

Intranet wikis

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ABSTRACT

Historically, when business organizations realized that web technology could also be used internally, the development of intra-webs took off rapidly. In 2002, several studies showed that 75% of web servers were running behind enterprise firewalls. For years, the World Wide Web has been a *de facto* read only media where anyone could browse and only a very few could publish. Similarly for intra-webs: the *one webmaster syndrome* killed in the egg the potential for collaboration and sharing.

On the World Wide Web things have changed rapidly in the last two years with the emergence of Blogs and Wikis: the Web started to turn into a more *writable media*. The browser can be used now to edit and create content like the very first browser which Tim Berner's Lee wrote in the early 90's.

So, with a little delay, wikis and blogs started to appear in the intranet world as well. In this paper, we present the wiki concept and focus on its use in the intranet context, both in academic and in business organizations.

Categories and Subject Descriptors

K.4.3 [Organizational Impacts]: Computer-supported collaborative work.

General Terms

Management, Measurement, Documentation, Experimentation, Human Factors, Standardization,.

Keywords

Wikis, Intranets, collaboration, creativity, social context.

1. INTRODUCTION

We have conducted two experiences over several years with intranet wikis: six years ago we installed a wiki that is today the heart of the intranet of the computer science department of the University of Nice, with about 400 regular users [1]. Since 2001, we have also had a close relationship with the ILOG Company which has developed a very impressive wiki-centered intranet [2].

Furthermore, companies like Google, Motorola or the New-York Times made public the way they use a wiki in their organization.

In some cases the wiki concept has been adopted and has improved the way people share knowledge, in other cases it has failed. Why? What does a company need to take into account in order to set up a wiki in its intranet that works? Why would a company need a wiki?

Very few academic papers addressed the intranet-wiki topic [4]. In this paper we will first try to define the goals of a business organization intranet and see how the web technology and tools helped or failed to reach these goals.

Then we will present the wiki concept and try to understand why it has been such a phenomenon in the World Wide Web. We will show that its success relies on several social conditions that can not always be found in the business organization's culture.

Finally, even when wikis have been adopted they are not a zero defect solution to the knowledge sharing and collaboration problem. They fill a gap but they may be improved. We will present the current drawbacks of the wikis and propose several leads to improve their usability.

2. Intranets: like the web or different?

The web proved to be one the most successful publication systems for sharing information over time and space, but it has been considered for a long time as a *1-n* system where *one* author barely knows the *n* persons who will read the content he created[8]. Furthermore, publishing content on the web was not an easy task and required technical knowledge. Some researchers like Chang [9] explain this situation by the biased design of web browsers since the NCSA Mosaic web browser was accepted as the *de facto* standard in 1994. All browsers that appeared later on assumed that like Mosaic, they were designed for *browsing already authored texts*.

Most intranets follow the same model: content is produced by a very small number of employees assigned to this task and all the underlying technical procedures are delegated to the IT people in charge of the security and maintenance of the system [11]. In the beginning of the 21st century, several publications showed that this situation came directly from the culture of control and security pre-eminent in business organizations [12]. There was a sort of tacit agreement that the publishing process is much too complicated and has to be done by specialists! Don't let anybody express himself without control or you'll get anarchy in the company very soon. Every bit of communication should follow the corporate rules of the company. The literature recommended procedures [13], [14], rules, and recipes in order to get a good intranet in 10 lessons. Standardisation and formalisation meant quality.

A few people noticed that on the Web people published because *they wanted to* although in intranet people published because *they had to*. Soon organizations realized that their intranet was poor, static, rarely updated and not very useful [1][2].

A similar effect appeared with email. It took ten years before it was widely accepted inside intranets. Products like Lotus Notes had their own, private, controlled mail system before companies

realized that their employees may need to communicate outside. They had fear that email or external web access will be so time consuming that the productivity of the whole company would suffer. But even now, email is not satisfying. It is one of the intranet tools but where is the information? In everybody's mail boxes! And who reads it? Sometimes not even the receiver! As stated by C.Shirky [8] email can indeed be a conversation tool: if I'm mailing you, and you're mailing me back, we're having point-to-point and two-way conversation. But mailing lists enable me to broadcast a message to dozens of others and I'm not going to talk to them. And there are chances they won't read it either. Organizing and searching information with email became an increasing problem. What can be done to improve this desperate situation? What makes an intranet more useful?

2.1 Intranet: the organization's point of view

For a business organization, the intranet plays different roles: it is a communication tool ("let us notify our employees that something happened"), it can hold services ("go to that URL and you'll find the people directory"), etc. However, as an information system, *it can greatly improve knowledge sharing between members of an organization and becomes its memory*. Ideally, the Intranet is a Knowledge Management (KM) tool that can boost productivity, help taking the good decisions, and help the organization to survive the possible loss of some of its key members or teams.

Soon, researchers like Steinmark [6][5] or Hahn and Subramani [15] stated that "*Successful KM depends on contributions from all organisational members, and for the intranet to serve as a knowledge sharing environment, high participation is important*".

Pierre Levy describes the intranet as a shared cyberspace that can be considered like an ecosystem of ideas [17]. His hypothesis assumes that there is a strong correlation between the collective intelligence of an organization (the dynamic balance of all of its dimensions) and its performances in the economic marketplace.

Thus, the main difficulty consists in capturing and making knowledge available on the intranet. Regularly, knowledge is carried and exchanged without technology (around a table in meetings, by the coffee machine etc.) but when the technology is involved it becomes possible to capture, archive and turn this knowledge into searchable information. Databases, documents like reports, emails or web pages represent knowledge. However, there remain two challenges today: (1) **How to capture more Knowledge?** In particular the implicit, informal knowledge that is not in the corporate documents of yesterday's intranets: brainstorming that take places in improvised meetings, decisions taken on the fly to solve an unexpected problem, draft versions of never published documents that may hold relevant information, contact lists, informal discussions, *modus operandi* that never cross the boundaries of particular team inside the company, etc. (2) **How to make this knowledge widely available if the intranet is read only and if the email does not work**, as we saw in the previous section?

In order to succeed the keywords are: high participation, collaboration, user involvement, trust, autonomy. The centralized web-publishing model has to be rethought.

