

Internet Collaboration: TWiki

Robert E. Raygan; UAB; Birmingham, Alabama

David G. Green; UAB; Birmingham, Alabama

Keywords: Collaboration, Wiki-Wiki-Web, Internet, Communication, TWiki.

ABSTRACT

This research paper covers TWiki, a Wiki clone, as a collaboration tool for the development of educational papers and technical projects. The need to conduct business and research in a collaborative manner will increase as a result of the downturn of the economy and a desire to reduce travel due to the events on September 11, 2001. The time has come to use Internet mechanisms to supplement face-to-face meetings and to facilitate collaboration.

The objective of using TWiki was to determine how the technology behind the application worked, and determine the usefulness and capabilities of incorporating its use with other groupware applications. The Wiki-Web concept has potential for technical, scientific, and project collaboration. This asynchronous method of collaboration fits well with synchronous collaboration tools, making it a valuable addition to any corporate or educational approach to “e” communications.

The results of using Wiki-Webs for paper development and small project management are favorable. However, any tool used for collaboration is constrained by the methodology and compliance to the methodology used by the participants. Getting “Round-to-it”, as with many new approaches, is the most difficult issue of Wiki adoption.

1. INTRODUCTION

1.1 The time has come to use Internet mechanisms to supplement face-to-face meetings, and to facilitate collaboration.

In his book, “Practical Internet Groupware”, Jon Udell describes Internet Groupware; “It arises from three distinct - yet interrelated - modes of document exchange: the Web, email, and Usenet conferencing. The confluence of these modes makes the Internet the mother of all groupware applications [1].”

This paper evolved from an interest in Internet Collaboration beyond Internet Relay Chat (IRC) and other collaboration tools as discussed in “Synchronous Meetings” [2]. This work explores the Wiki-Web [3] concept using an implementation named TWiki technology [4].

Table 1: Collaboration Activities – Asynchronous (A), Synchronous (S), and Mixed (M).

| ACTIVITY | A | S | M |
|-------------------------------------|---|---|---|
| Decision – Making | | X | X |
| Brainstorming | | X | X |
| Immediate Action | | X | |
| Deliberative Discussion | X | | X |
| Collecting Concepts | X | | X |
| Efforts requiring significant work. | X | | X |
| “Polishing” | X | | X |
| Time Shifting | X | | |

1.2 Collaboration

The Four types of collaboration commonly cited are: Event Coordination, Group Discussion, News Broadcasting and Monitoring, and Scientific Publishing [5]. Additional examples are project management and paper development -- both explored in this paper. Table 1 lists activities that drive collaboration methodology and technology choices.

One of the lessons of all collaboration activities is that technology is only a portion of the solution, arguably not the major component. This paper will discuss both the technology used (TWiki) as well as the methodology used to make effective use of the technology. For example, the IEEE Region 3 paper [2] documents group discussion using real time Internet Relay Chat (IRC) and the need to adhere to a pre-established procedure of conduct (agenda, discussion protocol, logs, etc.) and the use of a facilitator.

Generally, a mixture of approaches is necessary for effective long collaboration. Again, using the reported Region 3 experience as an example, the group uses IRC for discussions, web pages for distributing pre-reading material and agendas, and a newsgroup for threaded discussion.

1.3 Both asynchronous and synchronous methods are valuable.

Synchronous methods are where “...all parties are on-line and communicating at the same time while asynchronous means that parties do not have to be on-line at the same time [2].” Approaches for synchronous communication include face-to-face meetings, IRC, telephone conferencing and video conferencing.

Asynchronous methods of collaboration do not require all parties to participate real time in the communication. Examples of asynchronous communications include books, letters, e-mail, threaded discussions and web publishing.

Table 1 lists activities associated with collaboration showing which activities are generally done synchronously, asynchronously, or with combinations of both approaches.

1.4 Other considerations.

Other parameters impacting the choice of collaboration approaches include cost, bandwidth, user training, social issues like “body language”, and complexity. Collaboration is a means to an end and the selected approaches ideally allow effective work towards the larger goals of the collaboration.

1.5 The Wiki-web concept has potential for technical, scientific, and project collaboration.

Ward Cunningham's, Portland Pattern Repository's Wiki, Web site is a common starting point for studying Wiki concepts [6].

