

BIWiki – Using a Business Intelligence Wiki to form a Virtual Community of Practice for Portuguese Master's Students*

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Abstract: Web 2.0 software in general and wikis in particular have been receiving growing attention as they constitute new and powerful tools, capable of supporting information sharing, creation of knowledge and a wide range of collaborative processes and learning activities.

This paper introduces briefly some of the new opportunities made possible by Web 2.0 or the social Internet, focusing on those offered by the use of wikis as learning spaces. A wiki allows documents to be created, edited and shared on a group basis; it has a very easy and efficient markup language, using a simple Web browser. One of the most important characteristics of wiki technology is the ease with which pages are created and edited. The facility for wiki content to be edited by its users means that its pages and structure form a dynamic entity, in permanent evolution, where users can insert new ideas, supplement previously existing information and correct errors and typos in a document at any time, up to the agreed final version.

This paper explores wikis as a collaborative learning and knowledge-building space and its potential for supporting Virtual Communities of Practice (VCoPs).

In the academic years (2007/8 and 2008/9), students of the Business Intelligence module at the Master's programme of studies on Knowledge Management and Business Intelligence at Instituto Superior de Estatística e Gestão de Informação of the Universidade Nova de Lisboa, Portugal, have been actively involved in the creation of BIWiki – a wiki for Business Intelligence in the Portuguese language.

Based on usage patterns and feedback from students participating in this experience, some conclusions are drawn regarding the potential of this technology to support the emergence of VCoPs; some provisional suggestions will be made regarding the use of wikis to support information sharing, knowledge creation and transfer and collaborative learning in Higher Education.

Keywords: Wikis; Business Intelligence; Communities of Practice, Knowledge Creation; Knowledge Sharing; Knowledge Transfer Management.

1. Introduction

The so-called Web 2.0 software in general and wikis in particular have been the focus of growing interest; in some ways they are being considered as new and powerful tools capable of supporting a broad range of collaborative and informal learning processes.

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As there is not yet a generally accepted definition of what a wiki is, one can think of a Web site which allows its users to create, share and edit web pages, in a collaborative way. Undoubtedly, the most famous example is the Wikipedia, an online encyclopedia, whose development is based on the assumption that group knowledge is likely to be more comprehensive than that of a single person. Those who support it are simultaneously both users and creators. In this context, it was decided to adopt a wiki-type platform for the module on Business Intelligence in the Master's programme on Statistics and Information Management of ISEGI - Instituto Superior de Estatística e Gestão de Informação, of UNL - Universidade Nova de Lisboa. The intention was to assess the potential of a wiki in Higher Education, as a way to facilitate a collaborative writing process. In this case, those students attending the Business Intelligence module take responsibility for creating their own content; at the same time, they are learning and collaborating with colleagues to improve and add value to this information. This paper, presents a short introduction to Web 2.0 and wikis, the roles the latter can perform in the learning context and in the creation of Communities of Practice. In the final part, an exploratory case study is described which analyses a wiki being developed as a teaching and learning tool, to support the formation of a VCoP for Business Intelligence in the Portuguese language.

The term Web 2.0 refers to a second generation of web development and design that encourages creativity, information sharing and collaboration among users (Wikipedia 2009). This concept gave rise to the development of communities based on the Web and the evolution of supplied services, such as sites for social networking, video-sharing, wikis, blogs and folksonomy. Although Web 2.0 suggests a new version of the World Wide Web, there was not an evolution in technical specifications but only alterations in the way in which: i) the software is developed and ii) final users utilize the Web. Some technology specialists argue that the term does not make sense, as Web 2.0 just takes advantage of the technological developments and components that already exist, being just another buzzword (Brodkin 2007).

However, there are numerous definitions of this new concept, presented by those who defend the existence of Web 2.0, also known as the Social Web; these definitions share a common point. Users were merely information receivers, in the past; now they perform a more active role, acting as information creators, suppliers and receivers. In this environment, their opinions and points of view can now be presented and shared on a global scale.

2. Wikis

As stated above, one of the most significant innovations of Web 2.0 is the wiki. The terms wiki (pronounced /uíqui/ or /víqui/) and wikiwiki are both used to indicate a specific type of document collection in hypertext and wiki is also the name of the collaborative software used to create them (Wikipedia 2008). The term "wiki wiki" in Hawaiian dialect means "super-fast".