2.2 Intranet: the employee's point of view

For the members of a business organization the intranet is a tool for archiving, sharing and looking for information. It is also a tool for *working better together*.

J.Nielsen described the *ideal intranet* from a user's point of view in [18] : Share in a single place all the information necessary to the project; everyone can *easily* find this information and contribute to the existing information, *kill the webmaster!* Exchanges, opinions, discussions are all written using computers. Work can be done asynchronously, even from a distance (at home, on the road). Actors of the project dispose of a visible memory of the project. Things can be traced back by looking at the history of changes. Participation to this shared knowledge space must improve social links. Tools must be kept simple and push readers to become writers.

But whatever talents one can get, whatever the task he is assigned to, adjustment to other's needs and other's constraints is necessary. Whatever autonomy one can get, personal goals and objectives must always – in principle – contribute partially or totally to the organization's goals and objectives, and those in charge of the organization, those who judge other's people work, must agree with that. If a company's organization is bad, if there is too much social friction, employees will not share knowledge and the solution to the *working better problem* can not be improved or solved by a magic tool!

Nielsen's description assumes that the intranet is a *writable media*. In the last years tools have appeared that *in a way* turned the World Wide Web into a *writable media*, solving the one webmaster syndrome. They are Blogs and Wikis. They quickly became a phenomenon. Where Blogs tend to express a one person voice [19], wikis are about writing and sharing information.

The present paper is mainly concerned with wikis as a technological innovation that may help improving an intranet's usability by boosting users' collaboration and knowledge sharing. We will now present briefly the wiki concept and try to understand why wikis have been such a phenomenon on the World Wide Web. We will see that the philosophy of the wiki concept as proposed by its inventor, Ward Cunningham, cannot be transposed *as is* to intranets.

3. The wiki concept

The wiki revolution started in 1995 when Ward Cunningham wrote the first wiki for the Portland Pattern Repository¹.

Tired by the centralized way of web publishing, by the complexity of HTML pages production, influenced by Hypercard and certainly by Tim Berners Lee's initial vision of the Web, he invented the wiki concept: a web site where people can create, modify, refactor and link pages from within the web browser, in a very simple - one click - way. Instead of HTML he proposed a very simple markup language, WikiML, inspired by the way people were formatting text-only messages in the days when the Internet was not multimedia. Cunningham's biggest contribution from our point of view is the invention of WikiWords as a mean to create hyperlinks², even to non existing pages. Type in a NewPage and it will be saved as a link to a page whose URL ends with NewPage. If the page does not exist, clicking on the link creates the page. Yes, it's that easy.

Zero installation, just click edit, type in text and WikiWords and you are publishing web content! Non technical people could

¹ <http://www.c2.com>, still active. This site has entered the Web Hall of Fame now and is commonly cited as "Ward's wiki".

² This syntax is inspired by the naming conventions of the SmallTalk language classes. SmallTalk is itself a WikiWord.

handle it and Ward's wiki started to grow exponentially. The other famous example of a public wiki is the wikipedia encyclopaedia. It has more than 16.000 contributors, many of them not technical people. They built a hyperlinked encyclopedia! Wikipedia is now one of the top 40 most visited web site in the world. So yes, apparently, wikis *are usable* and can be use to share knowledge, at least in these two famous examples. We may add that historically, nobody expected such an enthusiastic reaction of the internauts.

Why did it become such a phenomenon? At the Wikisym 2005 conference, Ward Cunningham and Jimmy Wales, president of the Wikipedia foundation, gave some clues: *a wiki is like a garden: users (or at least the ones with a gardener's spirit) must take care of it. Start with some seeds and watch it grow, and the wiki will become moderated by its users' community, respect and trust the users, leave them anonymous in order to avoid ego problems, ...good things happen when you trust people more than you have reason to, let everybody express his opinion, no censorship, consensus must be reached, ...the wiki is adapted to a dynamic social structure because of its refactoring features. Do not impose a rigid structure, users will refactor and structure the wiki as it grows.*

This sounds revolutionary and very much influenced by the Hippy culture... Indeed, social aspects are very important and could not be neglected when talking about wikis [15].

Anonymity, trusting people more than is reasonable... compare these words with the culture of control in business organizations we described in section 2. Is it transposable? Can wikis really work *that way* in intranets?

4. Intranets studied

The numerous papers about wikis that have been published on the web or in popular press illustrate the growing interest in that phenomenon by the public but also by actors from industry. On the other hand, academic papers about wikis are not as common and mainly describe experiences with public wikis. Enterprises wikis, by definition, run behind firewalls and are more difficult to study. D.Steinmark, who wrote several papers on that subject, noticed that a search on the keyword "wiki" on ACM digital library returned less than 100 hits but all papers were conducted on the public Web [4].

Since 2000, we had the opportunity to look closely, for a long period of time, at two different large intranets articulated around a wiki.

The first one has been installed by the author in the intranet of the Computer Science Department of the University of Nice (France) in 2000 and is used by all the teachers, students, industrial partners, etc... It holds more than 4000 pages and has more than 400 regular users. We used this wiki every year since 2001 for cooperative student projects across country borders (see [1] and [25]). It is also an every day tool for most students and teachers. This year we conducted interviews with 17 students in last year of their master degree in computer engineering and with 5 teachers (out of 23 at the CS department). The interviews were about the wiki usability, how and what for they used it, etc. A synthesis of the results is presented in the next sections.

The second wiki is the heart of the intranet of the French company ILOG. Installed in 1999 it is now composed of 37 000 web pages and has more than 700 users. Since 2000, we conducted several masters student projects and training periods

with ILOG, all dealing with the wiki. All the projects and training periods were about improving the wiki's usability so finally we set up an official collaboration between the INRIA laboratory and ILOG in the form of research action called "Usable intranet"³. During that time we had access to the ILOG intranet, regular meetings with the team in charge of this intranet and two masters students specialized in ergonomics spent a six months training period in the company. They conducted several interviews with more than 20 ILOG employees in order to analyze the intranet usage.

