WIKI COLLABORATION IN ORGANIZATIONS: AN EXPLORARTORY STUDY

Mansour, Osama, Linnaeus University, Department of Computer and Information Science, PG Vejdes SE-351 95, Växjö, Sweden, osama.mansour@lnu.se

Abusalah, Mustafa, Consolidated Contractors Company, Department of Knowledge Management, 62B Kifissias Avenue St., Marrousi, 15125, Athens, Greece, mabusalah@ccc.gr

Askenäs, Linda, Linnaeus University, Department of Computer and Information Science, PG Vejdes SE-351 95, Växjö, Sweden, linda.askenas@lnu.se

Abstract

The use of social media technologies in organizations has introduced novel ways of collaboration, communication, and knowledge sharing. In this respect, the present study is concerned with examining the use of one type of social media, the wiki technology, by members of several professional communities of practice to collaborate and share knowledge with each other. As such, it seeks to identify and understand the factors that influence their use of the wiki at a large multinational organization. To this end we used an interpretive exploratory case study which included 12 in-depth interviews with senior employees and managers as primary sources of data. Additional data was obtained during two field visits at the organization through observation of the wiki, field notes, and organizational documents. The study concludes with rich insights into the dual impact of the openness of wiki collaboration as well as the manner and value of using the wiki for knowledge collaboration and sharing at the workplace.

Keywords: Social Media, Wiki, Openness, Communities of Practice (CoPs), Collaboration, Knowledge Sharing

1 INTRODUCTION

The impetus for organizations to use social media has increased recently and more organizations are employing different social media tools at the workplace to enable collaboration and knowledge sharing amongst their employees (Yates et al., 2010; Majchrzak et al., 2006). Social media is defined as a group of internet-based applications which builds on the ideological and technological foundations of Web 2.0 and allows the creation and exchange of User-Generated Content (UGC). The wiki, as a type of social media, is defined as a simple dynamic web page which is open for anyone to share and discuss personal knowledge in a collaborative fashion (Yates et al., 2010; Rafael & Ariel, 2008; Happel & Treitz, 2008). In this context, the wiki is increasingly used in organizational settings for different internal Knowledge Management (KM) purposes (Yates et al., 2010; Happel & Treitz, 2008; Wagner & Majchrzak, 2007). Most often, the wiki is used in organizations by virtual Communities of Practice (CoPs) (Yates et al., 2010), which are central to KM strategies (Ardichvili, 2008). A CoP is described as a group of people informally bound together by shared expertise and passion for a joint enterprise, who deepen their knowledge and expertise by interacting on an ongoing basis (Wenger, 2004; Wenger et al., 2002; Wenger & Snyder, 2000). Ardichvili (2008) and Wenger (2004) believed that CoPs represent a strategic approach to KM in organizations.

Hasan & Pfaff (2006) and Wagner (2004, 2006) discussed the wiki as a conversational knowledge management tool used by CoPs to addresses specific knowledge needs. Given the nature of the wiki, it has also been described as a lean approach to web-based content management allowing multiple users to collaborate on the creation of documents (Happel & Treitz, 2008). Further, Stenmark (2005) found how the use of the wiki has enabled more participation and knowledge sharing in an organization that had wanted to activate its intranet system.

Despite managers' recognition of the value of knowledge (Pfaff & Hasan, 2007; Wenger, et al., 2002; Wasko & Faraj, 2000) and the need to develop KM strategies in their organizations, they were still unclear about how to go about it (Wenger et al., 2002). Several attempts by organizations to use information systems to manage their knowledge have resulted in digital junkyards (ibid). Stocker et al. (2009), for instance, found that organizations using wikis struggled with the dilemma of a knowledge-sharing environment. While some managers perceive higher benefits from using the wiki to transfer and manage knowledge (Stocker et al., 2009), others tend to be uncomfortable with the idea that their content is open and accessible by a large number of users (Wagner & Majchrzak, 2007). In the same vein, Danis & Singer (2008) also argued that the uncoordinated use of wikis by many users might result in chaos: distrusted content, difficult navigation, and lack of consistency among wiki pages.

While there are numerous empirical studies which have examined wikis in educational contexts and Wikipedia, only a little amount of empirical knowledge is available on using wikis within organizational settings (Stocker et al., 2009; Danis & Singer, 2008; Stenmark, 2008; Majchrzak et al., 2006). It is important to mention that using wikis in education or Wikipedia is fundamentally different from using wikis at the workplace (Stocker et al., 2009; Danis & Singer, 2008). The current paper was notably motivated by the paucity of empirical knowledge on the use of wikis within organizational settings as well as the increasing growth and importance of using social media in organizations. It was based on an interpretative exploratory case study at a large multinational organization and involved multiple sources of data including interviews, observations, field notes, and documents. The paper sought to explore how members, who belonged to several professional CoPs, used a wiki to collaborate and share knowledge with each other at the organization. Accordingly, its ultimate aim was to identify and understand the factors that influenced the use of the wiki for knowledge collaboration and sharing within an organizational setting. It also focused on examining the value of using wikis by CoPs in organizations based on these factors. The paper falls into six sections. Section two provides a review of related literature while section three presents our research approach, the context of the study, and the data collection process. The empirical findings from our study are reported in section four. Section five discusses these findings. The last section provides some conclusions and recommendations for further research.