Historically, the first wiki – the *Portland Pattern Repository* – was created in 1995, by Ward Cunningham, to document and collaboratively manage information related with the updating of software design standards. It still exists today, as the *WikiWikiWeb*, and is an important resource for the wiki community. Probably, the best known wiki is the Wikipedia, a multilingual encyclopedia available for online use. By the end of February 2009, this site had more than 2 731 000 articles in the English language and around 457 000 in Portuguese (Wikipedia 2009).

A wiki allows documents to be created, edited and shared on a group basis; it has a very easy and efficient markup language, using a simple Web browser. One of the

most important characteristics of wiki technology is the ease with which pages are created and edited. Wikis can allow for public or private access; private access limits the wiki's use to a specific group.

The facility for wiki content to be edited by its users means that its pages and structure form a dynamic entity, in permanent evolution, where users can insert new ideas, supplement previously existing information and correct errors and typos in a document at any time, up to the agreed final version. As a consequence, public wikis may suffer from inaccurate entries, vandalism or outdated information. The lack of clear and complete information regarding author and version is still one of the most serious problems currently found in most of the wiki-based encyclopedias.

Most wiki software includes a function which allows for any vandalism to be repaired, by enabling the reversion of pages to their previous states. Furthermore, any material published without the author's permission can always be erased.

Author anonymity is an important issue for Higher Education Institutions, where student assessment and evaluation continues to be based on individual effort. (Fountain 2005).

The openness of wikis gave rise to the term "Darwikinism" (Wikipedia 2009), which describes the "Darwinist social process" to which wiki pages are subject. Basically, due to the openness and speed with which pages can be edited, they go through an evolutionary process very similar to Darwinian Natural Selection. While this openness may facilitate vandalism and the publication of incorrect or even false information, the same openness also makes possible correction and improved accuracy of wiki pages.

In fact, a recent research compared Wikipedia entries with those of the *Encyclopedia Britannica* online; in both online information sources, similar amounts of errors were found, which indicates that the quality of entries in Wikipedia is as least as good as that for the *Encyclopedia Britannica* (Giles 2005).

A wiki can be useful in several scenarios: content management systems; discussion fora and other forms of support to collaborative activities (Fuchs-Kittowski and Köhler 2002). By using a wiki, recently acquired knowledge can be easily integrated with the user's existing knowledge base, provided that it is already in wiki format. According to the above authors, the specific advantage of a wiki approach, when compared with other collaborative forms of knowledge generation and sharing, resides in its focus both on the communication process and product, as it facilitates simultaneously debate and collaborative work, leading to a joint outcome.

3. Wikis in Education

According to Deitering and Bridgewater (2007), wikis offer numerous possibilities for collaborative and educational knowledge sharing processes. In fact, a wiki can be used as a resource to obtain information and to transfer knowledge, as well as being a virtual collaboration forum. For example, students can debate or share information while developing coursework; the wikis even allow them to learn from each other (Boulos et al. 2006). These authors argue that wikis (and on a smaller scale blogs) have the capacity to involve learners in the development of their knowledge, in a pro-active way.

The main challenge of wikis, in pedagogical terms, is in exercising control (Fountain 2005). Wikis are more effective when students have significant autonomy over the process.

Wikis are increasingly seen as the ideal tool for collaborative work between teachers and students. For example, students can use a wiki to collaborate in the preparation

of a group report, for data collection or to share their research results, while teachers can develop a course structure and contents using a wiki, and subsequently make this the Website for the same course.

Schwartz et al., (2004) point out that it is difficult to estimate the number of wikis used by universities, or the wide range of its applications. Research on wiki use in 24 universities located in USA, Canada, Germany, New Zealand, Switzerland and United Kingdom concluded that they were used as an e-learning tool, enabling teachers to create interactive activities for their students, to present information on resources, pointers, tasks to be performed and to answer Frequently Asked Questions (FAQs). In turn, teachers can also monitor the debates taking place within the wiki, in order to identify problematic areas. Very often wikis, in higher education institutions, are used as Knowledge Repositories.

According to Shwartz et al. (2004), wikis can also exhibit some of the elements which Wenger (2001) considered as fundamental for the creation of successful Communities of Practice. For example, they provide virtual platforms, ease of participation, focus and relevant content; they also promote shared identity, personal and community interaction, democratic participation and evolution of expertise and knowledge. Many wikis have a central group or individual assuming the role of moderator of the community. In their application to education, wikis are a forum which enables students to discuss themes and obtain information of relevance to the course, for extra-curricular activities and establish partnerships in their areas of interest. The creation of personal pages and discussion areas helps to humanise the learning experience and promote social interaction between and among students.