Other sources have been used for this investigation. Recently Google presented its internal organization: Shashi Seth's talk (lead product manager) during the "corporate wikis" round table⁴ that took place at the WikiSym 2005 conference as well as Douglas Merrill's talk (senior director, information technology) at the Vortex 2005 conference have confirmed that Google, since its early days, uses massively collaborative tools [21], [22], [23]. In particular, their intranet is articulated around a big wiki that uses the TWiki engine.

At this round table Peter Thoeny from WindRiver, creator of the TWiki software⁵, discussed different success stories of organizations using TWiki [24]. Thomas Weigert (Motorola Global Software Group) described the wiki in the intranet of its company. We had also the opportunity to talk with Crawford Currie who pioneered the wikis at Motorola⁶ and who created a small company, Cdot.com that sells services around intranet wikis.

Three companies who make a living with selling intranet services around wikis participated to the discussions and presented their services and products: SocialText is famous for the introduction of a wiki at Nokia, JotSpot has developed a solution around a very innovative wiki engine and XWiki, a small French company famous for the XWiki software.

4.1 Wikis have been introduced into intranets by the back door!

4.1.1 How wiki gurus have introduced wikis in intranets

We started the intranet of the Computer Science Department of the University of Nice because at the time we had no intranet! In 1999 we had only personal web pages and an *officially dead* public web site that hadn't been updated for months. We installed a wiki and used it first, as a test, for some collaborative student projects that involved distant cooperation between countries. We had students from Nice, France who worked on the same projects with students from Mannheim in Germany. The results of this experience have been published in [1] and [25]. Interviews with actors of this project showed that the wiki was globally very much appreciated. Then we decided to use it for the whole intranet of

³ <http://www-sop.inria.fr/acacia/Colors-2005-UsableIntranet-Page-Web.html>, in French.

⁴ The author participated at this round table.

⁵ An open source wiki engine designed for corporate use: <http://www.twiki.org>

⁶ The first years of a wiki at Motorola are described in the "Wiki at work" chapter of Ward's Cunningham Book "The wiki way" [3]. Crawford Currie is one of the main contributors to TWiki now.

the CS department. We started to fill the wiki with courses, FAQs, general information about everyday life in the department. We also asked all students to register and *they were obliged to use the wiki* for publishing and archiving all their projects. The author was the wiki guru/evangelist/gardener until late 2005. Other colleagues replaced him in that role as the wiki is appreciated by the majority of our community and became rather self-moderated over the years. It holds the memory of the CS department since 2000.

We heard of the wiki concept from Colas Nahaboo, a friend who worked for the French Bull company and whose team was hosted by the INRIA research laboratory. He started a wiki there and told us to try it. He was the local wiki guru and really liked the way people from his team could use it as a shared notepad. In late 2000, his whole team was bought by ILOG. Its mission consisted in renovating and improving the intranet of the R&D division that looked poor compared to INRIA's intranet. Some WebDav servers provided shared disk space for exchanging files, some document templates were available for HTML or Word formats and everybody edited documents using his own editor. There were some official web servers but every time there was a problem only one person could help. People don't like to be dependant so a galaxy of web servers appeared: almost one in every team's computers. There was no coherency in ILOG's intranet. As described in [2] the wiki became the cornerstone of ILOG's intranet.

Almost the same story happened at the same time at Motorola. A small number of engineers whose team was practicing XP programming installed a wiki as a shared notepad, and then other teams noticed this funny tool and started to use it. The people who installed the wiki started to create workspaces for these other teams and the wiki grew. In 2000, seven teams used the wiki, distributed in different countries: Germany, England, France, Australia, Russia and United States. At this time 60 persons were contributing to the wiki. One person at Motorola, the local wiki guru (Crawford Currie) played the role of the wiki evangelist and gardener. In 2004, five wiki sites were in activity, used by 17 teams all over the world. Statistics showed more 16000 pages consulted every day, making the wiki the most popular tool in the intranet, way above the official Knowledge Base tool that existed before.

The New-York Times Digital has also a similar wiki story where in 1999 a small team with technical skills decided to install a wiki for helping maintaining the documentation of their project (see chapter "wiki at work" of [3]). Steve Wainstead, was the wiki guru. The documentation was all written in HTML using some Unix editor, and access to the web server was allowed only to a few people who knew the passwords. The wiki grew, especially because Noreen Wu, another wiki evangelist at the NY Times Digital, used it during meetings for writing minutes. Other participants could ask about this tool and Noreen showed how to use it. Statistics of the wiki usage showed some peaks after these meetings. And after a few weeks other teams asked if they could have their own space on the wiki. Managers, secretaries, journalists, everybody started to use the wiki. And it became the biggest document repository. Then problems arose, but we'll talk about that in section 5.

The Google case is a bit different as the wiki was there since the early days, when Google was a small startup made of geeks. And geeks loved the wiki concept.

4.1.2 No wiki guru means no intranet wiki? Small companies filled the gap!

Nokia is another famous case of a wiki that was introduced at the initiative of a few individuals. But this time, there was no local wiki guru!

The Insight and Foresight division of Nokia is specialized in technology watch. Members of this division were facing huge problems with the mail which was their main collaborative tool at that time: too many messages, no easy way to find and structure the information. The activity of this division required fast access to its knowledge capital. They heard about SocialText, a small startup company that proposed an alternative solution to the mail problems based on wikis, blogs and other optional collaborative tools like instant messengers (see Figure 1).

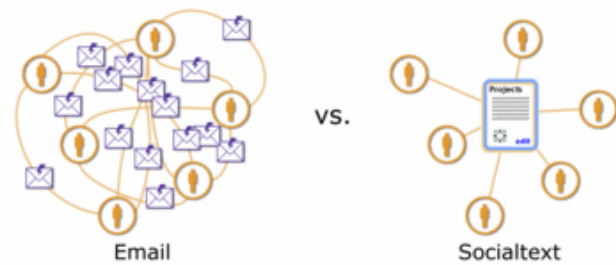


Figure 1 the social text market : solve the mail problem.

In section 4.1.1, in all the cases we studied, the wiki engine has been installed by local wiki gurus, people with high technical skills in computer engineering and whose job permitted spending time in wiki maintenance and evolution.

