New educational approach based on the use of wiki platforms in university environments

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Abstract— Wikis have become increasingly popular both in corporate and educational environments due to the new ways of working collaboratively that they offer, including new ways to improve the learning process of students and employees. Leading universities worldwide have started implementing their own wikis and applying them to different subjects with success, which made more universities follow their example, to the point where nowadays we can find wikis (some of them still in development) in almost all major universities in the world. Nevertheless, not all of the benefits of wikis in multidisciplinary university environments are always obtained; on the contrary many students and teachers do not use it to its full potential. For this reason, and in pursue of a greater understanding of why this occurs and which methods could be implemented to achieve and reach the wikis full educational potential, in this article a particular initiative in a specific subject of the Computer Science degree is described. The results will contribute to further evaluate the viability and develop the potential of the implementation of wiki platforms in other subjects and degrees, in the hopes of reaching a fully functional multidisciplinary wiki.

Wikis, wiki platforms, wiki engines, EHEA, online learning, wikis in teaching, teaching methodologies.

I. INTRODUCTION

We have all come across at least once with the term wiki, but what is it exactly? What are the possibilities and benefits that it offers and, more importantly, how does it affect our lives, and the traditional educational approach? The term Wiki comes from a Hawaiian word that means "quick" and was designed with the premise of 'simplicity' and 'collaborative work' in mind. Therefore, the wiki platforms were designed to allow users to easily add contents to interlinked web pages, using an easy-to-use markup language, through a basic online editor.

Wiki platforms have revolutionized the way in which universities, educational centers and companies design and implement collaborative learning courses [14] and subjects, enabling new ways of solving problems and achieving goals in a fully cooperative manner by encouraging student's interaction; allowing them to easily share their personal experience and knowledge with other students and teachers from their own university, or any other university; or even with the rest of the world through online wiki portals accessible from the internet.

This new model has shifted towards a system where information is no longer centralized, instead it is in a distributed system, where the effort put in by the community reflects on itself, so that the more contributions the users make, the greater the benefits they receive [5]. This new model also presents a new method of transmitting knowledge, which takes place in a three-part process: first of all the contents are created, then these contents are reviewed by the community and finally, the contents are distributed through various channels.

The methodology from this model has already been applied in software production environments, mainly in 'Free Libre Open Source Software' projects, but also smaller projects from the 'Free Software Foundation' and others from 'Open Source Initiatives'. Soon after it started spreading out towards other areas where terms such as "*Open Source Intelligence*" [24] appeared, referring to systems designed to produce independent and neutral contents, completely decentralized and with inner quality control systems.

Perhaps the term that can describe the wiki platforms best is "Web 2.0" [18]; a term that has been subject to controversy, as the 2.0 can be mistaken for an upgrade of the web's protocols, while in fact it refers to the new collaborative approach taken by the web's applications and systems.

This new collaborative way encourages users not only to use the web's content and resources, but to interact with them as well, uploading their own contents and sharing their knowledge [21]. This revolutionary new role for the users makes up the core of Web 2.0, where every user is simultaneously an end user, an editor and a reviewer of information and knowledge. This requires, however, a change in the architecture of many systems, in order to allow the users proper interaction through the use of blogs, chats and, obviously, wiki portals.

This has had a great repercussion in society, especially in environments related with the management of knowledge and information such as schools, universities and learning centers [3]. This method and the many possibilities it offers, has also been highly encouraged by the appearance of the 'European Higher Education Area' (EHEA), a new approach to high and university education, which pushes for the introduction of more collaborative

tasks in university courses and degrees [22] and a greater involvement of the students in the subjects, greatly improving their personal and team skills, and thus their learning process.

The wiki platforms offer solutions to these new EHEA educational requirements. They have a simple but robust collaborative approach which allows users to cooperate with each other to complete tasks and assignments in a rich environment and maintaining a complete history of the editions made to the pages contained, which also allows teachers to easily follow the progress of each student.

These wikis can be combined with other tools such as blogs and chats, together with a rich multimedia environment to obtain a full interactive learning experience for the students. This does not require expensive systems, only a server to be installed to. However, even this is not compulsory, as there are free and paid online servers that offer wiki hosting (such as *wikia* or *wikispaces*) with almost unlimited personalization options. This means that they can be configured to meet the specific needs and requirements of any university.

In the following sections there is a classification of the studies carried out by several Spanish universities, followed by a description of the methodology used and the results obtained from our own investigation.

II. BACKGROUND

The magazine "*Revista de Docencia Universitaria*", published on November 2009 a special edition [2] [4] dedicated to the application and use of wikis in university and learning environments.