The following wiki's characteristics are particularly relevant, from a pedagogical point of view (Fountain 2005). They:

- Maximize the interactivity;
- Enable the development of democratic relationships;
- Function in real time;
- Work on a text based technology;
- Facilitate collaborative document production, i.e. distributed authorship;
- Compile an assessment of what has been written;
- Promote negotiation;
- Enable the collaborative edition of documents or open editing;
- Enable an individual author to publish his/her own texts;
- Enable intensive and potentially durable public feedback;
- Are based on voluntary collaboration;
- Enable complete anonymity.

Wiki's popularity attracted the attention of a wide range of educators, who believe that they can facilitate communication, collaborative search construction and sharing of knowledge, all activities which are at the heart of the educational process (Reinhold 2006).

Among possible wiki applications in education (Duffy and Bruns 2006) list the following:

- in development of research projects, where the wiki functions as a documentation repository;
- for collaborative and annotated creation, where students can add summaries of their reflections on recommended readings;
- in distance learning environments, where the teacher publishes resources and students are able to edit and comment on them;

- as knowledge bases for teachers, enabling them to share reflections and thinking on pedagogical practices;
- in concept mapping, as wikis are very useful for brainstorming the creation of another wiki on a separate theme and the development of a network of relevant, interconnected resources;
- as support for presentations, in place of the use of conventional software (such as Powerpoint), enabling students to review and comment on the presentation, even while it is being presented;
- for co-authorship of documents, sending a document file to each member of the group in turn, where it is edited to produce an integrated, agreed version;
- in course evaluation.

Finally, it is pointed out that wiki use in education is still a recent development; the formal research literature on this issue is still rather limited (Fountain 2005, Grant 2006, Boulos et al. 2006, Parker and Chao 2007). However, one can take advantage of the research on Communities of Practice as this is also very relevant to the wiki communities.

4. Virtual Communities of Practice

The concept of a CoP first appeared in 1991, as proposed by Lave and Wenger (Lave and Wenger 1991). It soon attracted the attention of those interested in knowledge sharing, knowledge transfer management and organizational learning. CoPs emerge as informal collaborative learning spaces where the alchemy of different knowledge inputs of its members, from the common work practices they perform in their daily activities; they evolve over time, creating new knowledge from shared experiences.

In 2001, Wenger et al. proposed the following CoP definition “Communities of practice are self-organizing, informal groups whose members regularly share knowledge and learn from each other”.

This definition is important because it highlights two of the main characteristics of a CoP:

- the coordinating force stems from shared work practices,
- its driving force is learning.

Amin and Roberts (2008), based on a literature review, highlighted that the language of the CoP's is currently being stretched to explain knowledge generation and learning across a variety of working environments, including different organizational and spatial settings. They even go on to point out that the use of the term became imprecise and that the designation Communities of Practice is used at present as an umbrella term which aims to capture the generic forms of situated learning through negotiation of meaning among members of a CoP. The latest developments in ICT, including the growing number of social software applications, such as wikis, made available new technological options to promote knowledge sharing and potentially enabled the emergence of the so called Virtual Communities of Practice (VCoPs). In the case presented in the following paragraph, the students form the members of the VCoP; their unifying task is to develop, build and maintain a Business Intelligence resource on a wiki platform; their reward is recognition, as measured by assessment. The aim is to create a Web site which makes conveniently available a one-stop Business Intelligence Resource while, at the same time, creating a collective resource that supports students in their efforts to develop shared understandings and engage in knowledge building and learning.

According to Parker and Chao (2007), collaborative learning, when it takes place in a CoP, is more efficient. Wikis, by providing a platform, where community members can share their knowledge within the group, should encourage the emergence of VCoPs.

5. BIWiki

This particular student Community of Practice was formed within the context of a Business Intelligence module; it takes advantage of the interest Master's students have for this theme. They realized that there were no reliable information resources on the subject, in the Portuguese language, on the Internet.

The launching of the BIWiki (<http://biwiki.iseqi.unl.pt>) took place with the underlying belief that this potential VCoP could grow organically, feeding an information system, developing it and promoting its long term sustainability. This would be achieved by a continuous value-adding approach, in parallel with the constant expansion of a collectively built and shared knowledge repository. It began in September 2007 with the provision of the online software platform, where the module lecturer, by way of introduction, presented a paragraph entitled, "What is a Wiki?" and a short "Note" with basic instructions on how to use a wiki.