SocialText proposes two options to remove technical needs: host the software on their servers (they call that "SocialText workspaces") or install a server in a box inside the organization's intranet ("SocialText appliance"). They filled a gap as two other companies have been formed to pursue this market. The first one is Jot Spot⁷, which developed an innovative wiki engine heavily influenced by TWiki. Like SocialText they sell appliances (wiki-in-a-box) and can host intranets externally. The second one, XWiki, a French company, whose software is again influenced by TWiki, proposes for the moment external hosting only.

Ross Mayfield, CEO of Socialtext stressed during the Wikisym 2005 conference that technology is not the answer; their software is a very simple wiki that they are open sourcing, and claim that customers pay for Socialtext to teach them how to use simple tools to solve their problems, and that they do not care about fancy technologies. They both help in technical but also social integration of the wikis in business organizations, unlike their direct competitors.

4.2 User profiles in the studied intranets

The interviews confirmed what daily contacts with the users of ILOG and the CS department of the University of Nice showed informally: all people are readers who browse the wiki documents and some of them are regular writers/contributors. Students from the CS department are a particular case as they are *obliged* to use the wiki for their courses and project. Also, during their training period in an industrial context, they need to update their personal log (a wiki page on the CS department's wiki), reporting the

⁷ <http://www.jotspot.com>

progress of their work during the week, so they are all contributing regularly to the wiki documentary corpus. As we will see, teachers in computer engineering are the hardest ones to convert to the wiki concept.

Nevertheless, a core of common profiles can be identified among the wiki users we interviewed:

Techno-maniacs: every time there is a new technology available, they jump on it. Strangely, even in organizations where users are computer-aware this category is the smallest.

Technical skilled users: they use the wiki autonomously and appreciate this new freedom a lot. At ILOG they also write small embedded *Excel-like* applications using the macro language of the TWiki engine. They usually proceed by imitation; when they see cool things in another wiki page, they duplicate (by *copy'n'paste*) the content into their own pages, and modify it to their own needs. At the University of Nice, we find in that category teachers that have been using the wiki for several years, started to love it and finally read the online documentation for using some macros in order to publish forms, make editable tables, online spreadsheets, etc. They also proceeded that way after seeing what others did. Curious computer engineering students fall in that category that represented about 10% of the users.

Followers: these ones did not like the wiki at first but adopted it after a few months when they saw that many of their peers were using it. We noticed this with teachers on the CS department's intranet (reminder: students were *obliged* to use the wiki for their projects). It took a very long time to make some teachers admit that the wiki was *finally* a useful tool. At ILOG, they are the ones who accepted to work with the same tools others use in order to facilitate their social integration. And if a manager uses the wiki there are very good chances he can convince his subordinates to use it as well! Followers represent about 80% of the population.

Non wiki contributors. They are ILOG managers who do not want to change their habits, newcomers, or the ones who reject the wiki for different pretexts like the absence of a WYSIWYG editor. These last are often computer engineers that cannot accept to use such a simple tool. Our guess is that wiki engines are very simple software, with limited features (gui, etc.), designed to be used from within a web browser, without the need for extra client software installation. Certain persons can only see the shortcomings of this compromise and focalize on the primitive aspects of the wiki. They just refuse to use such simplistic software, which goes against everything they learned during their studies where complex solutions seemed to be the best. In the CS department's intranet, they are mostly teachers in computer engineering, for the same reasons. They represent about 45% of the teachers at the CS department! We do not have non wiki users among students.

Normal users, after a little investigation, notice that *there is no easy alternative solution for replacing what the wiki proposes and finally adopt it*. At the question "what better alternative solution do you propose for replacing the wiki", 100% of the people from the CS department proposed no other solution or proposed another wiki engine they heard of on the Web (Plone, in that particular case). Even the ones who criticized the wiki the most, who never contributed, admitted they don't see a better solution so far, but there *should be* at least one!

4.3 No one is anonymous!

In all the intranets we studied, users were not anonymous, contrary to big public wikis which are based on anonymity in order to facilitate contributions (see section 3).

In section 2, we explained how the organization's mindset led to information feudalism. Wikis and other social software emergence in intranets is a very slow process and these new means for publishing web content are still surrounded by suspicion and doubts ("what happens if somebody posts bad things about the company?"). Anonymity is not even an eventuality as confirmed by discussions with people in charge of all the intranets studied. Even for the *academic* intranet of the Computer Science Department of the University of Nice, we had to identify contributors to the wiki for legal reasons: every student and every teacher/researcher signs a contract that stipulates that the author of a web page assumes responsibility if he publishes content that does not follow the University guidelines. In organisational settings, *people also like to be identified*. Where anonymity can reduce evaluation apprehension in public wikis or in the public Web, participants in a corporate intranet are used to being identified, they talk freely in open space, share their offices, talk with each other. In such an environment, anonymity is not the attribute one would think of. Steinmark noticed in an experience located at the Volvo Information Technology's headquarters that anonymity is a two-edged sword: it reduces apprehension but has a negative effect in participation if the employees feel that their contribution will never be recognized nor rewarded [7].

Nobody among the persons we interviewed complained about the lack of anonymity. All the intranets described in that paper use a wiki engine that manages user identification and all contributions to the wiki are traced in the history of each page.

4.4 What we find in wiki intranets

The intranet of the CS department of the University of Nice is organized by type of content. We have a workspace (a TWiki *web*) for the courses, a workspace for the projects, for the student's clubs, for discussing the life of the CS department, etc. The size of the corpus is about 4000 pages partitioned into 25 different workspaces.

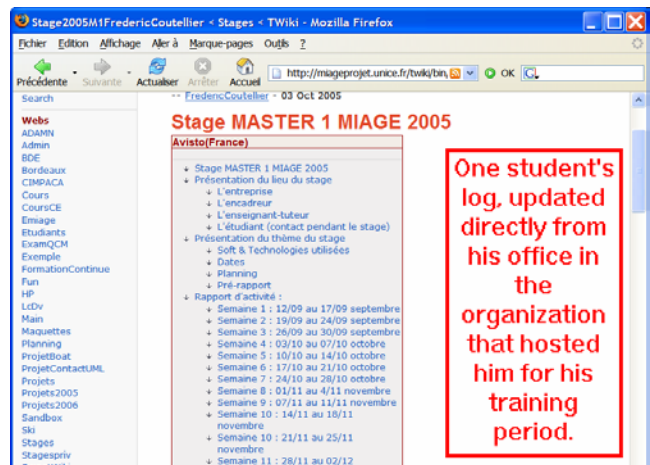


Figure 2 Student's log updated each week.