2 THEORETICAL BACKGROUND

2.1 Wikis

Wikis were introduced for the first time in 1994 by Ward Cunningham who wanted to have a collaborative medium that would serve as a shared place for software developers and designers to collaborate and share knowledge (Stenmark, 2008; Stenmark, 2005). A wiki, a Hawaiian word which means quick, refers to a simple dynamically updated web page that is open for anyone to add, edit, discuss, and track content. It consists of hyperlinked pages that allow anyone to collaborate openly for the creation and modification of knowledge (Yates et al., 2010; Happel & Treitz, 2008; Pfaff & Hasan, 2007). One of the unique attributes of wikis, which differs from pervious technologies, is the free or open editablity that enables anyone to edit others' contributions in order to improve readability, organize pages, and integrate ideas (Yates et al., 2010; Rafael & Ariel, 2008). In this context, Yates et al. (2010) referred to the process of rewriting, reorganizing, and integrating the wiki content as "shaping", a purposeful activity that transforms existing knowledge on the wiki into useful knowledge. Nowadays, one of the most famous examples of the wiki concept is the large online encyclopedia called Wikipedia (Happel & Treitz, 2008). Wikipedia represents well the concept of open wiki collaboration and voluntary knowledge contributions (Wagner & Prasarnphanich, 2007).

2.2 Wikis in organizations

Perhaps the term that best describes the use of wikis in organizations is Enterprise 2.0. Andrew McAfee (2006) coined this term to represent organizations which build and use social media or web 2.0 technologies, namely, wikis, blogs, and others at the workplace. The use of wikis in organizations is far different from how it is used in other contexts such as educational settings or open environments like Wikipedia (Danis & singer, 2008; Stenmark, 2008).

Many scholars (e.g. Hester & Scott, 2008; Wagner, 2006; Hasan & Pfaff, 2006; Wagner, 2004) argued that the wiki could be used as a conversational knowledge management technology. For instance, in a survey conducted by Majchrzak et al. (2006), several organizational usages of the wiki were found: project management, CoPs and user groups, marketing, resource management, etc. However, Danis & Singer (2008) argued that the nature of the wiki might introduce difficulties for organizations such as management of their content, which may result in chaos, inconsistent content, and difficult navigation. The following section discusses several aspects of using wikis by CoPs for knowledge collaboration, sharing, and management.

2.2.1 Wikis for knowledge collaboration and sharing

Wikis are increasingly used in organizations by virtual CoPs (Yates et al., 2010). In this respect, Ardichvili (2008) found that CoPs were gaining popularity as a vehicle for collective learning and knowledge creation within organizations. A CoP is defined as a group of people informally bound together by shared expertise and passion for a joint enterprise, who deepen their knowledge and expertise by interacting on an ongoing basis (Wenger, 2004; Wenger et al., 2002; Wenger & Snyder, 2000). Wenger & Snyder (2000) explained that CoPs differ from other forms of organization, i.e. project teams or formal work groups in terms of purpose, belonging, and bond among community members. The purpose of CoPs is to exchange knowledge and develop capabilities. Members of CoPs often select themselves to participate with others. Passion and commitment are bonds that hold them together. Ardichvili (2008) maintained that one of the most recognized benefits of CoPs is their ability to allow for the generation and dissemination of tacit knowledge, which is hard to communicate, as it is intuitive and embedded in a specific context. He referred to CoPs as a platform for sharing and internalizing tacit knowledge. Within organizations, Ardichvili (2008) further argued that CoPs play a central role in the KM strategy. However, Wenger (2004) believed that CoPs need a technological infrastructure that enables members to communicate regularly and accumulate documents.

In this context, Knowledge Management Systems (KMSs) refer to a class of information systems applied to management of organizational knowledge. They are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage, retrieval, transfer, and application (Alavi & Leidner, 2001). Wikis are an example of these systems used in organizations by members of CoPs to create, share, and aggregate their knowledge into a new intellectual capital (Yates et al., 2010). Wagner (2004) explained that conversational knowledge creation, using wikis, emerged as the most popular way for organizations to create knowledge in the context of online communities. Many benefits can be achieved by using wikis for collaboration. For instance, Majchrzak et al. (2006) believed that organizations might improve their collaboration, work processes, and knowledge reuse using wikis. As the modern economy runs on knowledge (Wenger & Snyder, 2000; Wasko & Faraj, 2000), KM is considered one of the major sources of competitive advantage in modern organizations (Wagner, 2004). KM is defined as the process of identifying and leveraging the collective knowledge in an organization for competition purposes (Alavi & Leidner, 2001). Knowledge, in the sense of CoPs, is an accumulated outcome of the ongoing process of exchanging and contributing knowledge to the community (Wenger, 2004). In addition, Wenger (2004) viewed CoPs as the social fabric of knowledge and argued that CoPs are the cornerstones of knowledge management. He identified three characteristics of CoPs which represent the foundation of a knowledge strategy in an organization: the domain that brings the community together, the community which is a group of people for whom the domain is relevant, and practice that is the body of knowledge that CoP members develop and share together.

3 RESEARCH APPROACH

Due to the paucity of empirical knowledge on the use of wikis by CoPs within organizational settings, this paper used an exploratory research approach. In other words, the paper explored the phenomenon of using wikis in organizations inductively. The choice of using exploratory research was stimulated by both the nature of the problem, being a new and complex social phenomenon, and the likely high-degree of its uncertainty due to the paucity of empirical knowledge (Trauth, 2001).

