# Wikifailure: The limitations of technology for knowledge sharing

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**Editorial Commentary**
In this case study, although the use of a Wiki for knowledge sharing was at first successful, use declined over time and attempts to stimulate re-use failed. Two key reasons were identified: a lack of critical mass of users and the time taken to access and use the Wiki. Given the 90:9:1 law of Social Media that states for any social tool; 90% of people will only read, 9% will read and occasionally contribute and only 1% will actively engage and participate; these findings are not too surprising. Two other rules of thumb emerge in this paper:*"Things never work as you expect*" and *"You can't force people to use Social Tools".*

**Abstract**: Currently there is much interest in the use of Web 2.0 technologies to support knowledge sharing in organisations. Many successful projects have been reported. These reports emphasise how the use of such technology has unlocked new pathways for knowledge transfer. However, the limitations of Web 2.0 technologies are not yet well understood and potential difficulties may have been overlooked. This paper reports a case study of a Wiki which was implemented to support a group of researchers. Although belonging to the same institution, the group members were relatively dispersed and their research areas were disparate. Nevertheless a short study showed that there were benefits to be gained from sharing knowledge and that many of the researchers felt that a Wiki would be a good

mechanism to support this. A Wiki was implemented and was initially very successful. A significant number of researchers contributed to the Wiki and almost all made use of it. However the usage declined over time and attempts to stimulate interest by providing incentives for contributions were unsuccessful. One year after launch use was minimal. A qualitative study was carried out to understand the reasons for this decline in use, and is reported in this paper. Responses suggest that two factors may have been particularly significant in explaining the failure of the system. One problem appears to have been a lack of critical mass. Only a small proportion of users are likely to contribute and there may be a threshold size for a community to be able to support a vibrant Wiki. Time also seems to have been an issue. Some respondents said that they simply were too busy to contribute to or use the system. Organisations which are considering the use of Web 2.0 technologies to support a knowledge management initiative should consider the likely impact of these factors in their own situation. Although technologies such as Wiki have great potential there are also pitfalls in undertaking such projects which are not yet well understood.

**Keywords**: Web 2.0, Enterprise 2.0, Wiki, knowledge sharing, knowledge management, collaborative technologies



# 1 Introduction

Sharing knowledge is one of the key processes that allow organisations to create value. In choosing their approach to the implementation of knowledge sharing strategies many organisations have been heavily influenced by the growing popularity of Enterprise Social Software – also known as Enterprise 2.0 (McAfee 2006). Jeed (2008) argues that using Web 2.0 tools or social software inside organisations improves collaboration, knowledge sharing and innovation.

Additionally, a review of the literature shows that it contains many more reports of successful Enterprise 2.0 initiatives than of failed ones. To mention just one of these technologies, successful knowledge management initiatives based on Wikis have been reported in a wide range of fields including software development, project management, technical support, sales and marketing, and research and development (Kussmaul and Jack 2008: 152). Thus, organisations are at risk of assuming that implementing one or more of those tools will be a silver bullet to overcome the limitations of their intra-organisational knowledge sharing processes.

This paper reports a case study where a Wiki was implemented as a knowledge sharing tool among a group of researchers working for a single organisation. The study is based on the findings of previous research, which indicated that members of the organisation had a wide range of areas of expertise and the willingness to share it. As face to face interaction was not possible on a regular basis, most of the researchers suggested they would share their knowledge using a technology such as a Wiki if it were available.

However, although the Wiki was initially successful it became clear, several months after its implementation, that it was not attracting the continued level of use that was originally hoped for. Apart from the occasional episode where use peaked dramatically due to extraneous factors (such as a competition or social event being advertised on the Wiki) the overall trend was towards a very low level of use. The research documented in this paper explores the reasons for the failure of this implementation.

The research concludes that more work needs to be done to understand the strengths and weaknesses of Enterprise 2.0 technologies such as Wikis so that they can be used appropriately.

The paper is structured as follows: section 2 provides an overview of the existing Enterprise 2.0 technologies in use as mechanisms for encouraging knowledge sharing between organisational participants. The rationale behind the selection of Mediawiki as the technology used to improve knowledge sharing within the organisation in this case study is detailed in section 3. Section 4 outlines the features included in the Wiki that was implemented. Section 5 reports the analysis of the usage statistics for the Wiki. The main reasons behind the lack of success of the Wiki as a knowledge transfer strategy in this case are explored in section 6, highlighting that these may also apply to other organisations.