Most of the documents are standard wiki pages, mainly text, sometimes with documents and archives attached to the pages. Teachers put in their courses, lecture notes, exercises; sometimes they attach some PowerPoint or pdf files, zip files, etc. Students

are mainly using the wiki for updating and publishing their project work as illustrated by Figure 3. They are also obliged to keep up to date a log of their work during their industrial training periods, as illustrated by Figure 2. They also use the “Student workspace” workspace a lot for their own discussions about topics like organizing week-ends or a trip to the mountains. We also find pages that are not linked to each other; the wiki is used in that case as an improvised online notepad.

On ILOG’s intranet, there are no personal pages, no workspace dedicated for hobbies or fun. Only work documents. The intranet is structured in many workspaces, one for each team inside the R&D division and is currently composed of 37 000 pages. Inside each workspace, teams are free to organize themselves. We mainly find pages used for classic informal project management (agenda, meeting minutes, ongoing tasks, product documentation for review, software bug tracking, brainstorming, surveys about diverse topics, blogs inside the wiki, etc.). The first thing that we remarked when we studied this intranet is the omnipresence of tables, particularly Excel-like tables. We did not find such a thing on the CS department’s intranet. These tables are in fact small embedded applications written using the macro commands available in the TWikiML, the formatting language used by the TWiki engine. TWiki is what we call “an application wiki” or a “component wiki”. One can create forms, and there are simple tools for archiving the data from the forms as wiki pages.

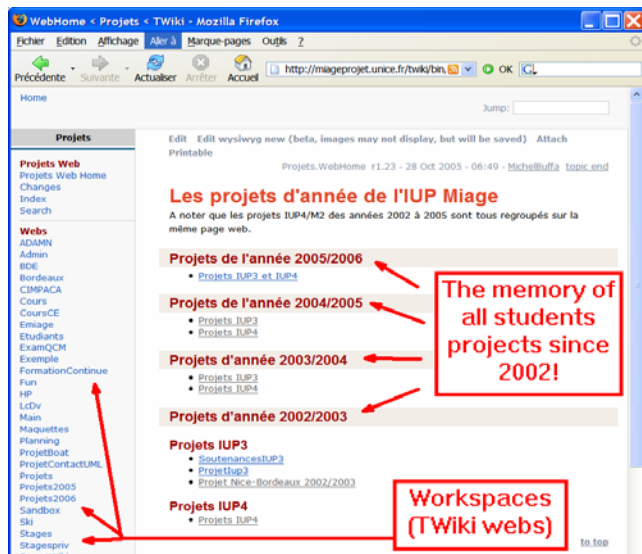


Figure 3 all student projects since 2002 are located on the wiki of the CS department of the University of Nice.

A very powerful %SEARCH% macro can in turn be used for presenting data corresponding to given regular expressions data as dynamic tables. At ILOG they also installed some plugins for TWiki for creating tables whose content can be edited directly on the web page or for turning tables into a spreadsheet (with dynamic calculations like in Excel). Figure 4 shows an editable table from an ILOG’s wiki page: cell content can be modified directly by typing text or using combo boxes, rows or columns can be added or removed. Figure 5 shows table made of data extracted from other wiki pages. Clicking the “edit icon” on the left of each row brings a wiki page in edit mode: the one that contains the corresponding data. Figure 6 shows such a page; we notice some wikiML at the bottom while the top of the editor is a form for editing the structured data.

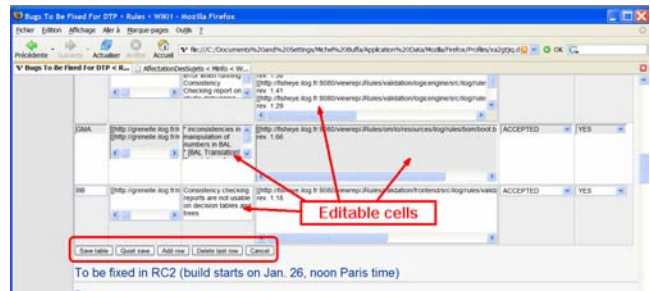


Figure 4 an example of an editable table in a wiki page. From the ILOG’s intranet.

These applications are written on demand by the WebCore team in charge of the intranet or by technically-skilled users as described in section 4.2. These applications only take a few lines of code and are embedded in the wikiML of wiki pages, anyone can modify, customize or copy an existing application so that it suits his needs. This “learn by copy’n’paste” feature of the wiki concept is by no doubt one of the strongest points in favour of wiki as social software: it gives autonomy and people can self-manage the documents and micro-application they develop.

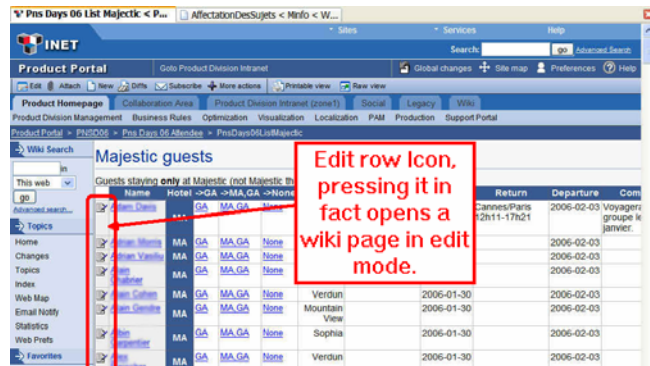


Figure 5 An embedded application. Data are extracted from other wiki pages using a TWikiML macro.

