

Low Cost Collaborative Tools for Virtual Communication

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Abstract

How much of the information worker's production depend on collaboration? How much of that collaboration is mediated by information technology? The Gartner group predicts 60% of an individual's work within five years will depend on group input from team members, many located in different countries and time zones (Grigg, 2001). Working in virtual mode with co-workers, clients, and even competitors will be the norm for our graduates. How are universities preparing students for this future? What experience do students have working in virtual teams in their classes? What technology exists to support collaborative group work that is low cost so that it can be widely used by academic institutions? The purpose of this research is to explore the ability to deploy and use of virtual tools for information systems education. Since cost is a critical factor for schools, our goal was to find and evaluate free (or low cost) collaborative platforms appropriate for use in student team projects. We have found there is a wide assortment of such tools for no cost or with a low cost subscription models. This paper will describe the tools available and discuss their application to course assignments.

Keywords: Virtual teams, collaborative tools, open source, group work

1. INTRODUCTION

Information systems education is deeply committed to the use of team projects. The rationale is that group work translates into skills that enable students to be more productive in the work environment. However, the nature of teamwork in industry is changing drastically. Teams now span divisions, time zones, and countries by operating in virtual mode. Research clearly shows that there are many challenges for virtual teams (Cramton, 2001).

Leadership is a critical issue. So is flexibility and adaptability in the use of technology. Virtual teams are more prone to breakdowns from miscommunication and technical glitches. Students need to be exposed to

these challenges before they encounter them in the workplace. While trade articles are full of "success stories," companies are reluctant to divulge problems or failures (Majchrzak, 2004). Therefore, the classroom is the best place to try out virtual teams, and provide an opportunity for students to reflect on their challenges and advantages.

The move to virtual mode

Even in "traditional" brick and mortar companies, more and more communication takes place in virtual mode. Frequently the tool of choice is e-mail, but managing e-mail is a daily and time consuming task. Employees also turn to instant messenger to coordinate activities, even when company policies prohibit its use (Majchrzak, 2004). While e-mail

and instant messenger are popular choices for virtual collaboration, they are by no means ideal choices. E-mail is slow and disorganized. Instant messenger is typically not logged, and even a log is not very helpful after the fact. The dependence on e-mail and instant messenger means projects go forward without a comprehensive shared archive of communication. This hinders new team members, who cannot catch up by reviewing earlier messages.

Although we have gotten used to using e-mail for everything, there are low and no cost options that offer better support for collaborative work. There are tools that automatically archive messages and threaded discussion. Other functionality includes the ability to work on a shared document or other artifact in virtual mode. Each of the options described in this paper are available for a small fee or as open source tools. Each of these has different characteristics or "personalities," that facilitate one mode of group interaction over another. Many virtual teams end up using multiple tools to coordinate their interaction.

Basic requirements of group work

Research has shown that group work contributes to deeper and more effective learning (Hiltz, 2005). A basic requirement for groups to function effectively is "collaboration," defined as communication and cooperative processes that enable groups to complete a task. Effective communication is a basic element for collaboration, may it be verbal, textual or visual. When it comes to virtual collaboration, the medium used for communication should be capable of providing a common platform to share ideas and resources and an arena to discuss different issues in synchronous or asynchronous mode with maximum interaction and with minimum technical effort.

There are a number of groupware tools available freely in the public domain that supply some or most of these requirements. The tools we will describe in this paper include wikis, Blogs, Microsoft SharePoint, and the open source product Collaborative Virtual Workspaces.

2. WIKI

Wiki is server software that allows users to freely create and edit the content of a wiki

Web pages using any Web browser. Wiki was created by Ward Cunningham to support the software pattern community (Wagner, 2004). Wiki supports hyperlinks and has simple text syntax for creating new pages and cross links between internal pages on the fly. Wiki is optimized for intense collaboration and fast shared knowledge creation shared by multiple authors (Wagner, 2004).

There are two main components that make up wiki. The user interface is made of a collection of editable web pages, connected by software to manage the web pages. Wiki web pages can be created and edited by anyone who uses it, and each page is built using contributions from various users updating and editing them. Most wikis, especially those supporting development projects, require a login that tracks the identity of those who access the site and make changes (Wagner, 2004).

One of the most successful wiki applications is www.Wikipedia.org, an exhaustive online encyclopedia of thousands of topics created and maintained by hundreds of volunteers. Although it seems that letting "anyone" add anything would lead to chaos, WikiPedia is considered one of the reliable sources of information on the web. At work is the "many eyes" principle, a principle of open source development, where mistakes or inappropriate content are quickly found. Wiki software enables a quick response to errors by using continuous version control, keeping a history of changes to allow rollback if necessary.

Wiki is really a generic name for a kind of software. There exist many dialects of wiki that vary slightly in the markup language used to create pages. Some examples include TWiki, and QuickiWiki. A site that offers free hosting of wikis with a simplified wiki language is www.seedWiki.com. All wiki pages have these key characteristics:

- Web pages and documents can be authored collectively
- Previous versions of edited pages are saved and can be restored
- The pages are created using simple markup language which is a simplified version of HTML. HTML content is also accepted usually.



Figure 1: How to edit a page on Wikipedia

- The content is not reviewed before its publication, but anyone can later edit or delete published material.
- Whenever a user creates a hyperlink using the markup language a new page is created when they click it.

The software that manages the wiki pages and provides all its functionalities is known as "wiki engine". There is no common or universal wiki page. Anyone can create their own wiki engine in whatever language they prefer implementing the basic principles. There are currently many wiki engines available written in different languages such as Perl, PHP, CGI, or Python.