Given the nature of the present research problem, the study adopted an interpretive approach to research. It emphasizes, in a phenomenological sense, that an interpretive understanding of human experiences can be derived from data collected in real life settings (Rowlands, 2003). In this respect, the process of collecting and analyzing empirical data was informed by this interpretive philosophy which sought to produce a deeper understanding of the phenomenon as given by our participants (Walsham, 2006; Chen & Hirschheim, 2004; Walsham, 1995a). An in-depth case study research strategy was the vehicle for our exploration of the problem. The use of a case study as an exploratory research strategy was motivated by the need to get insights and increase familiarity with the problem and to identify further problems for more precise investigations (cf. Nunamaker et al., 1990). Equally important, case studies allow for combining multiple sources of evidence (Yin, 2009; Eisenhardt, 1989), thus increasing the richness of the empirical investigation (cf. section 3.3.1). Accordingly, the use of an interpretive approach combines with an exploratory case study was useful in capturing deeper meanings and interpretations of our participants' interactions with each other within single, real life settings (Yin, 2009; Walsham, 1995a). The following sections present and discuss the context of our case as well as the processes of data collection and analysis.

3.1 Description of the case and the context of the study

This study took place at Consolidated Contractors Company (CCC), a large multinational contracting organization which has over 160,000 employees distributed all over the world. The *Engineering News Record* (ENR) magazine ranked CCC as the top construction contractor in the Middle East and the 13th contractor worldwide. CCC, headquartered in Athens, Greece, has offices in the five continents. It is specialized in civil and mechanical construction projects such as building harbors, airports, tunnels, and gas and oil plants. These projects often involved large numbers of employees ranging between 2,000 in smaller projects up to 30,000 employees in large projects, and they also covered many places across the globe. CCC often used traditional communication channels, such as emails, IP telephony, to connect these employees with their management. It also used a document management system that allowed project teams to store and organize their knowledge (e.g., technical method statements, procedures, lesson learned, etc.) into their own content management portals. However, these systems were ineffective to allow for a dynamic and flexible sharing of knowledge amongst employees. Also, the complex distributed nature of these employees and their increasingly large number, which has quintupled in the last ten years, had created difficulties for CCC to effectively leverage knowledge from its stationed employees. Therefore, the top management had decided and supported the establishment of a KM department to be in charge of developing and managing a shared platform for collaboration and knowledge sharing at CCC. Then, the KM department was officially established in July 2007. After eight months of planning, the KM Department launched a wiki in March 2008 (see next section). In order to put the wiki into operation, the KM Department established a core team of senior employees and top managers. This team included well-experienced organizational members. The team aimed at providing a basis for building and cultivating different specialized communities. The wiki was launched with five professional CoPs, as they referred to them in the company. Each community was specialized in a particular domain and was led by a community manager and a number of community captains. Also there were Subject Matter Experts (SMEs), who often aided community captains in managing the community in particular knowledge areas and subjects. In 2009, the wiki included 11 CoPs, 700 active members, and 3,237 contributions. Hence, the novelty of using the wiki at CCC and the richness of the environment were major reasons for choosing it as our empirical case.

3.2 Wiki as a knowledge management tool at CCC

Document Management Systems represent a traditional method of storing, organizing, and searching for organizational knowledge at CCC. This knowledge can be accessed based on access rights criteria. However, the adoption of an innovative knowledge sharing platform requires a more collaborative and social oriented medium to facilitate knowledge sharing and access. In this respect, after studying different collaboration and KM tools, the KM Department at CCC, decided to use the wiki as a collaboration and KM tool. The wiki consisted of spaces which represented several CoPs. Members of these CoPs were distributed across different areas and projects within a particular field. They used their wiki space to collaborate, explore ideas, and discuss work problems.

The advantage of using a wiki over other collaboration tools, such as forums, is that all CoP members can edit articles published by other members; therefore more than one member can collaborate to prepare an article. Also contributors can track changes of their articles through wiki versioning. This practice is very important as it provides a basis for CoPs to collaborate in order to produce method statements that explain best practices, work flows, work procedures, etc. (Abusalah, 2008). As discussed before, in the introduction, uncoordinated contributions to the wiki may result in chaos. At CCC, the wiki was designed based on spaces. Each space is used by a particular CoP and is organized hierarchically based on areas and topics related to that CoP. Any new contribution should be categorized under the related topic. This method of categorization makes it easier for users to navigate and easily locate contributions. Further, the wiki contains contributions that are collaboratively created by more than one author while other contributions are based on personal or organizational experience and authored by a single author. To audit the quality of the contributions and to inspire additional coauthoring and editing, the KM Department employed "content review workflow", implemented after the completion of this study, to produce high-quality contributions. This does not mean that some contributions were void or invalid. Rather, it means that two different contributors might author the same method statement in two different ways. Whenever a user accessed the wiki to search for this method statement, he would pick up the best practice out of these two method statements. Captains of CoPs could use the "content review workflow" to obtain best practices and to ensure the integrity of contributions. In addition, the wiki was semi-moderated so that members could only author articles related to work. An article or a comment might seldom be deleted due to the lack of relevance.