The challenge issued to the students was to build from scratch the BIWiki, without any additional intervention from the lecturer. Each student could choose any theme, under the broad scope of Business Intelligence, bearing in mind that the content structure should be attractive and convenient to use.

In the first edition of the module Business Intelligence (2007/2008), 52 students were registered for this curricular unit but only 39 completed with success. In this first edition, student participation was on a voluntary basis; students were rewarded with an extra bonus, for their contribution to the wiki, which could amount to a maximum of 10% on their final mark. The actual amount was a function of the contribution(s) each one made to the BIWiki and was assessed by the lecturer. By the end of term, 46% of students, who completed the module on Business Intelligence with success, had contributed to the BIWiki.

The second in the series of Business Intelligence modules functioned in a slightly different way, as students started from a significant knowledge base. Their challenge was to refine the existing content and improve the structure of the wiki. Furthermore, there was an initial presentation of the BIWiki at the beginning of the Semester, where the ease of using a wiki was demonstrated and examples of how to create and edit pages were introduced.

In this second edition of the module, which ran in the first term of the subsequent academic year (2008/2009), there was a slight alteration in the student assessment procedure. BIWiki contribution became one of the obligatory components of the students' final assessment; each individual's contribution was given a 10% weighting on the final mark. This change contributed towards a significant increase in student participation; out of a total of 41 students completing successfully (in a total of 56 registered), 85% participated in BIWiki.

By the end of February 2009 (23rd February), there were 259 entries in the BIWiki database. These include the "Discussion pages", pages on the BIWiki Project, several draft pages and others that have not yet qualified for inclusion. In addition to these, there are 48 entries which can be classified as "legitimate" content. Also 164 other files have been loaded (images, schemes, etc)

In terms of usage statistics, since the beginning of the BIWiki, a total of 10,738 pages have been visited and 1,367 pages have been edited. This gives an average of 5.28 edits per page and 7.86 visits per page.

At the last check, there were 79 registered users; the ten most visited pages are shown in Figure 1 below:

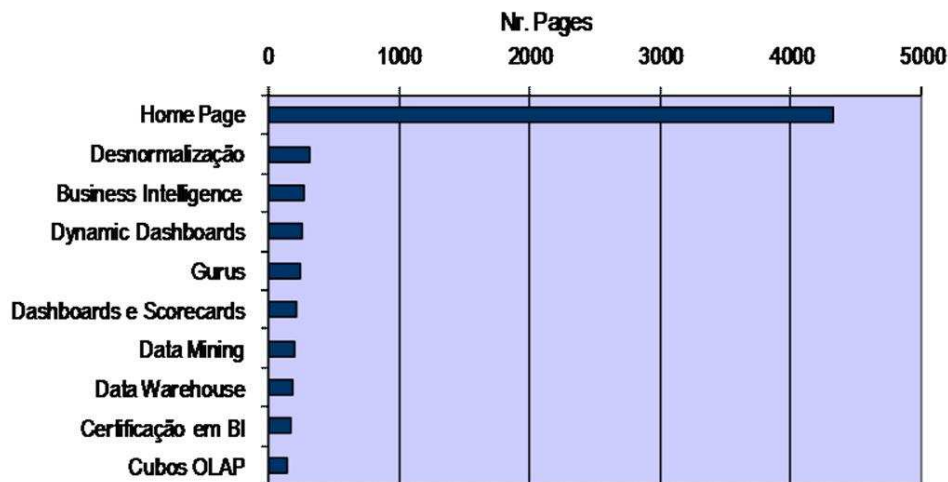


Figure 1: BIWiki most visited pages, on 23 February 2009

Analyzing BIWiki usage statistics, the most intensive use takes place towards the end of the term, as shown in Figure 2. This seems to agree with the model proposed by Ebner et al. (2008); it can be considered that the nurturing of a VCoP in Business Intelligence, in the Portuguese language, via a wiki is made more realistic, in terms of knowledge creation and sharing, because there is a recognition of contribution in the final mark, instead of being just a bonus as it was in the previous academic year.

