies have been adopting Wiki as an alternative for knowledge management (Avram et al., 2017; Bao et al. 2019; Portillo-Rodriguez, 2012). According to related works, Wiki is an important resource for knowledge management. However, when Wiki has several information, users can face difficulty to use and this scenario can be a problem during the onboarding process.

Sidia is a R&D Institute, responsible for improvements on the Android Platform of Samsung products in all Latin America. As we work in a distributed environment, we have been adopting Wiki as an alternative for knowledge management. In Wiki, we provide information about project processes, tools used, focal points of each telephony partner, stages of the software development process etc. However, we observed that novice project leaders (PLs) faced great difficulty in using the Wiki due to a large amount of information, and difficulty to use and explore information access.

For this reason, we performed experimental studies to identify difficulties faced by our newcomers and another study aimed to understand how they solve problems. We use results from these studies to group knowledge in categories that we believe can have a direct and indirect effect on the participation of newcomers on collaboration process. In the next section we describe two studies already realized showing how these studies were useful to re-design Wiki pages’ structure used by the team.

2.1 First Experimental Study

The first study, detailed in Cunha et al. (2020), we aimed to identify difficulties faced by our team. During newcomer onboarding process, new members received basic trainings related work activities and we used the first version of all activities described in Wiki as reference. However, they reported several difficulties to find information, tutorials related to process and PL activities.

In this sense, we designed our first experimental study to evaluate Wiki content used for knowledge transfer from the perspective of new project leaders by Sidia. In this scenario we designed the study, to collect data using an online questionnaire.
Table 1. First study results (Cunha et al. 2020)

<table>
<thead>
<tr>
<th>Experiment: Design</th>
<th>Summary Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>We chose 24 volunteer participants of the PL team by convenience. These participants were composed of only newcomers and only had initial experience with Sidia project processes.</td>
</tr>
<tr>
<td>Indicators</td>
<td>To evaluate the quality of use and acceptance when participants interacted with wiki, we analyzed perceived usefulness and perceived ease of use indicators within the Technology Acceptance Model – TAM (Davis, 1989). This model is focused on aspects that are strongly correlated to user acceptance of a given technology.</td>
</tr>
<tr>
<td>Results</td>
<td>We decide to collect information about frequency of usage Wiki to understand if information provided in Wiki is adequate and useful to assist newcomers. Considering ease of use, 42% reported that they had difficulty with Wiki content presentation, and another 32% considered Wiki easy to find information. Considering useful perception, 76% of users reported as positive results.</td>
</tr>
</tbody>
</table>

The results were useful to identify usability issues, outdated content, gaps in training that affecting their onboarding process. We used results to resolve usability issues and update some wiki contents. As contributions of this study we create a Wiki template content, based on 5H2W model. This new approach was useful to help newcomers associated Wiki content to work process.

Other important contribution of this study was training program. During pandemic period, we adopted a platform that allows online training can be recorded to access any time. Since hence, we decided to realize a qualitative study regarding the participants’ interaction with Wiki and their learning process strategy. We took such decision aiming to obtain a more accurate result. Thus, we can combine quantitative and qualitative data to better understand the identified problems.

2.2 Second Experimental Study

Despite results from first study, we decided to collect qualitative opinions to understand which features could be improved to facilitate knowledge transfer, as well as which problems could be compromising learnability. In addition, we aimed to collect learning strategies adopted by newcomers during the onboarding period. During study execution, we applied a questionnaire asking for subjects’ opinions regarding their improvement. The questionnaire was made available for a week.

Table 2. Second study results (Lima et al. 2020)

<table>
<thead>
<tr>
<th>Experiment: Design</th>
<th>Summary Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>By convenience we use same 24 volunteer participants of the PL team.</td>
</tr>
<tr>
<td>Indicators</td>
<td>To analyze the data collected we used Grounded Theory procedures - GT (Mills, 2006). We used this method to build knowledge about improvements in Wiki and to identify relationships between subjects reported and some items. We extracted qualitative data and coding using data reported by PLs. Then, codes found in questionnaires were grouped according to their properties, thus forming concepts that represent categories. For the analysis of inspector’s interaction with technique, the following categories were defined: Learning Strategies, Wiki Issues, Improvements and Ideas.</td>
</tr>
<tr>
<td>Results</td>
<td>Considering learning strategies, we can observe that despite trainings and content, new PLs prefer asking experienced colleagues. Related to Wiki issues, we identified some problems that affect learning experience by new PLs, such as duplicated pages, dropped processes, some terms not clear and others related issues. Considering improvement and new ideas, the most important contribution of this study was related usability improvements.</td>
</tr>
</tbody>
</table>
The findings of second study, detailed in Lima et al. (2020), were important to improve our training methods during the integration phase of newcomers. Also, we adopted a mentoring program, where experienced members have been responsible to assist new members during onboarding process. We improved Wiki training section creating a quick start guide, specific for newcomers. Based on the results obtained, we created categories divided by: process, tutorials, FAQs and useful information.

Results were important to create an approach for redesigning Wiki content. Thus, we developed a proposal for a new Wiki version. In next section we present 2nd Wiki version, based on contributions and show that collaboration was maximized. Also, we present improvements applied on previous studies.