3.3 Data collection process

The data collection process aimed at obtaining data from several sources. These sources included interviews, field notes, observations, and documents. In order to start the interviewing process, we had to prepare for two important tasks. First, we developed a case study protocol which included general information about the study as well as a number of themes and questions related to the use of wikis in organizations. These themes were developed based on the literatures on wikis, knowledge management, and CoPs (cf. sections 2.1; 2.2; 2.2.1). We also developed themes based on our preliminary discussions with KM specialists about the wiki platform at CCC. For instance, we used themes, such as the openness of the wiki, to ask questions about the influence of openness on knowledge collaboration and sharing within communities. The protocol was mainly designed to guide our conversations during the interviewing process (Yin, 2009). Second, we defined selection criteria on the basis of which we chose a number of participants in our research. The selection criteria consisted of several factors: seniority level, membership in different wiki communities, level of activity, computer skills, age, gender, and geographic distribution. These criteria were defined to ensure a maximum level of background variations among our participants. The next section describes the selection of our research participants.

3.3.1 Selection of participants

The KM Department helped us in selecting our research participants out of 700 registered members in all CoPs. After revising their profiles, we decided that only 28 community members would best match our selection criteria. Then we sent invitation emails to all selected members to invite them for participation in our research. Each email included general information about the purpose and focus of our research as well as practical information related to the interviewing process such as the interviewing time, voluntary participation, and anonymity and confidentiality issues. Eventually, we received twelve positive responses from employees with different backgrounds. These employees represented members from several communities and geographical locations and with various levels of experience at the company. The range of our participants' experience was between ten to thirty years. Most of them belonged to at least one community such as hydrotesting and precommissioning, mobilization to remote areas, pipe fabrication, safety, etc. Further, we had participants from different parts of the world including Australia, Greece, Kazakhstan, Oman, Saudi Arabia, Qatar, and UAE. More importantly, our selected participants had different roles and levels of activity within their communities. For instance, we had normal community members with roles were limited to reading or commenting on articles.

We also had participants playing the role of community leaders. These were in charge of leading and nurturing the community. In addition, we had participants playing the role of community captains who were active wiki users and were tasked with the motivation of community members, monitoring contributions, inviting new members, and suggestion of topics for discussions.

3.3.2 Data collection

The primary vehicle for our data collection was the in-depth semi-structured interview. However, we have used other sources of data such as field notes, organizational documents, and participant observations. The use of multiple sources of data is called triangulation, a major strength of case studies allowing for addressing a broader range of behavioral issues in our case (Yin, 2009) and increasing the robustness of our data (Rowlands, 2003) (cf. section 3.3.3). Given the geographical distribution of our participants in different parts of the world (cf. section 3.3.1), ten interviews were conducted over one month either via telephone or an online conferencing system (e.g., Skype). Only two face-to-face interviews were conducted during the first field visit. The average interviewing time was one hour, and we used a voice recorder to record all interviews for later transcription and analytical purposes. Pertaining to the interviewing processes, we used a fluid stream of themes and questions (cf. section 3.3) to follow the line of inquiry (Yin, 2009). This was useful to allow for a free exploration of our participants' perceptions as well as for the emergence of new themes during the conversation with the participants.

Further sources of data were obtained during two field visits at the company. The first visit was to CCC headquarters in Athens, Greece and the second was to CCC offices in Abu Dhabi, UAE. The main aim of the first visit was to observe the wiki which was only accessible through an internal CCC network. The second author, a KM Department employee, helped us in making this observation by describing the structure and organization of the wiki. Our observation of the wiki has helped us to get deeper insights into how different communities were structured and categorized into specialized areas and also to understand how community members interacted with each other. We have documented the observation of the wiki by taking several notes and screenshots. Furthermore, during our discussions with the KM leadership, several notes were taken. These notes mainly contained information about several issues and challenges pertinent to the wiki, such as the introduction of new communities, sustainability of the current communities, etc. With respect to the second visit, its aim was to participate in the 10th quarterly meeting of the 'hydrotesting and precommissioning' community. Additional notes were taken during this visit describing actual discussions and interactions among community members while exchanging ideas and experiences related to the content of their community in the wiki environment. Our role as participant observers was particularly useful to perceive the reality of these meetings from within (Yin, 2009). In addition, we obtained several electronic volumes of the monthly newsletter published by the KM Department. The newsletter included a variety of information related to community updates, featured articles from different wiki communities, and monthly statistics about contributors and contributions. This information was a useful resource to provide us with additional insights into the activities of several CoPs.

3.3.3 Data analysis and validation

Perhaps the concept of hermeneutic circle, discussed by Klein & Myers (1999), best describes the process of our empirical data analysis. The concept of hermeneutic circle is foundational to all interpretive work (Klein & Myers, 1999). It emphasizes that a whole understanding of the phenomenon can be achieved through a circular understanding and interpretation of its parts and their interrelationships (Cole & Avison, 2007; Klein & Myers, 1999; Butler, 1998). Based on this, each interview transcript was reviewed and several segments or parts of data were identified and examined based on their significance and relationship to the main focus of the study. In this context, open coding was used to develop descriptive codes and themes which characterized the main message in each data segment (e.g., we used the code "Inhibitor" to describe what one participant said about the lack of confidence and courage to share knowledge due to the openness of the wiki) (Rowlands, 2003; Trauth & Jessup, 2005). These codes and themes represented the meanings and interpretations of using the wiki as given by the participants. After we completed the segmentation of data and the development of codes and themes, we used axial coding to create connections among related codes and themes (Rowlands, 2003).