A Wiki-Web is formed around a topic or project effort. Components include a web server, Wiki engine, disk space communication channel, authors, and readers. At its core, the Wiki concept allows anyone to edit any page and thus the division between author and reader is small. New pages are linked to existing pages by means of a “WikiWord”. A WikiWord is made using text which has a capital letter first, then adding lower case letters before adding another capital letter, with no numbers or symbols between capitals. In practice, the WikiWord is used in an existing page. This word will show with a “?” after the update of the page. Clicking on the link associated with the “?” will start the process of creating a new Wiki page. Once created and saved, the “?” disappears and the WikiWord on the existing page serves as a hyperlink to the new page.

2. TWiki IMPLEMENTATION

2.1 TWiki Origins

According to the TWiki.org web site, Peter Thoeny installed the first version of TWiki on July 23, 1998. It was based on JOS Wiki. It was developed as a corporate tool at a company called TakeFive Software (now a Wind River company) [7]. TWiki is an implementation of a Wiki engine that strives to give more structure to the overall collaboration process while maintaining the ease of use for collaboration.

The original purpose of TWiki development was as a dynamic Intranet tool that technical support personnel could use as a knowledge base. The result of its use was to reduce customer support calls, and facilitate better collaboration within the company. As a result Peter Thoeny stated that TWiki helped the company to: Increase customer satisfaction, Reduce the number of support calls substantially, be more efficient in customer support, and increase the information flow between the offices (to and from the factory) [7].

Table 2: TWiki Features [4]

| FEATURE | COMMENT |
|---------------------|---|
| Any web browser | Edit existing pages or create new pages by using any web browser. There is no need for ftp or http put to upload pages. |
| Edit link | To edit a page, simply click on the Edit link at the bottom of every page. |
| Auto links | Web pages are linked automatically. You do not need to learn HTML commands to link pages. |
| Text formatting | Simple, powerful and easy to learn text formatting rules. Basically you write text like you would write an email. |
| Webs | Pages are grouped into TWiki webs (or collections). This allows you to set up separate collaboration groups. |
| Search | Full text search with/without regular expressions. See a sample search result. |
| Email notification | Get automatically notified when something has changed in a TWiki web. Subscribe in WebNotify . |
| Structured content | Use TWiki Forms to classify and categorize unstructured web pages and to create simple workflow systems. |
| File attachments | Upload and download any file as an attachment to a page by using your browser. This is similar to file attachments in email, but it happens on web pages. |
| Revision control | All changes to pages and attachments are tracked. Retrieve previous page revisions and differences thereof. Find out who changed what and when. |
| Access control | Define groups and impose fine-grained read and write access restrictions based on groups and users. |
| Variables | Use variables to dynamically compose your pages. This allows you for example to dynamically build a table of contents, include other pages; or show a search result embedded in a page. |
| TWiki Plugins | Easily install program enhancements using external plug-in modules. Developers can create plug-ins in Perl, with the TWiki Plugin API. |
| Templates and skins | A flexible templating system separates program logic and presentation. Skins overwrite template headers and footers; page content is unaffected. |
| Managing pages | Individual pages can be renamed, moved and deleted through the browser. |
| Managing users | Web based user registration and change of password. |
| Statistics | Create Statistics of TWiki webs. Find out most popular pages and top contributors. |
| Preference | Three levels of preferences - TWikiPreferences for site-level; WebPreferences for each web; and user level preferences. |
| Topic locking | Users are warned if another person is editing a page. This is to prevent contention, e.g. simultaneous page editing. |
| Referred-By | Find out back-links to a page. |

2.2 TWiki Basics

“TWiki is a cgi-bin script written in Perl. It reads a text file, hyperlinks it and converts it to HTML on the fly” [4]. The source code is available under the GNU general public license (GPL). The software can be made to run in a variety of environments with Linux being a frequent choice.

TWiki is a feature rich collaboration tool as indicated by the features list in Table 2. Development of additional TWiki enhancements is greatly facilitated through the GPL and a plug-in architecture.

Unlike some (completely) open Wiki implementations, TWiki has some security capabilities. In addition to normal web server and operating system hardening, users can be

authenticated and individual pages can have read/edit access controls.