3. CONTRIBUTIONS OF EXPERIMENTAL STUDIES

Understanding obstacles that affect sharing and transfer of knowledge is the first step in identifying potential solutions. We used experimental studies to identify and understand difficulties faced by new team members. The main difficulty reported by newcomers was related Wiki organization. For this reason, as contribution of first study, we also proposed a template with good practices and content structure, following the 5W2H method to facilitate learning, importance of each page and process related to that page. Other improvements, as second study results, were improving training programs, using online platform.

![Figure 1](image1.png)

Figure 1. Changes applied from version 1 to version 2

Despite this organization, new members still had difficulties finding the desired information. For this reason, we organized content by considering knowledge groups during the re-designing of Wiki. We organized considering 10 categories, as shown in Figure 1.

Figure 1 shows difference between Wiki versions. In the first Wiki version information was grouped into following categories: useful links, how-to, quickstart guide, tools, team members and plan & meetings. Useful links category presented information related to software process, roles and responsibilities, organizational charts, glossary, trainings, reports shortcuts and others. How-to category presented information related to tutorials and others rules to process execution by PLs. Quickstart guide is a specific category created to newcomers, in this section we grouped contents related to documentation, glossary, organizations, common issues, trainings and others recommending tasks that are appropriate for newcomers. Tools category presented information, tutorials and some FAQs related to automation tools used by PL team members. Plan and meetings presented information related projects schedule and some milestones.
Based on the difficulties reported by new members, we categorized them by considering knowledge groups, process, tutorials, useful information and quick start guide for newcomers, as showed in Figure 2. These modifications improved access and search for content. In the first version, PLs related difficulty to find specific contents.

Figure 2. Overview of new Wiki page version

In the second version, grouping knowledge by common content made it easy to find specific content because we grouped the information by considering: process, how to do, useful links for each content (See point 2.1 from Figure 2). This field assists to search new contents and others that were not indexed by the main page. Also we create a template for new pages (See point 2.2 from Figure 2) to help newcomers create or update Wiki content. In addition, we created two extra sections: latest modification to help PLs to identify recent pages updated and a search field (Figure 2.3).

This grouping was useful to define learning pattern where newcomers can see from a macro perspective, considering process overview to understand how we work on projects scope. After that we present tutorials with steps to perform each activity for each process chosen by the new PL (Figure 2.4). To finish, we present information and details related to each process such as FAQs, lessons learned, known issues and quick start showing how to resolve each issue (Figure 2.5-2.6).

As important contribution was related to views and collaboration to improve new Wiki pages. After releasing new Wiki version, we collected log information to check how the new Wiki design can substantially influence collaboration and engagement. We extracted logs from March 2020 to December of 2020, see Figure 3.

Figure 3. Rate of collaboration by newcomers after new Wiki version released
We observe that collaboration was maximized. Some factors can influence collaboration such as: learning process. As the new PLs learn a particular process or activity, they can also collaborate by updating information related to process, pages and tutorials. We can observe increasing rate of collaboration by unique viewers. This rate can be explained by modifications related improvements done by newly PLs. Despite newcomers have to depend on others to guide or train them to execute their duties, it is too important to have a main knowledge repository, such as Wiki. However, this process can be effective only if the knowledge content is well structured. Thus, the results can be considered an indicator that during onboarding process, newcomers can collaborate more efficiency with repository well organized.

4. CONCLUSION

This paper presented an extension of studies performed on Wiki, where we collected information about how newcomers learned as relates to working process at Sidia R&D Institute. Previous works, described in detailed at Cunha et al. (2020) and Lima et al. (2020), presented quantitative and qualitative results related Wiki usage by newcomers. In the first study we presented an overview about difficulties faced by new PLs during onboarding process at Sidia, specifically about knowledge transfer. In the second study, we presented a qualitative analysis, results and improvements made as contribution of the quantitative analysis.

Considering Wiki issues, we observed that most issues are related to usability and content structure. As improvement we restructured content by dividing them into sections by common knowledge (Cunha et al. 2020). Considering learning strategies, we can assume see that new PLs learned most effectively with experienced colleagues (Lima et al. 2020). In this case, we proposed recorded training sessions and shared specific pages to new PLs. Considering Improvements, we created a team which is in charge of controlling and managing Wiki content and as future work, we are planning new actions such as games and workshops to improve integration by newly PLs thus, promoting more contribution by these newcomers in Wiki content presentation.

Based on these results we are redesigning the Wiki content. However, another interesting aspect to be investigated as future work is how to minimize the impact of newcomers misunderstanding during integration in the company. In our case, we applied Wiki, but it is possible to recommend a set of data analytics based on the learning of developer profiles. However, it is an aspect that still needs further investigation.

Thus, we will replicate this study after improvement and compare the results with this work. We expect that with this experience report, we have shown, through practical examples, that it is possible to improve the learning process of newcomers in a GSD environment. In addition, we intend to encourage software development industry to improve knowledge transfer to improve newcomers’ onboarding to better support difficulties faced by them.

ACKNOWLEDGEMENT

Our thanks, in the terms of the Informatics Law N° 8387/91.

REFERENCES