# 2 Enterprise social software and intra-organisational knowledge transfer

AIIM (2009) defines Enterprise 2.0 as “a system of web-based technologies that provide rapid and agile collaboration, information sharing, emergence and integration capabilities in the extended enterprise”. Organisations

aiming at the implementation of strategies to elicit knowledge from experts and transfer it to practitioners using Enterprise 2.0 tools have a wide range of technologies at their disposal.

Enterprise 2.0 technologies can be grouped into two categories – those that support collaboration and those that allow the posting of information in a common space for other people to access it.

According to AIIM (2009) and Forrester Research (Yehuda et al. 2008), Enterprise 2.0 tools that support collaboration include:

- Wikis. Software that allows users to freely create and edit Web content using a Web browser. Given their relevance in the context of this research, Wikis will be referred to in more detail later in this and other sections.
- Social Bookmarking: A form of tagging done by individuals to communicate context and categorisation of information and knowledge resources that may not have been seen through a more formalized taxonomy-driven viewpoint.
- These principles have been implemented in a large number of knowledge sharing environments with a significant degree of success, according to Mika (2005).
- Collaborative Filtering: A method of determining the relevance of information and knowledge resources according to the actions of individuals.
- These systems often record the browse and search behaviours of users in order to assess the “value” of resources (Hahn and Subramani 2000).
- Social Networking: Dynamic “relationship” building, person-to-person connections – not necessarily "community" or collaboration.
- Facebook and LinkedIn are prime examples of consumer-facing Social Networking sites, now being implemented at intra-organisational level in many organisations.

## 2.1 Wikis: Success and failures

Enterprise 2.0 tools supporting a common information space include Blogs, RSS, and Wikis. Although the first two of these have also been considered successful Enterprise 2.0 technologies, they are less relevant to knowledge

elicitation and transfer. However, this is not the case for Wikis. Wikis are particularly relevant as they allow contributors not only to post information into a public space but also collaborate in building a knowledge base by editing content that have been posted by others in the Wiki platform. As a result, Wikis have been exploited by many organisations for knowledge sharing.

Particularly successful has been the case of Sun Microsystems. Brown (2008) argues that – along with an extensive program for the training of staff in the use of the tool, Wikis have been developed and used as project management tools and community builders at Sun Microsystems, resulting in a significant step towards the implementation of further Enterprise 2.0 in that organisation.

Other successful initiatives have been recently reported. Wikis have been developed to support knowledge sharing in a wide range of projects not only within the scope of knowledge management (Selhorst, 2008) but also in related areas such as teaching and training (Raman et al., 2005) and the development of social networking strategies (Hustad and Teigland, 2008).. These have been encouraged by the result of studies such as that of Majchrzak et al. (2006) which, taking into account issues such as length of existence, number of users and frequency of accesses, concluded that corporate Wikis are sustainable. However, the literature shows almost no sign of negative experiences concerning the implementation of Wikis in organisations.

Nevertheless there is increasing concern regarding the importance of formulating a coherent foundational theory for the use of Wikis in organisations (Majchrzak, 2009).

# 3 The need for a Wiki as a knowledge sharing technology in a research environment

This case study was carried out in a research-oriented organisation among a group of researchers who were mainly working in areas such as engineering, applied science and management. The investigators undertook a study to see how these researchers exchanged knowledge and expertise and whether it could be improved.

There are in the organisation approximately 35 full-time researchers, whilst another 150 are part of the organisation on a part-time basis or for a fixed period of time, usually one year. The organisation is structured in departments that, although geographically dispersed, conduct research on related areas. As concluded by Garcia-Perez and Mitra (2008), interviews with staff revealed a wide spectrum of knowledge available in the community. However, work was possibly being duplicated and researchers were not supporting each other as they believed they would if they were more aware of each others' work. There was awareness of this problem at all levels within the organisation. However, because there was very little interaction among researchers on a regular basis, knowledge sharing was not taking place effectively.

There was a tacit agreement among all researchers about the need for more knowledge sharing, and most of them recommended the use of information and communication technologies as an appropriate way to address the problem given the organisational context. In particular, they mentioned the need for a Wiki and agreed to share their full profiles and relevant knowledge if such a technology was put in place.