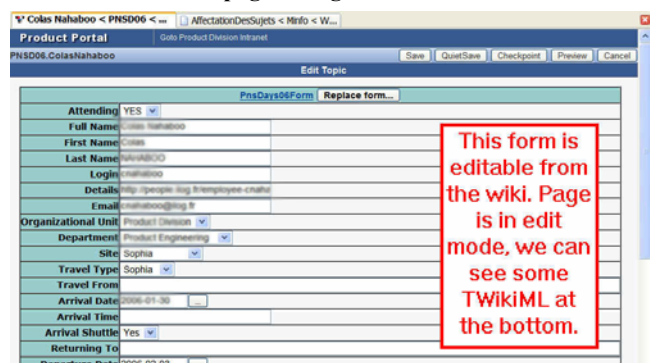


Figure 6 Editable view of a row of the table from Figure 5.

The interviews showed that ILOG’s employees who contribute to the wiki consider it easy to operate and use it spontaneously for very diverse tasks. It seems to be the main intranet tool comparable to email.

Informal project management on the wiki differs a lot from one team to another. Some teams only create pure textual pages, other use lot of micro-applications. The team manager must feel comfortable with the tool as it appeared from the logs that he is very often the main contributor in a team’s workspace (other case: he does not use the wiki but delegated all the dirty work to a

subordinate). As there are no rules that indicate how to do things on the wiki, every team does it their way.

Crawford Currie and Thomas Weigert (Motorola Global Software Group) confirmed during the “intranet wiki” roundtable that took place at the Wikisym 2005 conference that Motorola’s wiki is also used for similar informal project management and includes many embedded applications. See [24] and [3] (chapter “Wiki at Work”) for details.

A Google representative, Shashi Seth, during the same round table, reported that the huge Google intranet is based on a wiki, and production of intranet documents in Office formats is strongly discouraged: it is OK to use Office format for single-author documents, but things that are to be edited by others must be Wiki documents. Google uses a TWiki engine -a common point with the other intranets studied in this section-, and that it is used to gather as much as possible data about the quick changes that occur in the enterprise. Douglas Merrill points to Google’s Project Database (the wiki) as a solution for dealing with rapid change and troop movements. He calls it a reporting system, not a project tracking system, that allows “Googlers” to keep track of what they and others in the company are working on. “It creates public data, for all to see and come up to speed on projects, and maximizing the opportunity for accidental cross-organizational pollination,” Merrill said. “Everybody from engineering to sales to folks who sweep the floors can read about and create commentary on anything in database.” Nearly every activity goes through the prism of the wiki. See [23] and [22] for details.

4.5 Wiki engines dedicated to intranet usage

Application wikis

TWiki is the oldest and most deployed wiki engine dedicated to intranet usage. Many big companies have been using it for years [24]. It is an open source engine that has been initially developed by Peter Thoeny for the intranet of the WindRiver Company he was working for. It included some key features like user authentication, a versioning system, the possibility to attach files to every wiki page, an email notification system for tracking changes on wiki documents, etc. Open source, with a plugin architecture, it has been constantly improved by contributions from its users, many working for the organizations that used it in their intranet. It is an “application wiki” in the sense that the TWikiML language used for formatting the documents includes some very powerful macros. These macros make the writing of Excel-like applications easy, with no need to set up a database nor writing more than a few lines of code. The user community is one of the largest.

JotSpot, the wiki engine developed by the eponymous company is a “new generation” wiki, very much influenced by TWiki, according to JotSpot’s representative. JotSpot was the first wiki engine to come with a high quality WYSIWYG editor, while proposing a text-based, wikiML editor. The JotSpot Company runs a wiki farm for external hosting of private intranets, or can deploy a JotSpot box (JotSpot Appliance) behind an organization’s firewall. JotSpot standard users will certainly use only the WYSIWYG editor, import/export documents from Office applications or use the JotSpot Tracker, an innovative tool that turns any Excel table/application into a web based clone. JotSpot also proposes an “application gallery” where in a single click one instantiates a full featured application like a recruiting application, an agenda, a blog etc. These applications come as a set of wiki pages and can be edited, customized, etc.. JotSpots

supports a markup language plus a XML-based language called JotScript. Advanced users can write their own applications in JotScript. JotSpot appeared recently on the market. Their products are clearly top notch from a technological point of view.

XWiki, an open source wiki engine is also playing in the same league. The XWiki Company runs a wiki farm for external hosting and sells services for helping organizations to set up XWiki inside their intranet. Very ambitious the XWiki engine supports web services, embedded application, etc... but has not yet encountered acceptance by large companies.

Other application wiki exist, like Confluence, MoinMoin, Daisy, but we preferred to focus on the most famous or innovative ones.

Simple text based wikis

Writing wiki applications is certainly a need for some intranets where a few users have technical skills and where Excel-like applications and tables are a common way of communicating information and knowledge, but there are numerous scenarios where a simple text based wiki is sufficient. The SocialText wiki engine is very simple, with limited features. And that’s perfect for non technical organizations which look for a brainstorming tool that can boost creativity. Ross Mayfield from SocialText states “*Eclipse is a "guess the button" programming environment; we do not want our wiki to be like that!*” Keep things simple and usable. The survey of the CS department of the University of Nice’s intranet showed that there was no need there for wiki applications. The organizational climate, the tasks that have to be conducted will guide the choice for one kind of wiki engine or another. JotSpot or TWiki are however also easy to use, nobody is obliged to read the documentation nor write complex applications with cryptic macros.

4.6 Knowledge sharing with the wiki

Set up a sharing culture: the Google case.

There is a strong sharing culture at Google since the very beginning. Google’s intranet is made of numerous different tools but it is articulated around a big wiki. All employees are pushed to share freely and to learn from each other (the opposite of the company’s interaction with the outside world), no isolated team (no silo), and open communication is the rule. The company tries to hire smart people who are nice to work with, with an open mind suitable with the sharing practices. “Everybody from engineering to sales to folks who sweep the floors can read about and create commentary on anything in database.”[22]

The loss of power induced by sharing knowledge may considerably restrain people’s contributions. Even with employees selected for their aptitude to share information, in the competitive context of a corporate organization bad feelings may emerge the day someone gets a promotion or a reward using someone else’s knowledge. In order to avoid this phenomenon, Google decided to promote one’s ability to collaborate with others. Performance management across the entire company is open and transparent. A distributed, public performance management system automates the complete process, requires discussion and provides data and calibration. It interacts with the intranet and determines who worked with a particular employee on a project and automatically sends out an email to get feedback.