We then went back and forth across codes in each transcript and eventually mapped related cods into each other, thus developing larger themes which addressed our main research focus. Cross-transcript analysis was also conducted to further develop general themes that spanned across several codes and themes found multiple transcripts. The use of both open and axial coding in our hermeneutic analysis was useful in terms of focusing on the particulars found in the data as well as developing an overall interpretation and understanding of our participants' meanings of using the wiki for knowledge collaboration and sharing. However, interpreting qualitative, text-based data is often regarded as a subjective process influenced by the researchers' values, beliefs, and preconceptions (Walsham, 1995b). Data validity, therefore, is essential to address the subjective nature of data collection and analysis (Walsham, 2006). In this respect, the triangulation of multiple sources of data in our case (cf. section 3.3.2) was one major approach for addressing validity issues in our research. Yin (2009) argued that the use of multiple sources of data provides multiple measures of the same phenomenon. For instance, though we obtained rich descriptions of the wiki environment through interviews, these descriptions were not enough to develop a practical picture of the structure and organization of the wiki. The observation of the wiki during the field visit was useful in terms of helping us in developing a clearer picture of how content and CoPs were organized and structured. In addition, we have managed to send interview transcripts to five participants, who had agreed earlier to receive them, to review and evaluate the conversations.

4 FINDINGS

4.1 Patterns of wiki collaboration in organizations

The dominant understanding of the wiki at CCC emphasizes a synonymous relationship between the wiki and KM. Many of our participants expressed the importance of this relationship to enable knowledge collaboration and sharing at the workplace. A proposal leader expressed this importance as follows: "*In my opinion KM, wikis, and such applications in the professional environment are very important especially in an organization that has many years of experience. Everything is still in the brains of people, nothing on paper*". Further elaboration of this importance was provided by one of the group technical managers. He emphasized the importance of the wiki as a vehicle that helps to put together the experiences of a large number of employees and also spread knowledge to other employees. He stressed that it was the basic principle of KM at their organization. He said: "*The basic principle of KM, first of all, is gathering of experience gained by the people in the company, which until KM was introduced, had been the property of this individual and it was not spread. And the second step of KM was the systematic analysis of the subject and the spreading of this knowledge to selected users. So this is the only vehicle. You cannot spread such information to such a vast number of employees by any other means*". As such, the introduction of the wiki enabled the company to leverage knowledge from distributed and mobilized employees. In this respect, one of the control project managers explained the value of referring to wiki CoPs with respect to the distributed nature of their work: "*It's much easier now. If I mobilize to a new area, I can easily go to this CoP, community of practice, for mobilization to remote areas, and I can access a lot of information, and it's not only this. I can share my problems with my colleagues on the other side of the globe*".

Moreover, as the community involved managers and captains with long experience, they used the wiki to make this experience accessible to all other employees. One of the mechanical construction managers described it succinctly: "*I am conveying whatever my experience is from 1984 up to now to the others*". Another construction manager also explained how community captains shared the responsibility of contributing to the wiki: "*After the team and the captains are aligned ... we are sharing the responsibility; yes we have lots of contributions in this aspect*". Further, a senior administrator reflected upon the discussions on the wiki compared with face-to-face (f2f) discussions: "*It's also a way that you can, maybe, communicate with. It is not exactly the same as f2f but you can get something out of it which you cannot, maybe, get in f2f. I mean it doesn't substitute f2f but it has other advantages*". The wiki use was not only limited to community members but it was also open to other people with variable degrees of accessibility to read and comment. A mechanical project manager explained how community members and others outside the community were making use of the wiki:

"*We used it as a library in fact, and sometimes we exchanged ideas, we had sometimes points where we added our comments on that, of course between the members and any other man outside our community*. Moreover, many of our participants reported that the wiki enabled them to meet new people through discussions. The head of Business Systems said: "*It will give me an opportunity to know more about these people and what their titles, or functions are within the project or the company. So it introduces more people through this media instead of just sitting and knowing the persons around you*". A proposal leader added: "*The wiki opens you up to people all over the organization, to their thoughts*".

In addition, a control project manager emphasized the importance of the knowledge available in the wiki compared to knowledge available in other resources: "*Our KM is very specific to CCC, and very applicable towards our own procedures. I don't want to get information from other sites that are good but at the end of the day they are not applicable to our procedures because our projects might be different*". In this respect, the use of the wiki in organizational settings has a specific objective as described by one of the mechanical construction managers: "*We are a company and we need the optimum benefit out of this. We are not general users of the wiki; we have an aim from the wiki: to use it efficiently and effectively for our work and socially for our community, the CCC community*". A stronger opinion about this, emphasized the responsible use of the wiki and the sensitivity of its knowledge. It was expressed by a construction manager: *"Actually it is not YouTube. Here, because we are relating to things totally pertaining to technical issues and things related to the lives of others … This is a source for all CCC staff all around the world. If you could take any piece of information and he will contribute it or practice it on site, any fatality, any accident, he will be responsible … and we'll find that our wiki is not used in the proper way*".

4.2 Perceptions of open wiki collaboration in organizations

Most of our participants embraced an open wiki environment at the workplace. However, the informal nature of the wiki was seen by many of our participants as a barrier to knowledge collaboration and sharing. One construction manager put it: "*It is not a formal tool to be utilized as a sort of communication … it is not that much official source that I get something related directly to my job and take it*". He justified it: "*Because at the very beginning I said there were just only contributions … someone would get something from his library and he wanted to have it shared with others*". In this respect, many of our participants believed that the training on how to use the wiki was not as much important as understanding its importance and need for both employees and the organization. One proposal leader said*:* " *Usually, in my opinion, you need someone to imprint a path goal as of why you are using it and how it is going to affect us*".