File versioning allows previous versions to remain available for reference, audit and recovery. The core of this versioning system is the RCS (Revision Control System) originally written for software source code revision control. This software works well for text but poorly for binary attachments. Members of the TWikiAdminGroup can roll back pages but all users can view the versioning information.

2.3 TWiki Plug-ins

Plugins are very nice features of TWiki. They allow the functionality of TWiki to be extended in a modular fashion. Within the edit page of a TWiki page, special syntax can be written to utilize installed plug-ins. Once installed and referenced, the plug-ins will render various items such as an area for drawing, spreadsheets, calendars and even a Perl code test capability [8].

During evaluation, a Perl script was written to convert separated value files into TWiki table format. It seems feasible, that a plug-in could assist in displaying an attached or referenced file as Wiki table. The TWiki author could invoke the plug-in with the following text:

```
%CSV2TWiki "{http:// Wiki.attached.file.path}"%
```

Other plug-ins include database access, table of contents and topic trees. These topic trees allow all information related to a page to be rendered including parent and children page names.

3. CASE STUDIES

3.1 Overview

TWiki has potential for technical, scientific, project collaboration. TWiki was used to develop this paper, as well as, used for project collaboration on the Windows 2000 / Exchange 2000 Project at UAB. Coordination and administration is key to maintaining the TWiki, as well as providing demonstrations and training to new users.

Using TWiki in all of the collaboration modes has augmented other groupware tools. TWiki has become the central work area for members. Important information, which needs to have specific collaboration with tracking of responses, has migrated to the news group which was up and running more than five months prior to the TWiki installation.

The UAB TWiki farm has 22 users of 7 TWiki's for paper development, class related research, TWiki evaluation and project management as well as a site supporting IEEE Region 3 activities. As of the writing of this paper, over 2400 page saves were recorded in the web statistics feature of TWiki for all sites.

3.2 Project Management Tool

TWiki was used within the Windows 2000 project at UAB to maintain milestones, task list, module testing, and design. Initial Microsoft Project task list was exported to HTML opened in a spreadsheet and then saved as a comma separated value file. A Perl script was written to read separated value

files and format the data into TWiki table format. Once converted and inserted into a TWiki page, tasks were managed in TWiki using TWiki-style page generation for each sub-task or research activity required. TWiki's ability to present pages that had been recently changed was used extensively to track work by project management. TWiki facilitated efforts by the team that spread out over three buildings on the campus.

Templates for repeated tasks such as module testing were created. In this way, TWiki facilitated easy documentation of module tests providing a consistent format and access on various computers used for testing.

Project managers also used the WebStatistics link, which automatically configures when a Wiki site is made, to see who is contributing content to the project. Results were displayed in a table showing: Month, Topic views, Topic saves, File uploads, Most popular topic views, and Topic contributors for topic save and uploads. Under the "Topic contributors for topic save and uploads" header, a count is displayed by each users name per month. While using these counts could be inappropriate, they did allow discovery of situations where either work was not progressing or communication/documentation was being put off.

3.3 Paper Development

One of the goals in this paper was to document the organization, editing, collaboration, and opinions of the authors of using TWiki as a tool to develop multi-author papers. The same methodology would apply to documentation of any project.

During the "Brain Storming" portion of paper development, TWiki allowed collaboration between the authors, sharing new discoveries and thoughts on the use of TWiki.

Once the testing and research phase of the TWiki paper development had climaxed, the raw data was outlined for conversion to Microsoft Word format. After insertion into Word, the need for a "spell check" was highlighted as necessity for TWiki paper development. Strategies were adopted to write in TWiki, spell check in Microsoft Word, and paste corrected text back into TWiki as a work-around to this shortcoming. Discussions continue as to how to most appropriate integrate a spell-check plug-in into this web-based environment.

In the final stages paper completion, it was necessary to finish the paper development in Microsoft Word as per conference requirements and for rigid control of the printing of the paper.

When using TWiki to develop documentation, it is helpful to enter a (TWiki) page explanation at top of the page to facilitate the "Changes" page that uses this information in its presentation. This method of page development aids newcomers to the effort as well as those returning after working in another area.

Even on single author efforts, TWiki webs have proved useful. Using an Internet-based TWiki or a TWiki installed on personal computer, an author can easily capture ideas and concepts for later development. Generally, these ideas were entered on an "Observations" page. References can be captured before including them in the master Reference list for

the entire document.