All of the studies presented were developed in Spanish universities, based on the incorporation of wiki platforms to the courses in different degrees. There are other studies such as [6], [10] and [15] which describe similar uses of the wiki platforms in other universities, and [7], [8], [9] and [12] which describe studies not related to university environments, but those related to corporate environments.

This shows that there is great potential on wiki platforms, and demonstrates that it is a concept worthy of further study and development, both in university and non-university environments.

University	Degree	Subject	Use	Acceptance	Author
Universidad Alfonso X el Sabio	*Ingeniería informática*	Nuevas tecnologías de la información	Work in groups. Teacher support Weekly supervision.	Higher student involvement. Better results (*60% less fails, 15% increase in grades*).	[23]
Universidad Politécnica de Valencia	*Ingeniería informática*	Herramientas avanzadas para el desarrollo de software	Work in groups. Teacher support Weekly supervision. Individual contributions.	Higher student involvement. Lack of original contributions.	[25]
Universidad de A Coruña	*Biología*	Conservación y Explotación de Recursos Animales	Individual work.	Lack of student continuity.	[15]
Universidad de Jaén	*Filología Inglesa y Turismo*	Gramática Inglesa	Work in groups and individual assignments.	Lack of student continuity. Students correct each other.	[11]
Universidad Oberta de Catalunya	*Turismo*	Ecoturismo	Work in groups. Individual roles.	Higher student involvement.	[17]
	Artes y Humanidades	Arte y Estética Digital	Individual assignments. Students correct each other.	Better grades. Lack of student continuity.	[1]
Universidad Autónoma de Barcelona	*Psicología*	Practicum Interno	Work in groups. Continuous supervision.	Higher student involvement. Higher quality work.	[20]
		Prácticas psicología social			
Universitat Rovira i Virgili	*Derecho*	Instrucciones de derecho comunitario	Work in groups. Continuous supervision. Role assignment.	Higher student involvement. Wiki server failures affected subject outcome.	[16]
		Clínica jurídica ambiental			
Universidad de Alcalá	*Derecho*	Inglés Legal / Inglés Jurídico	Work in groups. Weekly supervision.	Higher student involvement. Students correct each other.	[19]
Universidad de Granada	*Arquitectura*	Diálogos y Negociaciones en la ciudad (Dyn)	Work in groups and individual work. Continuous supervision.	Higher student involvement.	[13]

Figure 1. Studies realized in other universities.

In "Fig. 1" we can see a summary of some of these experiences, which can be considered as the main background for the study presented in this document.

But these are just a small part of our study, and show that the use of the wiki platform as the main tool, or as a support tool in case studies that require collaborative work, is beneficial for the learning process of the students.

These studies show in general that the use of wikis increase the involvement of the students and show a positive cause-effect relation between the contributions made and the grades obtained; with a few exceptions due to the lack of continuity and involvement of a few low grade students. These exceptions had a negative effect on the rate of success of the platform implementation and

revealed the need of having to establish continuous supervision through the whole process to ensure that all the students develop the appropriate work habits and abilities properly.

Unfortunately, due to the limited size of the sample, it is complicated to fully appreciate the true impact that the use of the wiki platform had, as it also depends on many other factors; for example, on the department or degree where it was implemented.

Nonetheless, we can observe that these studies not only show the benefits that can be obtained, but also, and perhaps more importantly, that the problems and limitations encountered can be easily solved. All these means that future studies will certainly bring further

improvements in those areas which will definitely increase the positive impact of wikis.

III. METHODOLOGY

The data used in this chapter have been obtained mainly from a previous study experience developed by one of the authors of this article and that has been documented on [23].

By using this data, it is possible to enumerate the parameters needed (whether qualitative or quantitative) to evaluate the impact of introducing a wiki portal in university teaching, both from the student's and the teacher's points of view and to help improve the wiki for future applications. It will also enable the possibility of establishing various usage patterns to determine new designs to be used for the different tasks required by the subjects that are going to be implemented at a particular wiki platform as part of the course.

This study was carried out in the subject "*Nuevas Tecnologías de la Información*" that can be found on the last year of Computer Engineering Degree in *Alfonso X el Sabio* University. The purpose of the wiki portal in this case was to serve as a support tool to be used during 3 case studies that students had to solve to pass the subject. To further encourage the collaboration between students and to guarantee a better use of the wiki portal, the case studies had to be solved in groups of 3 to 4 students and only contributions made during term time were allowed, discarding any other contributions.