Although Google is very proud of its inner organization, several observers noticed that rewards in creative and collaborative work do generally fail on the long term. It may lead to a detrimental

effect on performance; especially if the reward is used to induce people to do things they otherwise would not [7].

Use pedagogy, help individual autonomy and self-management: the ILOG case.

There is no such official sharing culture at ILOG, but engineers from R&D are used to sharing source code through versioning tools like CVS. Do not stress users, explain they that cannot break anything. Thanks to the versioning system that keeps trace of every change, it is always possible to revert to a previous version. In case of problem, users can ask WebCore members for help, and they are taught each time that they can just copy'n'paste things from other pages. So they learn little by little until they are autonomous. Also, never oblige people to use the wiki. After a while many join the troops of wiki users as they could not find a valuable alternative solution.

Today, five years after the wiki installation, the log shows: 700 different persons edited a page in the last month, very few cross-team pollination, people edit mostly pages in their team's workspace on the wiki, 37 000 pages on the wiki, with a linear increase, between 10% and 20% of the users contribute *regularly* to the document base, creating or editing pages, 700 edits a day but on 50 pages (same pages are edited many times).

The percentage of regular contributors is low compared to the total number of wiki users (readers and writers) but this number increases every month. This is a very impressive ratio compared to what we find on the main public wiki sites like wikipedia where the wikipedians, the regular contributors, represent less than 0.1% of the community of users.

Educate people to share! This works with students. The CS department case.

At the CS department of the university, we have cyclic peaks of wiki usage, depending on what the students do at different times of the year. We also broke the rule used at ILOG, *we do force them to use the wiki* in a collaborative way: they do group work on their projects, and all the project management has to be done on the wiki. We even set up an experience unique in France in the form of collaborative projects that involve students from different universities (even across country borders). During six months periods groups of students from both universities update the wiki and use it a shareable space. Teachers use the wiki more regularly but as stated in section 4.2 only a few of them create documents on it (65%) and most are casual writers. Answers to the questionnaire only showed that 5 teachers out of 23 are regular contributors, including the wiki guru.

We stated several times that the students had no choice but using the wiki. That is true, but the questionnaire we conducted with masters' students, who have been using the wiki for three years now, shows that all of them appreciate the wiki except for a few aspects (pages are not nice, problematic search).

4.7 Use global Access rules, do not let individuals protect their documents

How can I protect my documents? This is one of the main concerns for people who discover the wiki concept. After years of centralized, structured tools for producing quality controlled documents, it is hard to change one's habits. "Fortunately, said C.Nahaboo from ILOG's WebCore team, with TWiki, access rules are rather complicated to use, so we gently dissuade people from using them!" Indeed letting individuals protect the documents will restrain considerably the sharing and collaborative

process. Furthermore it is commonly accepted that this will lead to people shooting themselves in the foot: they will overprotect (even forgetting how to access their own documents) or on the contrary forget to protect confidential data, or be certain that they put the right protections but didn't. The solution adopted by WebCore consists in a global protection system: there are four different zones, each one running a wiki that differs from the other by its look and feel. Users go transparently from one to another.

1. - The R&D wiki. Global access protected by firewall. Free read/write access for all members of the R&D division. No access for other ILOG employees.

2. Global wiki, read access for all ILOG's employees. Most pages have free read/write access. Some teams protect part of their workspace, like the "quality" team protects draft pages but gives read/write access once they are of a sufficient quality. This behaviour is not common.

3. External wiki. Accessible from outside the company. Used for sharing data with the real world. Some workspaces are public (read only) some other have restricted read access.

4. Wiki for employee representatives, located on an isolated server. Access restricted for their own use.

The biggest wikis are 1 and 2. With these global protections users feel more confident: R&D documents don't need a high level of quality as documents on the global wiki do (the global wiki is accessible by all the company's managers, R&D wiki is not).

At the CS department of the University of Nice, we do have two different wikis:

1. The intranet wiki, mainly dedicated for internal use and every day tasks. This one contains the courses, the student's projects, etc. This wiki is also accessible from the outside world. Most workspaces have full read/write access for all registered users. Only two workspaces have restricted read access: the ones that may hold confidential reports from student's projects or training period. This is the case when we have industrial partners.

2. An "official" wiki used for presenting the CS department to the outside. Read access for the whole world but write access only for teachers. The look and feel is different; we removed a lot of things from the standard gui in order to give a "clean, not overloaded" look and feel to the site.

Reports from Google seem to indicate that their intranet is in read access for all employees, with the possibility for anybody to comment any wiki page [22].

5. Structuring a wiki

The number one problem reported by people interviewed at ILOG and at the CS department of the University is related to the wiki open structure that makes navigation, orientation and search sometimes difficult. This occurs when the wiki reaches several thousand pages.

While at the University of Nice we are still using the search engine that comes with the TWiki software, ILOG uses a Goggle-like search engine (aspSeek). This way, all intranet resources are indexed and can be searched the same way. Strangely, the logs suddenly dropped and after a short amount of time people stopped using the search. Interviews and investigations proved that the assumption that everybody knows how to use Google was wrong. On the internet, when one does not find something, it is acceptable, maybe it is not there. On an intranet, sometimes

people know that what they are looking for is there, and really don't understand why they cannot find it using the search engine. After many usability tests, the user interface for the search engine has been improved, but still people complain about the difficulty to find things on the wiki.

The interviews, logs and questionnaires at the University of Nice confirmed the same thing. Search is becoming less and less useful as the wiki document base grows.