The research reported here complements work conducted in 2007 with the aim of facilitating knowledge elicitation and transfer within the organisation using a Wiki. Some members of the community – including one of the authors of this paper, carried out the design and implementation of a Wiki as a collaborative, knowledge sharing tool within the organisation. The following sections describe the implementation of the Wiki and its adoption by the research community.



# 4 Design and Implementation of the Wiki

With the aim of enabling the community of researchers to share their knowledge two researchers (including one of the authors of this paper) agreed to design and implement a Wiki. In doing this they were following the recommendations of the interviewees, who had recently suggested that they would use the Wiki to share and reuse knowledge. The organisation's IT department agreed to provide the necessary server space, accounts and so forth that would be needed to support the Wiki. The community, lead by a development team, would only need to develop and maintain the Wiki.

## 4.1 Selection of features

Initial discussions led to a basic design of the structure of the Wiki, the features that it would include and the information and knowledge to be offered. These facilities were decided on as a result of the following:

- Needs expressed by members of the community during interviews, which led to the selection and implementation of the following facilities:
- People's profiles including a space for each researcher to publish their main areas of expertise, previous work experience and contact details. Most researchers had said they would be willing to share this information
- Group profiles, describing existing groups and communities of interest and practice within the organisation and their areas of research
- A 'How to…' section that everyone would contribute to with solutions to all sorts of known problems
- A bibliography space, where relevant documentation and web links would be shared
- Standard features of other Wikis implemented by known organisations or available on the Internet. These included:
- An area for researchers to do collaborative work, mostly developing documentation about the organisation and their research
- A joint calendar where all activities of common interest would be included
- A categorisation of pages and tagging features to facilitate search and retrieval of relevant information within the Wiki
- The investigators' views of what could potentially encourage researchers to exchange information and knowledge resources. Among these were:
- A message board to support the emergence of communities of interest within the organisation
- Chat facilities to make the interaction between researchers even easier
- A space used to discuss and organise social activities

Two of the researchers worked on the development of the first version of the Wiki from the beginning of 2007. This work involved the installation of Mediawiki, design of the interface and implementation of the above features. From April 2007, a larger team dedicated a significant amount of time to create as many pages as possible. By July 2007 the Wiki had begun to be known to the community. It had more than 100 pages with information covering all areas that had been mentioned by the community of researchers. Also, most of the features described above had been fully implemented, and these were supported by an interface that was designed to be attractive.

The Wiki was formally launched to the community in August 2007 with an email to all full-time researchers as the initial target of the initiative. The email not only included a description of the Wiki but also an invitation to a launch meeting a week later. More than 30 researchers attended the meeting, including some that had recently joined the organisation. Judging from the discussion that took place, the Wiki was embraced by the community as the tool needed by the organisation. Also it was confirmed that the community was still willing to use the technology as their main knowledge sharing mechanism. However, its usage over the following 18 months was not as predicted. The following section describes what followed the launch of the Wiki.

# 5 Use of the Wiki

In order to study and report the use of the Wiki a log file of accesses made was obtained from the IT department covering the period between 18 July 2007 (weeks before it was launched) and 14 January 2009. A number of different reports from several viewpoints were created and analysed using *Deep Log Analyzer*, a technology developed by Deep Software Inc., member of the Web Analytics Association. In a search for a better view of the diagrams generated by *Deep Log Analyzer*, some of these were exported to Microsoft Excel. The diagram in Figure 1 shows the fluctuations in the number of visits to the Wiki over the whole period:

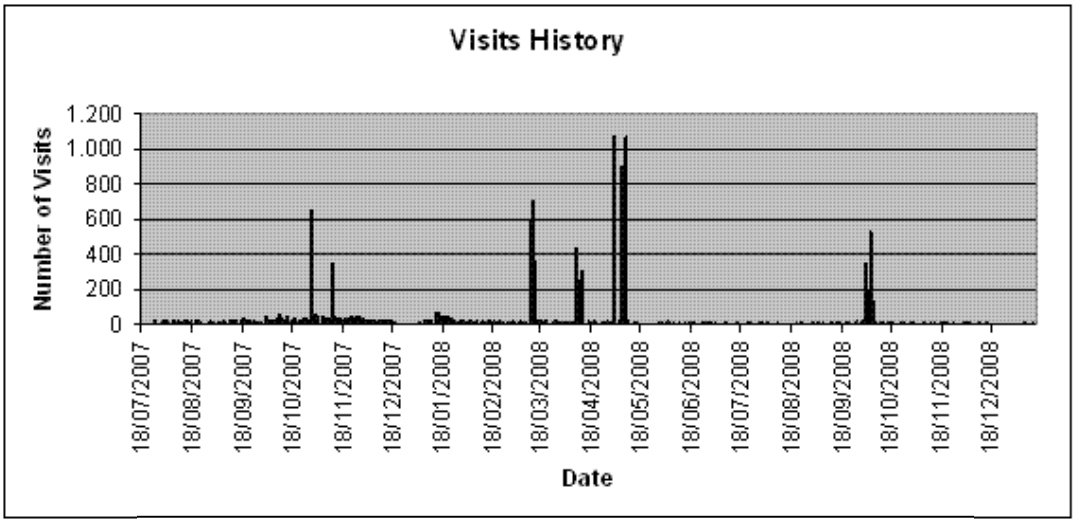


**Figure 1: Visits per day during the whole period**

In order to have a clearer view of the number of visits, an additional graph has been created by truncating the number of visits that exceeded the number of 50 per day. The resulting graph is shown in figure 2.

The total number of visits to the Wiki was over 15,000 in the period of 547 days being analysed. There were 200 visitors, considering as a visitor an IP address where a visit originates. Therefore, up to 200 people accessed the Wiki within the organisation or externally through a connection to its Virtual Private Network. These figures exceeded the initial expectations of the developers.

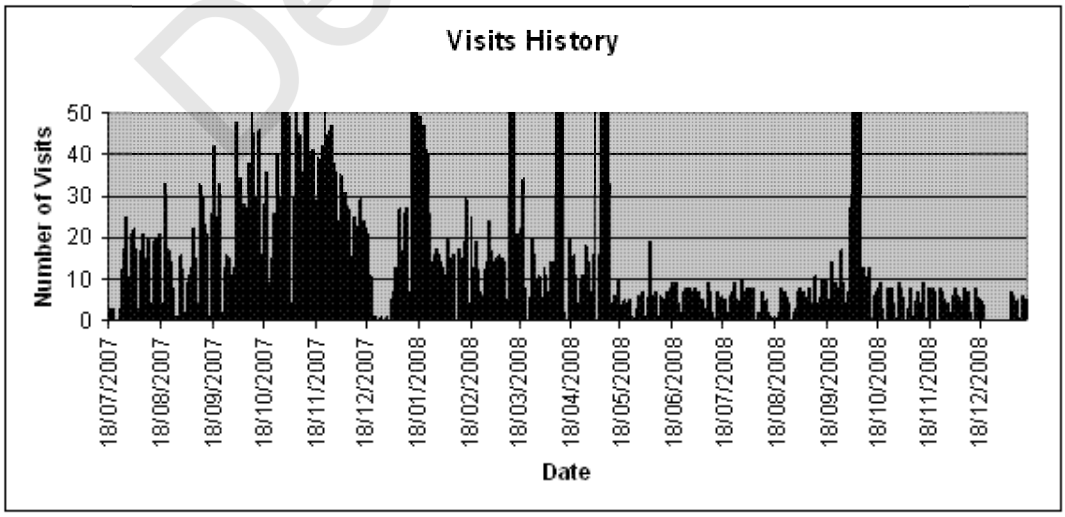


**Figure 2: Visits per day during the whole period – truncated at the level of 50 visits**

During its first month on the organisational domain (8 August to 8 September 2007) the Wiki had 362 visits coming from 46 visitors, as shown in the following diagrams:

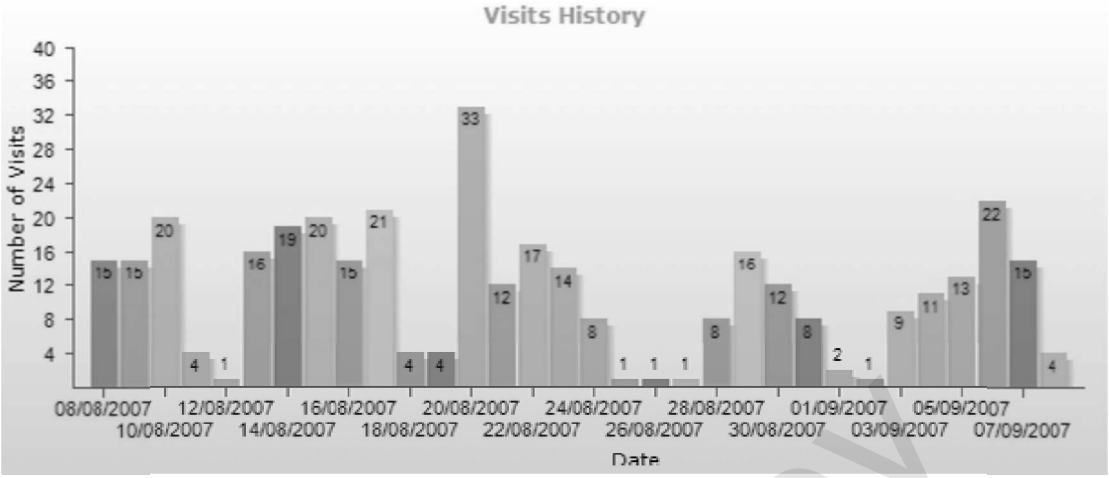


**Figure 3: Number of visits to the Wiki per day during the first month after launch**

The number of visits to the Wiki steadily grew between its launch in August 2007 and the beginning of 2008, with the expected low in its usage during the Christmas period in 2007.

However, in spite of its success during early stages, the analysis of visits and visitors over the whole period revealed several significant features, in particular:

- More than two thirds of the total number of visits originated from the same computer, which suggests that the visitor was either an administrator or a single user
- More than 13,000 of the total number of visits lasted less than 2 minutes.

Although these two issues were not noticeable during its first month (see Figures 3 and 4), they became areas of growing concern for the development team as time progressed. Additionally, only 14 of its users added some information to be shared with colleagues through their profiles.

In February 2008 the use of the Wiki began to decline. It became a pattern that most visits came from the same visitor. The Wiki never received more

than 50 visits per week, except for six specific dates that can be seen from Figure 1 and can be explained as follows:

- Five of the peaks relate to the promotion and organisation of social activities which were advertised only in the Wiki
- The sixth and highest peak took place in May 2008 and is associated with an attempt to stimulate use of the Wiki by running a competition as a recovery strategy.

## 5.1 Looking for the reasons for the decline in use

A survey was conducted in February 2008 to explore the reasons for the low usage of the Wiki. With that aim, a questionnaire was designed, including three main questions. These were:

- Are you aware of the Wiki and the resources it contains?
- Have you ever used the Wiki?
- If so, was it a positive experience?
- Are you using the Wiki at present?
- Why?
- How could the Wiki be improved?

The questionnaire could be applied either face to face or using electronic means. The use of the Intranet or the Wiki itself would have introduced bias in the results - answers would be likely to come from those researchers who visited the Wiki on a regular basis. Therefore, one of the authors carried out interviews with members of the research community. A semi-structured interview would provide a richer insight following the topics outlined in the questionnaire above.

Eight researchers randomly selected from the community were interviewed. The key findings are outlined below.

Awareness of the Wiki:

- All interviewees were aware of the fact that a Wiki had been developed and deployed
- However, three of them accepted that they were not aware of the information the Wiki contained
- Three of the interviewees had contributed to the Wiki with at least one article

Use of the Wiki

- All but one interviewee had visited the Wiki at least once
- All of them described the Wiki as a very useful resource – including one person who had never visited the Wiki, but who mentioned that she had heard about it
- None of them had visited the Wiki in the month before the interview took place

Although no suggestions for improvements were made, issues relating to the lack of use included, in order:

- Time: Lack of time, being very busy with own work. Spending time in reading / contributing to the Wiki was seen as a lack of focus in their own work
- Information: Feeling that the Wiki did not have much to offer to those that had been in the organisation for more than 2 years. They had "survived without it", they argued. The information on the Wiki did not motivate them either to come back after a visit or to contribute new information
- Accessibility: Not having an easy, direct link to the Wiki on their computer desktop or the home page of the intranet hindered its usage

## 5.2 A recovery strategy: Rewarding contributions

Some of the issues which were uncovered by the survey, such as respondents' concern about time, could not be directly addressed by the development team. However, having funds available to improve the Wiki, a competition was designed to encourage new contributions in the hope that these would attract further users. Ideally, such contributions would also add value to the information already in the Wiki, and usage would increase. An iPod was offered by the organisation to the person who made the largest number of contributions over a three month period ending the 9 May 2008.