As development of the paper progressed, content was removed from the Observations page into separate pages that focused on particular sections of the paper. This approach seems to be preferable to early generation of pages. This factorization of content into the “correct” number of focused sub-pages remains a challenge for each new effort.

One of the initial challenges faced when trying to prepare a paper using content from an established Wiki site is the sheer volume of links. One can easily get lost. For paper development, first establishing an outline where topic areas are WikiWords has proven to be quite effective. This was the original approach taken for this paper. Using

```
%INCLUDE{“TWiki.FullPaperName”}%
```

allows the full paper to be viewed as a whole while keeping the actual contents of the main outline page to a minimum. This inclusion approach is both convenient for the author and works around a size limitation that some browsers have in uploading large pages back into TWiki.

3.4 Other Case Studies

Some case studies mentioned in “The Wiki Way, Quick Collaboration on the Web”, are XP Wiki, New York Times Digital, TWiki at TakeFive, and TWiki at Motorola [7]. From these case studies it is apparent that for a Wiki to work in any environment a dedicated editor/administrator is required and user training is essential. Additionally, these studies indicate that Wiki projects are best used for small teams (20 people and under) with some type of formal structure.

The use of Wiki for Extreme Programming (XP) was a good tool since XP development uses a concept of “cards” which easily map to Wiki pages. Documentation and task lists are additional uses, which combined to give a total project management platform for software development. Motorola deployment used TWiki for requirements capture, newsgroup, cooperative authoring environment, rapid production of Web pages, subsequent publishing, issues lists, and a meetings calendar [7].

4. OBSERVATIONS

4.1 Wiki Observations

A person’s first impression of Wiki is usually of chaos. The very nature of Wiki allows everyone to generate links to various pages and web sites at will. Some user education and training is necessary. The cited references in this paper serve as good introductory material. Wiki provides a method for rapid web development. Once accustomed to the formatting rules, pages can be prototyped and saved as HTML easily.

There are a multitude of Wiki implementations varying in features, implementation language and platform. While some of this re-implementation is useful, it would be useful if some of this re-implementation effort were used for extending the capabilities of a few Wiki implementations. This problem is not exclusive to Wiki implementations.

Wiki pages must be maintained just as other documentation. The authors have found that often the original author produces content, conversation about the content occurs at the top of the page (or the bottom or after the paragraph) and when consensus is reached, the content is modified and the discussion either included in the content or eliminated.

Using a Wiki for real time capturing of meeting information has proved effective. The success of this effort is directly related to having a trained user and a well thought structure built before the meeting.

One Wiki problem tied to its web implementation is the need to consider writing for web-readers rather than paper readers. There is a tendency by some authors to use cut and paste methods drawing on source information rather than restating the information in web-style. This tendency can reduce the effectiveness of the Wiki.

When one is starting a new site, one needs to give some consideration to WikiWord naming conventions. The more logical the naming convention is to the users, the more effective they are in providing the proper linkages.

4.2 TWiki Observations

One very useful addition to Wiki concept that is implemented in TWiki is the ability to upload files using the web browser and attach these files to a TWiki page. These attachments also participate in the version control system. This reduces the cost of sharing files for collaborators since they do not have to learn FTP or similar mechanisms for putting such content on the web.

The ability to see what has been changed is very valuable. The underlying RCS is line oriented so it is important to format the information into lines rather than use the browsers automatic wrap feature if this revision display is to be exploited fully.

TWiki also uses page locking to avoid the scenario where changes are lost when two authors make changes in parallel. This locking is very effective and the locks expire after one hour (by default) to reduce problems associated with some who stops their efforts in mid-edit (which leaves the page locked).

4.3 Other Observations

Instructors in the academic environment could use TWiki for class assignments. TWiki’s page security would need to be developed to control change access. Using the TWiki page include mechanism would allow a “locked down” assignment to be hosted within a page where the entire class could discuss the assignment. A small tool would need to be written to easily import students names to generate their registration and create a student personal secure space that only themselves and the instructor could edit. For classes requiring various electronic files to be emailed, or transferred to a directory, TWiki would greatly facilitate prompt delivery. Homework could be graded and commented by the instructor providing feed back to the student.