Structure and organization was such a big problem at the NY Times Digital that they had to abandon the wiki. They used the wiki engine W.Cunningham developed that did not include the concept of workspaces. When the wiki became huge, with thousands of pages, several problems occurred. When one creates a page he has to choose a name for this page. Users, after two years, sometimes had to try dozens of different names before finding a name that has not already been used. The original idea with WikiNames collision was that if you find out that there is a page that already exists with the same name; you would "join it" because it is supposed to be the best place for saying what you have to say. But it just did not work at the NY Digital: people wanted to create their own page! So they invented funny WikiNames that were no longer meaningful according to their content. Navigation and searching was so difficult that it was nearly impossible to find a document without knowing its URL, or at least without having bookmarked it (this has been reported also in some interviews at ILOG). Everybody realized that the wiki was becoming a mass of increasingly inaccessible pages but the user community was not ready to furnish the necessary work for refactoring and organizing it all. The writing and publishing process in a national newspaper is very structured, and NY Times Digital's employees could not get any trace of such a workflow in the wiki. What appeared as a lovely, promising tool that has been widely adopted turned out to be a faulty solution for helping in the publishing process. The wiki has not been completely abandoned but it is now used as a share notepad, with all serious, structured work being done with other tools.

Wikis are designed to be structured by the users themselves. People differ one from another, every individual has his own way of classifying and organising data, and this may change over time. A hierarchical structure like the one proposed by the workspaces is certainly a good thing from a technical point of view but it only gives a "first glance" mind map of a wiki intranet. Horizontal navigation (following links in the page itself) is the one most people use: usability tests showed that most people at ILOG don't know the names of the different workspaces. A common behaviour we noticed is that users started to add category keywords on the wiki pages. These keywords are WikiNames that lead to pages that proposes hyperlinks to all pages belonging to the same category. This naive classification helps but does not scale because of all the complexity, richness and charm of human nature. What works for one may not work for another. There must be a way for organizing the chaos!

As a research project conducted in collaboration with ILOG, our group proposes to try using folksonomies and social tagging as a better way to categorise the wiki documents [26], [27]. Social tagging is an existing concept used in the public Web by popular sites such as del.icio.us and flickr. It is also widely used by webloggers. You can annotate your blog entries, the pictures you posted to flickr by adding some keyword associations to your work forming a quasi-classification on the fly. These tags are used by the technorati.com's web bots; and the link to your tagged

resource is added to the other entries that share the same tag. Not only that, but items at del.icio.us and flickr are also shown in the page. The main excitement with this way of tagging is its ability to *socialize a classification*. People can still use whatever tags they feel represent the content of their writing, but they may find out that this tag has never been used before. So there are more chances they will choose another tag that puts them into an active social classification than one that doesn't. And it is important to display this information as they are typing the tags (an auto completion mechanism similar to Google Suggest⁸ should help avoiding divergence). Seeing a gratifying number of entries for this tag provides positive feedback. If one really wants to choose a new tag, no problem. But it will be proposed as a choice when another person enters a tag that starts with the same letters, and maybe this person will in turn choose it. This way, users as individuals, can categorize their writing any way they want and therefore begin a grass roots taxonomy—or folksonomy to use what is becoming a popular term. Many resources, not only wiki pages may be tagged in an intranet: office files in a shared repository, mailing lists, etc. And if all resources are tagged the same way, a search for the keyword "software management" will hit both wiki pages and other resources as well. Interesting things happen via our proposal to link all these tags within a folksonomy where tags are organized in a hierarchy and related one to another using relationships like a synonymy relationship for example. A supervising tool can be proposed to some of the administrators that will show how frequently tags have been used, highlight new tags that are still not linked to any category, etc. Tags may be related if they appear frequently together, etc. We believe that social tagging minimizes cost and maximise user participation, while helping in building a better folksonomy and improving on users' inputs. The folksonomy is the concept that links the tags together. They may be described using the semantic web technology and empowered by dedicated search engines. We have developed SweetWiki, an experimental wiki engine that supports such folksonomies. It is powered by the CORESE semantic search engine [28] and rely on the semantic web standards of the W3C. Figure 7 shows a screenshot of a SweetWiki page'. In parallel we will try to add folksonomy support into the TWiki engine used by ILOG. This is ongoing research work.

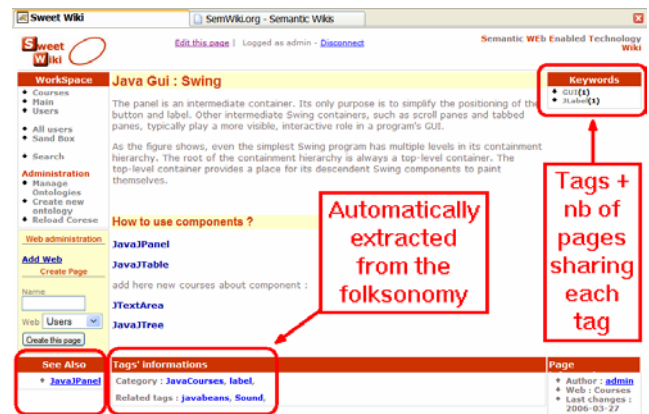


Fig 7. Faceted navigation links in SweetWiki.

6. Conclusion

We presented a synthesis of two experiences we had with intranet wikis over several years (CS department of the University of Nice

⁸ <http://www.google.com/webhp?complete=1>

and ILOG). Our research was carried out in two French organizations. Contextual factors, including norms and culture, are likely to differ significantly between and even within organisations and countries, and one must ask oneself to what extent these results can be generalised. This is the reason why we tried to correlate our measurements with other reports about other significant intranets articulated around a wiki (Google, Motorola, the NY Times Digital, Nokia).

We showed that using collaborative tools like wikis helps knowledge sharing and creativity. However, we pointed out that the solution to the problem of working better together can't be reduced to a tool or to a set of tools: several prerequisites are required for the group magic to appear.

It is hard to set up a wiki and to make people use it. Help from a local guru or from specialized private companies is necessary, technical skills for the software installation and maintenance are required but it is also very important to take care of the social aspects of users' participation. We tried to understand why some users are reluctant to use the wiki and why others adopt it without difficulty. We also looked at the wiki usage and we noticed that the wiki is mainly used for informal project management in addition to being a shared web-based notepad. In companies like ILOG or Motorola people developed many small Excel-like applications, while this feature has never been used by others.

Wikis did not scale well in our experiments, making navigation and search tasks problematic. We proposed a lead based on folksonomy and social tagging as a mean for classifying wiki documents in a user-driven approach that corresponds to the wiki culture and presented briefly an experimental wiki we are developing.

The literature on wiki usage in intranet is still small and we hope that other researchers will propose other case studies in order to improve our empiric results.

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