An important concern related to the introduction of the wiki was to see whether the company was willing to be more open and if it could nurture an environment in which people could use the wiki to openly share and exchange ideas with each other. The group plant manager expressed his opinion strongly on this: "*I did not support that such thing. When it falls in the hands of others, it will make us less competitive. I totally disagreed with that*". He added that the company was becoming more open: "*Gradually they were more open, let's say they gave permission to other people to use the wiki, of course in the company; people became more open about it*". In the same vein, the head of R&D for Open Source Development described the importance of openness: "*I believe that if you want to have a success story for your wiki spaces, knowledge spaces, knowledge topics … you need to create an uncontrolled space and you just allow people to go and talk … if you want to make it formal, people will not talk, you need to make it really informal*". However, a construction manager had a strong opinion on the openness and free editablity of the wiki when we asked him if he would edit others' contributions (e.g., his boss): "*I don't want to edit for him in front of many users; he will see that I already attended his article … he will consider that as an insult in front of others*". In spite of that, the nature of work and sense of responsibility have increased openness that is necessary when using a wiki at the workplace. For instance, the organization is sometimes required to share its experience with other companies as part of international cooperation. One of the group plant managers gave an example about the need to share experience and ideas of their efforts to reduce carbon effects at the company with an international organization: "*I had to really share a lot with members of 'ABC' through meetings … and we exchanged things related to carbon omission and how to reduce it*".

Moreover, there was a sense of responsibility and commitment by old organization members to share their experience with younger employees, which further stimulated openness at the company. One mechanical project manager explained: "*You know we are the old guys in the company with many years of experience. The newcomers should get benefit from us*".

So when we asked about the motivation behind people's contributions to different wiki communities, a mechanical project manager said: "*This is, you know, upon their volition…because the more you contribute to this, the better for you*". One construction manager discussed the voluntary nature of people to share on the wiki: "*You know what we are doing is spare; it is not our main duty. What we are doing is part time for us … This is, I will call it, voluntary. You do it as a volunteer*". A control project manager said that people had to believe that they could use the wiki to mutually share and benefit from each other: "*Believe in it. Believe that you can contribute to others and you can get from others*". Further, the nature of the wiki as an open and informal technology had a motivating influence on people to share and collaborate with each other. One group plant manager described it this way: "*To a certain extent, it is a less formal means of communication so people would voluntarily be more open to write things…so this is the sort of open mind you feel when it's a wiki thing*". Other participants added more perspectives explaining the reasons of why they started to use the wiki. One control project manager explained: "*I started to use it because it was introduced to us by the company, and the company encouraged us to start this technology; so basically it was my choice and the company's choice to get these facilities*". A senior administrator gave an additional perspective on this: *"I could initiate; I know that. But for some reasons (thinking) it's, maybe, because it's voluntary (laugh). Sometimes we need a bit of pressure to do things*".

Still, the use of the wiki has caused some behavioral changes among community members as described by one of the mechanical construction managers: "…*We have more confidence in that we can get the information we need. Before, we used to spend much time and we would get nervous because we couldn't get the information we needed*". He further explained the impact of using the wiki on his contributive and sharing behavior. He said: "*For my part, I feel it; I have more interest ... in giving information. I really feel my information is very valuable when I put it on the wiki, and people are looking at it*". The open and visible process of sharing on the wiki has stimulated an effect of the community within its members. For instance, a proposal leader explained how seeing other community members sharing and contributing to the wiki has motivated him to be more active: "*When you see more people participating, when you see more people writing, when you feel more confident that the people who will read your input know what you are talking about you start to be more cooperative. I think this is what added and improved my perception*". One senior systems administrator added : "*When you see more people online and more people sharing their opinions, posting things, and so on you feel more motivated*". Related to this was the emergence and enrichment of the sense of the community among community members. This was described by one group quality manager: "*One thing is that this particular initiative and the wiki itself have brought all the experts closer in the community. What I mean, now we know who the expert in our domain is, whom we can talk to about a particular issue…Now we understand that we belong to a community, which is relevant to the project or the level of seniority*". One group plant manager further added: "*You are sharing with others, you feel, especially categorizing these communities into different disciplines; you feel you are part of a group or a family. That feeling you don't have with other means of communication*".

However, the open nature of the wiki has also caused challenges and barriers for the community as described by one group plant manager: "*I was really against such thing that we just fill pages because you know people simply would like to show their contributions; quantity is sick sometimes*". The group quality manager also agreed that the quantity of contributions was not an indicator of expertise as knowledge contributed to the wiki was not necessarily of an adequate quality, which might cause problems in the wiki environment: "*The more contribution to a particular topic is, to the other members of the community, the more they treat you as being an expert in this field. This is not necessarily true (laugh) because what we have to take into account is the quality of the contribution. Quantity can be huge but quality could be very low*". One proposal leader further described openness of the wiki as a barrier: "*People were, maybe, a bit reserved to write their opinions. I was one of them, not because we don't want to share ,but because there was a bit of, maybe, a barrier with the audience that you felt.*"