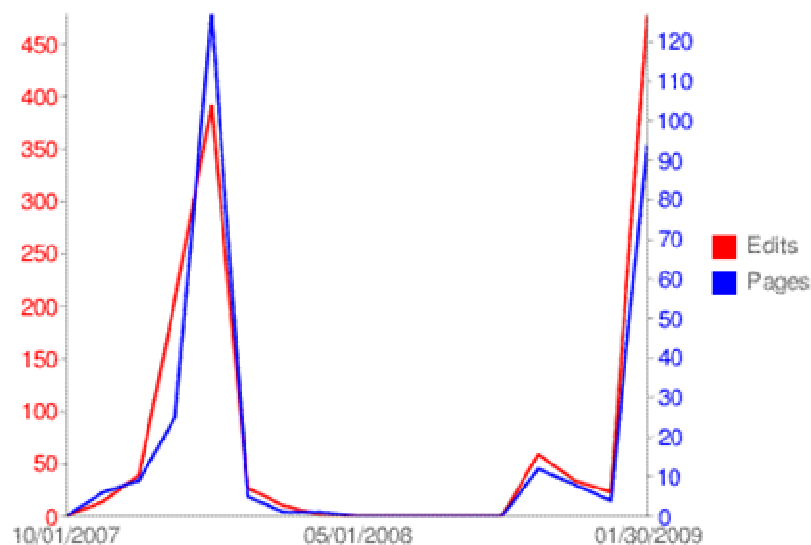


Figure 2: BIWiki usage statistics (1-Sep-2007 to 15-Feb-2009)

Wikipedia has a growth driven by only 2,5% of its users (Ebner et al. 2008). Extrapolating this to our BIWiki means that there should only be two users contributing effectively to the wiki. This has been confirmed; in both editions of the

curricular unit Business Intelligence there was one student who made the major contribution to the running of the wiki.

In the first edition of this curricular unit, the most dynamic student made 271 creations/edits of pages from 25th November 2007 till 9th of March 2008; that is he extended his contribution further than the module conclusion, which occurred in the first week of 2008.

In the second edition, which ended in the first week of February 2009, there was another student who emailed his intention to carry on his collaboration in the BiWiki:

"I wish to ask your permission to carry on contributing to the BiWiki even after finalizing (with success, I hope) the Business Intelligence module, continuing to provide new content for it, as I enjoyed this first experience. I believe I can help to develop significantly this wiki over time. I also would like to convey to you my thanks for making this initiative available to all Business Intelligence module students because, like me, I am sure many others found this experience very enriching and I am certain it will help us to contribute to this and other wikis"

Despite several references and a general belief in its user-friendly nature, some students reported difficulties in BiWiki use. The main ones are associated with image insertion and in page linking, with several "orphan pages" occurring.

In the second edition of the module Business Intelligence, the focus of students' contribution to BiWiki was more directed towards refinement of existing content and attempts to improve its structure. There was a need to organise the pages so that the knowledge available was more logically presented. Some of the contributors did not accept that some content was made available on the opening page while other material would require two or three clicks to be reached:

Student x: *"In my opinion the grouping of subjects in BiWiki should be done according to the various areas of BI and not as it is done at present, because I cannot understand the criteria. It looks strange to me that the link to "Enterprises" is on the main page" while "Data Warehouse" is found in "other themes"*.

Student y: *"I also reorganized the themes of interest related with Data Mining (my theme) under "Data Mining" and created a theme named "Other themes" where I put those themes that were not yet linked". I was also careful in copying the links. It seems to me that everyone should put his/her theme within a general theme, as in the case of Data Mining"*.

Situations like these required the first intervention of the wiki moderator, the curricular module lecturer, to point out the importance of the collective and participatory knowledge generated, through which value is added to knowledge created by others. The moderator maintained that a value hierarchy should not be imposed on content; its value being independent of its location in the wiki.

6. Interim Remarks

It is considered that the results obtained with this research in progress are positive, both in terms of content and the numbers of students involved. It is believed that the knowledge generated by the BiWiki is of value not only for the community involved in its creation but also for all those interested in the subject, including the general public, as there is no other source in the Portuguese language which addresses Business Intelligence.

As a result of the assessment of BiWiki functionality, over the two editions of the curricular unit of Business Intelligence, it is evident that there is a need for stronger intervention from the community moderator (module lecturer) in terms of the structuring of the content created. Eventually, this moderating activity could be

performed by a student or group of students within the community, recognised by colleagues as having the expertise and experience to be impartial. This is in line with CoP literature on the roles of experts.

It is evident that some students also see the BIWiki as a valuable study resource and not just as one assessment component of this particular curricular module, although this has not yet been fully exploited.

Future research will be carried out in the form of a structured survey, involving the students taking the module over the next academic year. This survey will perform a deeper and more quantitative analysis of the results achieved with BIWiki, as well as identifying constraints and bottlenecks to be corrected in future Business Intelligence courses. Our aim is to promote the sustainable and participative growth of a Portuguese speaking Business Intelligence wiki.

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