The motivation behind this competition was twofold:

- To encourage people to visit the Wiki in the hope that increased familiarity with the Wiki would in turn lead to greater use.

- To stimulate the production of new Wiki entries in the hope that this would help to produce a critical mass of relevant material and information to establish the Wiki as a useful resource for the researchers.

This strategy had a significant effect in the number of visits to the Wiki, taking it to its highest level (1,072 visits in one day), particularly towards the end of the period of the competition. However, immediately after the end of the competition the use of the Wiki fell sharply to the same levels that it was before, i.e. 40 visits per month mostly from one visitor, as seen in the diagram below:

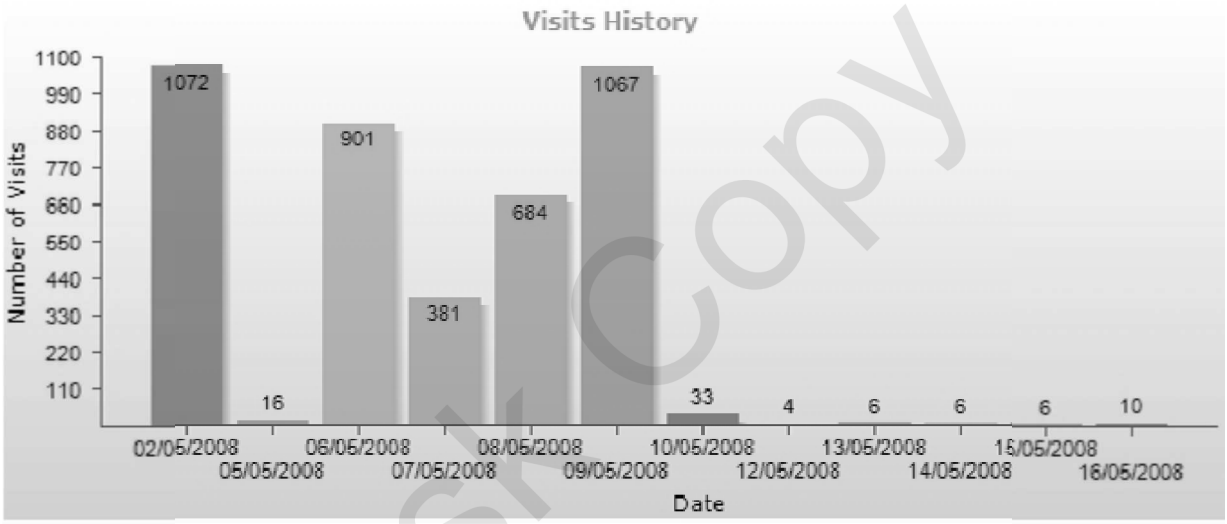


**Figure 5: Number of visits per day before and after the end of the iPod competition (9 May 2008)**

Although statistics do not allow an evaluation of the quality of contributions made during the period when the iPod competition was run, a review of the Wiki did not show a significant difference in the nature of resources. Visits to the wiki did not always result in new pages added, and the new contents were heavily concentrated in the section related to social activities and dominated by photographs.

The iPod competition failed to provide the expected results as a recovery strategy. The statistics during the following months (May 2008 until January 2009) show that the number of visits fell significantly over time. The following diagrams show the statistics for the last month being analysed.