The wiki engine used was *MediaWiki*, as the benefits and characteristics that it offers fitted better the needs of the study. As most of the students were not used to working with wiki portals or with the markup language used, there was an initial period of training to ensure that all students knew how to use the wiki portal to its full potential in the case studies proposed.

After deploying the platform, several parameters were defined to analyze the access to the platform, and therefore being able to obtain statistics of usage, acceptance and interest of the students in the wiki portal. A few of these basic parameters were:

- Number of articles in the platform
- Number of contributions that led to new articles
- Number of mayor revisions
- Number of minor revisions
- Number of accesses to the platform
- Number of read-only accesses

These parameters can be absolute or based on a specific period of time (such as the length of the subject). Additionally, from these base parameters, more complex parameters can be defined, depending on the needs of each subject, such as:

- Frequency of revisions in general
- Frequency of revisions per student
- Continuity of revisions in general
- Continuity of revisions per student
- Revisions quickly corrected (soon after the mistake has been spotted or after suffering from vandalistic attacks)
- Length of the article
- Amount of multimedia content
- Average visits per day
- Average usage depending on the degree
- Average visits depending on student's degree
- Comparison between quality of contributions and student's grades

This process is iterative, since for each new parameter defined, new parameters can be formed, and having a tendency of being more and more complex, though sometimes the simplest parameters will give us the most useful information.
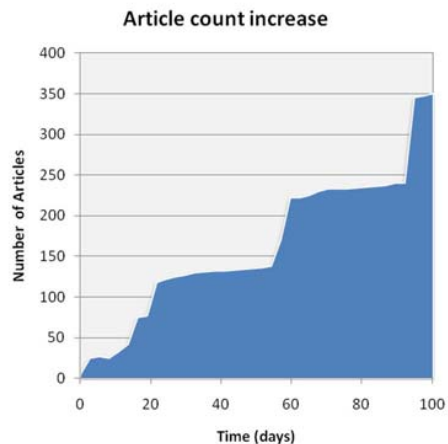

Figure 2. Evolution of the number of articles.

In "Fig. 2" we can see the evolution of the new articles created on the wiki, and it clearly shows that most articles were created at the beginning of each of the 3 case studies that the students had to complete. This was expected, as with each new case students had to create new pages, which were continuously edited during the following weeks.

Information from surveys taken by the students also helped to evaluate and improve technical and non-technical aspects of the wiki portal. These surveys unfortunately always tend to be subjective, depending for example on the grade obtained by the student, as a low grade student is normally more likely to criticize the wiki portal, but as they are anonymous it is not possible to identify them, therefore a small percentage of error has to be considered, as it happens with all surveys.
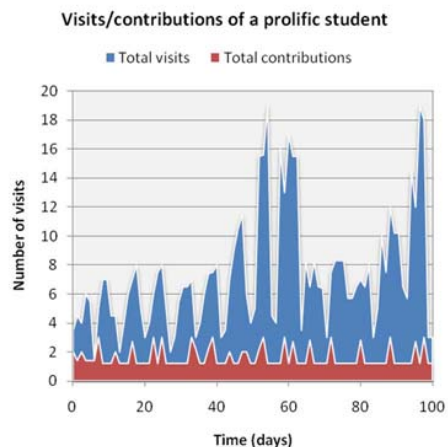

Figure 3. Visits/Contributions of a prolific student.

On "Fig. 3" we can see the profile of a standard student, were the number of accesses greatly outweighs the contributions made. This same tendency is widely seen on

other public wikis such as Wikipedia or on wikis contained in wiki-farms (dedicated servers with tools designed to host independent wikis) such as wikia.com.

Both "Fig. 2" and "Fig.3" also show that most new articles and most visits where made between the days 50 to 60 and 90 to 100, coinciding with both the second and third assignment's deadline. Unfortunately this means that continuity was not achieved, which is one of the main benefits to be achieved when working with wikis. Some possible solutions to this problem could be to distribute assignment contents into smaller sections or to have more continuous evaluation by reviewing contents every few days.

Finally, after carefully evaluating the surveys, we found that approximately 70% of students considered wiki portals as useful tools for case studies and as a system to exchange information and knowledge. However this percentage was reduced down to 25% when asked about implementing it for other subjects and degrees, as the students considered that there was a need for more stepped adaptation to the new system. This is due to the need of adaptation to this new system, which requires an initial extra workload for the students.