As a result, community managers and captains decided to introduce control and validation measures to the contributions on the wiki. In doing so, they aimed to ensure that contributions were reliable and valid. The introduction of validation rules to contributed knowledge as part of controlling the wiki collaboration was described by the group quality manager: "*Once a piece of knowledge is submitted, a document for instance, it will be submitted to the knowledge expert who will review it and he will have to say yes or no, to put it on the wiki or not. The wiki will have only the validated knowledge available for the user*". We also discussed how the community treated conflicting opinions and disputes that might arise due to contributing distinct experiences and ideas. One control project manager told us: "*Although we share ideas we may reach disagreement…Then some more senior people should interfere … so it's not sharing the knowledge. At the end of the day, when it comes to real execution of the job, somebody must have a say and say yes I agree. This is the way to do it*". The other way of controlling and validating contributions is through community meetings in which community managers and captains discuss the contributions made by others. One control quality manager told us that the role of these meetings was to filter knowledge and discuss further ideas on the wiki: "…*It is not only exchanging ideas online, we have meetings, we go and people of these communities meet and discuss things, and the thing is that this is some kind of filtering and coming up with better ideas and coming up with consensus and agreement on these ideas, so it's not only writing and reading*". In addition, these community meetings provided a basis for agreeing on different issues which are shared on the wiki. One construction manager said: "*All the things, we agree on immediately, will go through the wiki and the people outside this meeting can access it immediately...*".

5 DISCUSSION

5.1 Open knowledge collaboration and sharing using a wiki

Our findings revealed that the wiki was used for open knowledge collaboration and sharing but to some extent in a controlled manner. Many of our participants believed that the wiki had to be open for all but at the same time some rules of control, such as monitoring and reviewing contributed knowledge, had to be applied. This is due to the formal use of the wiki which has a specific objective: to benefit both employees and the organization in performing the work. In this respect, our participants strongly expressed their satisfaction with the wiki as a medium that allowed knowledge and experience to be accessible by a large number of people at the company. We also noticed that the nature of the wiki as a voluntary tool was useful to stimulate people to share their knowledge and experiences as well as enrich their sense of belonging and responsibility to the community (cf. Wenger & Snyder, 2000). This is an intriguing aspect of the wiki especially when compared to other types of collaborative technologies used in organizations. The wiki gave experienced people the chance to share their experiences and make it accessible to a large number of people for the benefit of the organization. By providing communities with a shared place, the wiki also enabled community members to connect with each other and identify who the expert was within a particular CoP, thus strengthening their attachment and belonging to the community as it became a source of relationships with experienced members and useful knowledge to their work. Further, many of our participants expressed their satisfaction with the wiki as a technology. They said that it was easy to use and often did not require any training. Their main concern was mostly related to the fluid wiki structure and large amount of accumulated knowledge, which might become lengthy and difficult to follow. However, these issues were not considered barriers to use the wiki. A salient issue that was raised by many of our participants focused more on the need to explain the importance and purpose of the wiki at the organization. Hence these issues have more weight than training when introducing a wiki to the workplace as the lack of understanding the voluntary and open nature of the wiki, for community collaboration and knowledge sharing, is considered to be a more important barrier than the need to learn how to use it.

5.2 Impact of wiki openness on knowledge collaboration and sharing

Many scholars (e.g. Yates et al., 2010; Ardichvili, 2008; Wasko & Faraj, 2000), discussed several barriers and enablers that might impact knowledge contributions to CoPs. In this respect, we found further issues related to barriers and enablers of using a wiki for knowledge collaboration and sharing by CoPs. The openness of the wiki has a dual impact on the collaboration and sharing of knowledge within CoPs.

For instance, the open nature of wiki collaboration might deter people from contributing and sharing their knowledge, even if they are willing to do so, because they are not comfortable with revealing themselves to the public (cf. Wagner & Majchrzak, 2006) or an unknown audience. These people have two characteristics. First, they might be a kind of people who do not accept criticism or might not accept the comments made by others to edit or shape their contributions (cf. Yates et al., 2010). Second, it might be that they feel shy to reveal themselves to a large number of people or prefer personal communication as a personal trait. Related to this is the lack of confidence and courage to comment on contributions made by higher-level contributors, as people do not feel comfortable to openly discuss or comment on issues made by senior people, higher in rank and experience. As a result, hierarchy and ascendancy are carried out to the wiki environment, and they might serve as barriers to wiki collaboration. The assumption that people might take the opportunity to contribute in order to be proud of themselves (e.g., contribute to show off in front of a large number of fellow employees and members) in the open environment was conceived to be a threat to the quality of contributed knowledge. Further, the voluntary and informal nature of wiki collaboration can also be a barrier to share and contribute to the community in the sense that people do not see the wiki as part of their jobs. In this context, a number of our participants expressed the need for organizational pressure to consider the wiki as a required tool at the workplace.

In contrast, although the openness of the wiki has created several barriers to collaborate and share, it has also attracted people to freely express themselves and voluntarily collaborate and share knowledge with others. This has made it easier for the community to access knowledge and locate experiences. More important, people feel that their knowledge is more valuable when it is open for others who read it and apply it in their real work. Moreover, the openness of the wiki is an important factor to stimulate the effect of the community on others. So when people see others contributing and sharing, they become motivated to do the same which to some extent reduces the constraining effect of hierarchy. In this respect, we found that wiki collaboration has enriched the sense of the community at the organization. The openness of wiki collaboration has made people closer in the sense that they can socially interact with each other and meet new people who might be experts in relevant areas. Accordingly, the wiki is considered as a source not only for knowledge but also for relationships with knowledge contributors which might emerge during open discussions and commenting on the wiki among community members.