**Figure 6: Number of visits per day during the last month of the analysis**

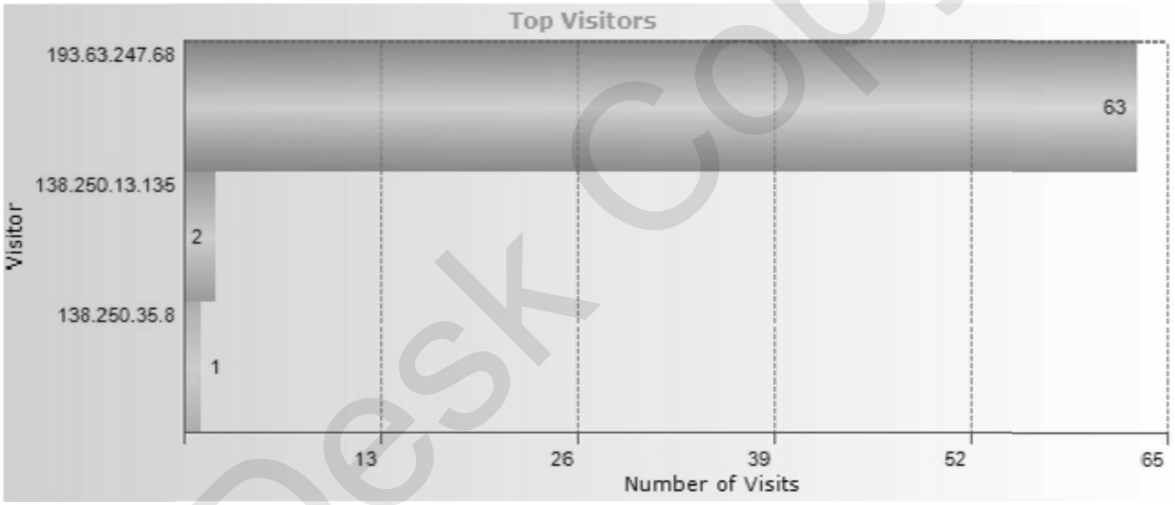


**Figure 7: Number of visitors during the last month analysed. Note that 63 out of the 66 visits come from the same computer**

The statistics in Figures 6 and 7 show that by the end of the period being analysed the use of the Wiki declined to sporadic visits from a small number of visitors. Again one particular visitor accounted for almost all the visits.

The initiative to stimulate use of the Wiki had thus not been successful. It is clear that in the short term the competition did result in a greatly increased number of visits and also encouraged a number of users to add a significant amount of further material. The fact that use declined sharply as

soon as the competition was over suggests that there were other problems rather than lack of awareness of what it offered or researchers not having posted information to the Wiki.

# 6 Discussion and conclusions

Obviously quantitative data on the number and duration of visits cannot be used directly to assess the value of the Wiki as a knowledge sharing mechanism. However consideration of the statistics does suggest that the Wiki was not achieving its purpose. An example of this is the fact that 91 visitors (46% of the total number of visitors) only visited the Wiki once, and 85% of the total number of visits only lasted less than 2 minutes. Although the number and duration of the visits does not necessarily reveal the nature of such visits, it is unlikely that someone who visited the Wiki once or navigated away within 2 minutes had taken part in successful knowledge exchange. Another example is the fact that more than two thirds of the total number of visits came from a single user (resulting in an average of 4 visits per day for the rest of the community), which indicates that the Wiki was not widely used.

This study confirmed the importance of a number of known issues in relation to the use of Wikis as knowledge sharing tools. These include:

- Time required to access/contribute to the body of information and knowledge embedded in the technology
- Critical mass: the balance visitors-contributors in some of the most successful Wikis, such as Wikipedia, is in a ratio of 1000 to 1 (Wikipedia 2009). Not all organisations can rely on such a low percentage of contributors to develop a technology that brings into the organisation tangible benefits in terms of knowledge sharing

However, the case study also found issues related to Enterprise 2.0 tools in general and Wikis in particular that, although relevant, had not been widely covered by the literature on the topic. These included:

- The validity of the technology as 'the right tool':
- In certain conditions an Enterprise 2.0 technology seems to be an appropriate solution to the sharing of knowledge within the organisation. This case study was representative of this situation: a rela-

tively small organisation formed by geographically distributed teams working on projects that were related in nature. Employees were very familiar with technologies and would be ready to adopt an organisation-wide strategy. All those who were involved with the design and implementation of the Wiki, as well as those users who had been interviewed prior to its implementation believed it would be successful. However, in practice the technology did not have the expected impact as a knowledge management strategy because employees did not use it as it was predicted.

- How the supposed 'willingness to share knowledge' is reflected in practice.
- The implementation of a Wiki should not be based solely upon employees' claimed willingness to share knowledge. Even if a study suggests that employees will share knowledge using a Wiki it does not necessarily mean that they will do so. Even at basic levels such as contact details or areas of expertise, there are several issues affecting the number and nature of contributions to the knowledge base. These may include barriers that potential users and developers of the technology did not consider before the design and implementation stages.
- The importance of carefully planned strategies to design, launch and keep the technology working, that consider issues such as communication and group dynamics.
- A Wiki can be seen as a framework to be used by communities of interest that may emerge and dissolve over time. Trying to force continuity of usage by a particular community that has changed its nature may have negative long term effects. Any recovery strategy should seek to encourage contribution and use of valuable resources.