After this evaluation, it was decided that extending the wiki platform to the whole degree of Computer Engineering was the next logical step. But before making it available to the whole degree, several upgrades had to be made to increase the wikis usability and capacity, based on the feedback given by the students. Some of the most relevant improvements made were:

- *Access Control*: while the wiki will be publicly available, registration will be required to be able to make contributions (students are automatically registered). This is necessary to ensure that student contributions are properly recorded and can be later used to evaluate them.
- *WYSIWYG [1] editor*: working with wiki markup language can be daunting for non-computer degree students, so a simple WYSIWYG editor has been included to simplify this task.
- *Categories*: a set of categories has been added to group articles according to the degree and subject that they belong to, thus simplifying searches and speeding up the access to related contents.
- *Article monitoring*: students are now able to select articles and get instantly notified when changes are made to them.

IV. RESULTS

As this wiki portal has been recently made accessible to the whole university, the results presented are preliminary and do not show the whole tendency and real impact, as this will only be possible once the results of the whole year are collected and thoroughly evaluated. This also explains why most of the contributions were carried out by students from the two last years of the Computer Engineering Degree.

Additionally, this also means that many students are not aware yet about this wiki's existence; leaving alone the possibilities offered by it. For this reason several events have been planned to take place during the next academic year to inform students and teachers about the wiki, its benefits and advantages and how to use it as a tool for course. Various learning seminars to allow students to learn the basic usage of the platform have been planned as well.

In "Fig. 4" we can see a short summary of the preliminary results obtained from the wiki at the moment it was made available to the whole university, therefore the results represent only a small percentage corresponding to its usage in the previous study which included only one subject from a single degree.

Article Statistics	
Content pages	46
All Pages	397
Uploaded files	174
Edition Statistics	
Page edits since wiki was set up	1.830
Average edits per page	4,61
User Statistics	
Registered users	58
Access Statistics	
Total visits	18.630
Total visits per edition	10,18
Most visited articles	
Página Principal	2.695
Blogger	982
Aplicaciones Web	828
CMS Made Simple	526
Drupal	494
Most edited articles	
Página Principal	160
Blogger	81
Mitos del software	58
Google sites	52
Lenguajes de programación	44

Figure 4. Preliminary Wiki results table.

For this reason 4 out of the top 5 most edited articles are part of the Computer Engineering Degree area, as articles related to other areas and departments are still under development requiring further contributions.

Despite this data being preliminary, the "Fig. 5" shows a tendency where most contributions are made during term time, reducing drastically during holidays, which make sense since contributions made outside of term time are not considered during the evaluation process.
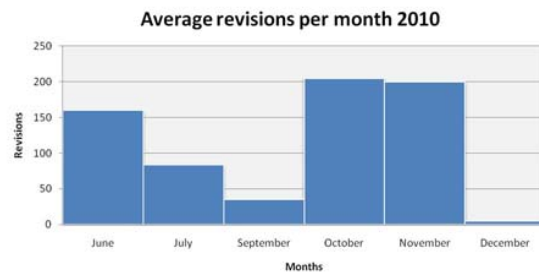

Figure 5. Preliminary Wiki results graph.

The contributions made during June and July correspond to the wiki being created and populated with the initial contents and basic structure pages, while the contributions made during October and November were made by the students to complete their case studies.

Additionally, this also shows that the initial training was successful as students were aware of the requirements of the subject, and followed the instructions correctly, avoiding contributions outside of term time as they would not be evaluated.

[1] Acronym for: "*What You See Is What You Get*"

V. Conclusions

The results presented, while being only preliminary, are very promising and inspiring. There is still much room for improvement, as students have shown the great potential that these platforms offer, and have also suggested changes and improvements that need to be made in order to make it more efficient and user-friendly, and ultimately increase its acceptance.

This kind of platforms offer lots of different collaborative ways of working to achieve a common goal, which is one of its more desirable characteristics specified in the requirements made by the EHEA, which explains the great success that they are having: from personal wikis to university wikis, and even large company wikis.

The portal presented, "*WikiUax*", is an initiative that has been available for less than a year, and which is the result of previous studies carried out in a few subjects of a single degree. It has received several upgrades since then to improve its functionality and to fix the flaws found during this study.

The use of the Wiki is also a challenge for teachers, as they need to become used to these new technologies, and the way in which they used to plan the courses and practices applying this new collaborative approach. This can be especially challenging for teachers of degrees that have little relation with computers and new technologies, as they need to adapt to these technologies as well.

This also has another advantage, because becoming familiar with new technologies give teachers access to many more tools and systems that can further enrich the learning experience of the students.

In conclusion, the advantages that wikis provide are far worth the effort, as once the teachers and students become used to it, the simpler and easier its use becomes and the greater the interest generated. This certainly improves the learning experience of both teachers and students.

Additionally, due to this great potential it will definitely continue to be further studied and developed to become even more useful for educators and professionals worldwide.

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