By and large, the issue of openness of the wiki and the quality of contributed knowledge were not considered barriers by many of our participants who were in favor of a controlled wiki environment (cf. Hasan & Pfaf, 2006). While many of them expressed their concerns about these issues, being an internal and controlled environment, and only accessible to selected experienced organizational members, made it a secure medium for sharing reliable knowledge. Most importantly, the organization applies some control in terms of monitoring the contributions by both community managers and captains as well as the knowledge management department, conducting offline meetings in which community managers and captains discuss the contributions made by the members of the community, and controlling the accessibility to the wiki. In other words, there is a level of control applied to the use of the wiki in organizational settings, thus limiting any potential problems with the quality of knowledge and security issues that might exist because of its openness and free editablity. In addition, the sense of responsibility by experienced organization members has driven openness at the company in the sense that the wiki has given them a chance to make their experience public and accessible to everyone. Once this experience is available on the wiki, the nature of work, which requires employees to look for different necessary procedures and methods to do their jobs, drives them to join wiki communities to access the experience. Both the nature of work and the sense of responsibility are not only driven by open wiki collaboration but they are also vehicles for openness.

5.2.1 Value of wikis in organizations

The value of using wikis within organizations can be understood from the enabling impact of wiki openness for knowledge collaboration and sharing. We have discussed above several aspects of the enabling impact of wiki openness on how members of CoPs collaborate and share with each other at the workplace. This section focuses on understanding the organizational value of wiki openness. It discusses each enabler with respect to the perceived value of using wikis in organizations.

This value may have two dimensions: the first is flexible and dynamic sharing of knowledge and the second is the effect of the community. With respect to the first dimension, it has been observed that the informal nature of the wiki, in the sense of being open for anyone to freely read, comment, and create and shape knowledge on the wiki, was one important factor behind the stimulation of flexible collaboration and knowledge sharing within communities. This could be attributed to the low cost of sharing, discussed extensively in the literature (e.g. Cabrera & Cabrera, 2002; Dyer & Nobeoka, 2000). It could also be attributed to enabling of the community approach to knowledge sharing resulting in knowledge to be owned by the community since everyone could participate in the development of knowledge (cf. Stenmark, 2008; Hasan & Pfaff, 2006). Related to this was the open accessibility to knowledge which allowed community members to freely access knowledge available on the wiki. Despite the application of control rules, mainly for editing and shaping content, anyone in the organization can still access and read this content. Hence, the flexible ability to create and share knowledge by communities can help organizations in empowering knowledge collaboration and sharing, thus leveraging knowledge effectively.

Pertaining to the second dimension, there are many aspects associated with the community effect enabled by the openness of wiki collaboration. Open and visible interactions within the community allow community members to identify expert contributors, thus getting influenced to contribute more as well as creating new relationships with them. For instance, community members in our case tended to seek these expert contributors and their contributions either through commenting and discussions or even through community meetings and offline phone conversations. This has accordingly increased the feeling of the value of sharing knowledge with others by knowledge contributors. It has also helped in fostering reciprocity and recognition as well as trust among community members (cf. Ipe, 2003; Orr, 1990). Knowledge contributors tended to appreciate it when other community members discussed or called them to further elaborate on specific contributions. It can be argued that such interactions and relationships may provide means for building mutual trust among community members and further stimulate the community effect in the wiki environment. Accordingly, organizations seeking to build and nurture a knowledge sharing environment might benefit from open wiki collaboration which can facilitate the development of critical factors such as reciprocity, trust, and recognition, thus motivating and increasing knowledge collaboration and sharing among community members.

6 CONCLUSIONS AND FURTHER RESEARCH

The main aim of this paper was to examine and understand the factors that influenced the use of the wiki by members of CoPs for knowledge collaboration and sharing at the workplace. The openness of the wiki was found to be one major factor that had a dual impact on determining peoples' behavior towards the use of the wiki in organizational settings. In this respect, the open nature of wiki collaboration was found to be both a barrier and an enabler to collaborate and share within CoPs. The hindering impact of openness could deter or lead to less collaboration that might result from the lack of comfort by people to openly contribute in front of a large number of fellow employees or an unknown audience. This might be caused by the fact that these people are not willing to accept others' comments and edits or they feel more comfortable with personal and less disclosed communication. Hierarchal constraints are also carried out to the wiki environment, which may prevent people from editing and commenting on articles by their superiors in public. In contrast, the enabling impact of openness has helped to attract more contributors into the community through the effect of transparent community interactions and the creation of new relationships among people. The open accessibility of knowledge also has a positive impact on knowledge contributors in the sense of feeling that their knowledge is more valuable especially when others can read and use this knowledge. Understanding the dual impact of open wiki collaboration and its value is increasingly important as more organizations are adopting wikis at the workplace. This importance stems from the fact that openness as a major wiki property may have a determining impact on the success or failure of implementing a wiki as a medium for collaborative practices at the workplace. Therefore, research is needed to further examine the dual impact of open wiki collaboration and the enactment of paradoxical organizational structures and cultures. We also recommend longitudinal studies that focus on examining gradual behavioral changes with respect to openness.

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