A browser-based application to assist one in writing documents in TWiki format would be useful. Perhaps the design of such a tool would use hot keys or buttons to insert headings, bullets, numbered list, etc. similar to an html editor.

A pda-based interface would be useful as well.

5. CONCLUSIONS

It is the authors' opinion that TWiki is a valuable tool for Internet Collaboration. With minimal training, users can begin using the system. For collaborations involving asynchronous communication that are web-based, Wiki concepts and the TWiki implementation should be considered. The available revision control, ability to attach other documents, manage access control and detect changes is very valuable.

User training is required. Like all interaction models, methodology is necessary as well as technology. The training should involve both. Many of the successful projects have one or more methodology advocates who nudge the collaborators to following the methodology to increase group effectiveness.

Wiki webs are not a synchronous technology. Many projects need either synchronous or nearer to synchronous approaches for some communications. The authors have used e-mail, instant messaging and telephone calls in the projects cited. It is also noted that in this effort, all parties had ample face-to-face meetings to become familiar with each other so that the intranet technologies were not hampered by problems associated with the missing unspoken communication (like body language).

TWiki was also found to be an excellent tool for development of project documentation and paper development. The authors expect to benefit from the methodologies that have evolved to facilitate the specialized work flows.

REFERENCES

- [1] Udel, Jon, *Practical Internet Groupware*, O'Reilly & Associates, Inc, ISBN: 1- 56592-537-8, 1999
- [2] Green, David; Lord, Charles; Ratcliff, William, ...; "Synchronous Meetings - Version 1.1c", IEEE Region 3 Paper, <http://www.ewh.ieee.org/reg/3/e-conf/guidelines/>
- [3] "Welcome to the PortlandPatternRepository and WikiWikiWeb front page.", <http://c2.com/cgi/wiki>
- [4] "TWiki - A Web Based Collaboration Platform", <http://twiki.org/>
- [5] Udell, Jon, "Internet Groupware for Scientific Collaboration", <http://software-carpentry.codesourcery.com/Groupware/report.html>
- [6] "Portland Pattern Repository's Wiki ", <http://www.c2.com/cgi/wiki?WelcomeVisitors>
- [7] Leuf, Bo and Cunningham, Ward, *The Wiki Way -- Quick Collaboration on the Web*, Addison Wesley, 2001.
- [8] "TWiki Plugins Repository", http://twiki.org/cgi-bin/view/Plugins/WebHome#TWiki_Plugins_Available_for_Down

BIOGRAPHIES

Robert E. Raygan

MSEE Student / Project Engineer
Department of Electrical and Computer Engineering
The University of Alabama at Birmingham
Birmingham, AL 35294-4461 USA
E- mail: raygan@uab.edu

Robert Raygan is the Project Engineer for the campus deployment of Windows 2000 Active Directory at The University of Alabama at Birmingham (UAB). He will finish his Masters of Science in Electrical Engineering August 2002 adding to his BSEE and BA, both from UAB. He is an active IEEE member. Work experience includes Imaging Projects Coordinator for Ascension / St. Vincent's Hospital in Birmingham, Computer Module Manager for UAB Vision Science Research Center, MIS coordinator producing Photo Simulations for SBA Communications, and owner of Raygan Commercial Photography studio. Robert Raygan's research interests include remote data collection and management, Internet collaboration and video image processing.

David G. Green, IEEE Senior Member

Associate Professor Department of Electrical and Computer Engineering
The University of Alabama at Birmingham
Birmingham, AL 35294-4461 USA
email: dgreen@uab.edu

Professor Green has served in the Department of Electrical & Computer Engineering at The University of Alabama at Birmingham (UAB) since 1981 and previously taught at the University of Alabama at Huntsville. Among other current activities, he is the Project Director for the Windows 2000 Active Directory project at UAB. He has published more than 20 technical papers and reports. Professor Green is the UAB IEEE Student Branch Counselor. He is an active IEEE volunteer presently serving on the Educational Activities Board of the Institute. He is a participant in the IEEE effort to create a career guidance system for undergraduate engineering students as well as numerous other projects in Regional Activities and Technical Activities in IEEE including entity web hosting, electronic conferencing, and on- line web databases. Research interests include software design methodologies, embedded computer systems, collaboration technologies and methodologies, computer networking, and engineering education.