Enterprise 2.0 technologies such as Wikis may provide the expected results in the elicitation and sharing of knowledge in certain conditions. However, they do not always work as expected. There are important challenges associated to the knowledge elicitation and transfer process.

The work reported in this paper suggests that there are reasons to be cautious in the implementation of Enterprise 2.0 tools. Even when the knowledge management team is working on fertile ground (e.g. users recommend the implementation of the technology and claim that it would be

widely used), organisations cannot assume that implementing something like a Wiki is a solution to the problem of knowledge elicitation and sharing.

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## References

AIIM – Association for Information and Image Management (2009), "What is Enterprise 2.0 (E2.0)?" [online], http://www.aiim.org/What-is-Enterprise-2.0-E2.0.aspx

Brown, S. (2008), "Wikis at Sun Microsystems: The Ongoing Evolution. *Find, Use, Manage and Share Information (FUMSI)"*, [online], http://web.fumsi.com/go/article/share/3328

Davenport, T. H. and Prusak, L. (1998), *Working Knowledge*. Harvard Business School Press, Boston, Massachusetts

Deep Software. (2009), "Deep Log Analyzer: A Web Analytics Software", [online], http://www.deep-software.com/?ref=dla

Garcia-Perez, A. and Mitra, A. (2008), "Tacit Knowledge Elicitation and Measurement in Research Organisations: a Methodological Approach", *The Electronic Journal of Knowledge Management*. Volume 5 Issue 4, pp 373 – 386.

Hahn, J., and Subramani, M. R. (2000), "A Framework of Knowledge Management Systems: Issues and Challenges for Theory and Practice", *Proceedings of the 21st International Conference on Information Systems.* Brisbane, Australia. pp 302-312.

Hustad, E. and Teigland, R. (2008), "Implementing Social Networking Media and Web 2.0 in Multinationals: Implications for Knowledge Management", *Proceedings of the European Conference on Knowledge Management*. Southampton, UK. pp 323-331.

Jeed, M. (2008), "Can applying Web 2.0 to an organization make it faster, better? It's certainly making for more collaboration and knowledge sharing", *AIIM E-DOC Magazine*, January-February, [online], https://www.aiim.org/Infonomics/ArticleView.aspx?ID=34208

Kussmaul, C. and Jack, R. (2008), "Wikis for knowledge management: Business cases, best practices, promises and pitfalls". *In*: Lytras, M. D., Damiani, E. and Ordonez de Pablos, P. (Eds). *Web 2.0: The Business Model*, Springer, US. pp 147 – 165.

Majchrzak, A., Wagner, C. and Yates, D. (2006), "Corporate wiki users: results of a survey", *International Symposium on Wikis (WikiSym 06)*. Odense, Denmark.

Majchrzak, A. (2009). Comment: Where is the theory in Wikis? *MIS Quarterly*, Vol. 33. No. 1. pp 18-20.

McAfee, A. P. (2006) "Enterprise 2.0: The Dawn of Emergent Collaboration", *MIT Sloan Management Review*. Vol. 47. No. 3. pp 21–28.

Mika, P. (2005) "Ontologies are us: A unified model of social networks and semantics", *Proceedings of the 4th International Semantic Web Conference (ISWC 2005),* Galway, Ireland, [online], http://www.cs.vu.nl/~pmika/research/papers/ISWC-folksonomy.pdf

Raman, M., Ryan, T. and Olfman, L. (2005) "Designing Knowledge Management Systems for Teaching and Learning with Wiki Technology", *Journal of Information Systems Education*. Vol.16. No. 3. pp 311–320.

Selhorst, K. (2008) "Putting 'Knowledge Management 2.0' Into Practice – The process of setting up a Wiki as a Knowledge Management tool in a Public Library", *Proceedings of the European Conference on Knowledge Management*. Southampton, UK. pp 807-816.

Wikipedia. (2009) "About Wikipedia", [online], http://en.wikipedia.org/wiki/Wikipedia:About

Yehuda, G., McNabb, K., Young, G.O., Burnes, S. and Reiss-Davis, Z. (2008) "Wikis and Social Networks are ready to deliver high value to your Enterprise", *Forrester TechRadar™ for I&KM Pros: Enterprise Web 2.0 for Collaboration*. Q4 2008.