An example wiki page from WikiPedia is shown in figure 1. There is usually an option to "edit this page", except for certain pages where security and administrative issues restrict edit access.

A new wiki page is created when a user clicks a link for which there exists no page, or by creating a page using camel case (i.e. CamelCase). After this the user can edit the newly formed page using the markup language for that particular engine. Details of changes made on existing pages are stored in "history" section of the portal. Wikis keep all previous versions of the pages along with any changes. There is also an orphan pages section keeps track of all the pages that are without links to them. To facilitate the growth of a wiki a list of open tasks or open links is kept, pointing to pages needing revision or content.

Wiki has become a very popular tool for teams developing and maintaining software projects. It allows developers and testers to quickly post issues, problems, and bugs, and remove them from the list as they are resolved. An example is a wiki dedicated to supporting UPortal, <http://iasigch.princeton.edu:9000/display/UPC/Home>. UPortal is an open source product providing portal functionality to colleges and universities (see figure 2).

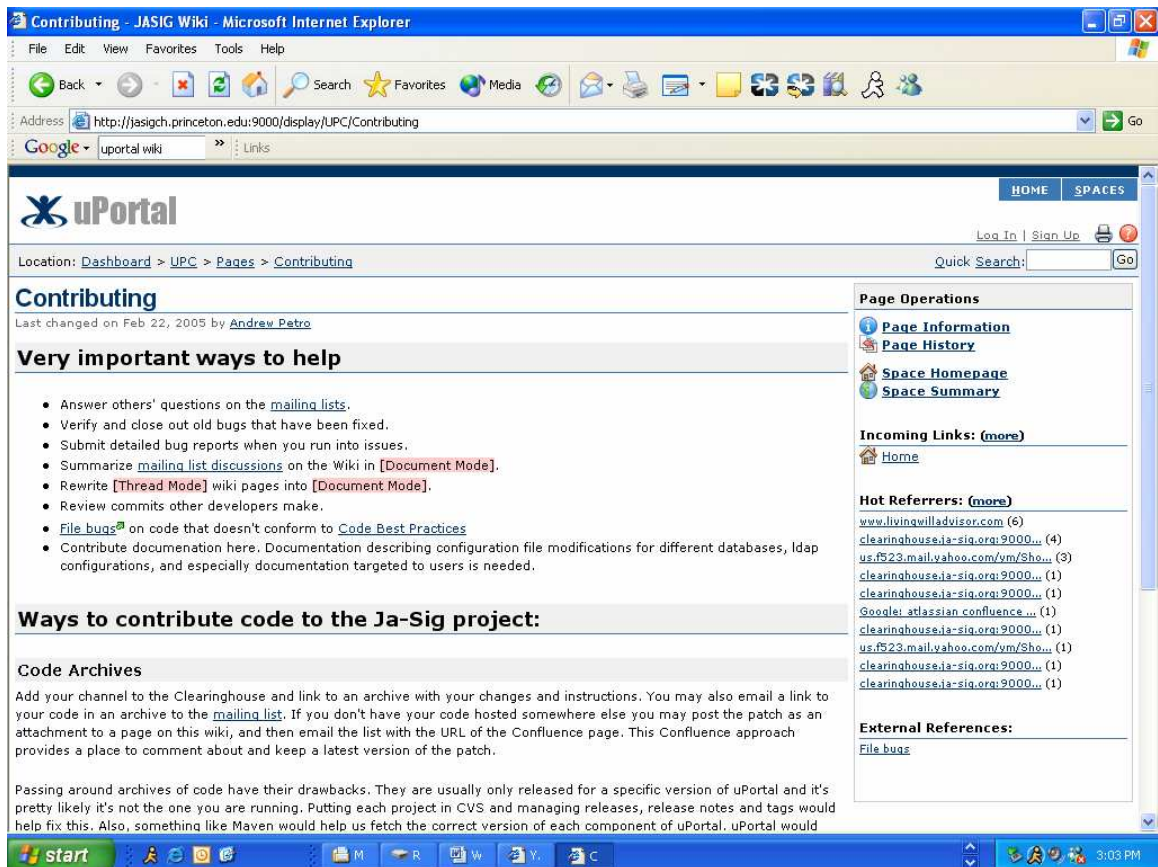


Figure 2: uPortal Wiki supports collaboration among open source developers

How can student teams take advantage of Wikis?

Wikis are appropriate for teams developing software and other collaborative projects where the final product is a team effort. Many open source projects maintain a development wiki for bug reports, project milestones, and status reports. Wiki is also very useful for quickly collecting and categorizing areas of knowledge, similar to what is done with Wikipedia. IS World (www.isworld.org) has recently added a section for research wikis, including a wiki for IS Scholarship, <http://ic.bz/>, that posts reviews and commentary on current IS research papers and topics

3. BLOGS

Blogs, short for web logs, are online journals. They provide an opportunity for indi-

viduals to express their opinion on a wide variety of topics. A blog is an easily created, updatable website that an author can produce with little knowledge of HTML, FTP or any web design tool. A blog can literally be an online journal, a filing cabinet, a discussion forum, a photo album, a collaborative space between teacher and students of a class and so on depending upon author's requirements and intentions.

Blogs share the following characteristics:

- Contents of a blog, displayed with the most recent posting on top, represent opinions by authors and comments by various users on the particular postings. They are marked with the date and time.

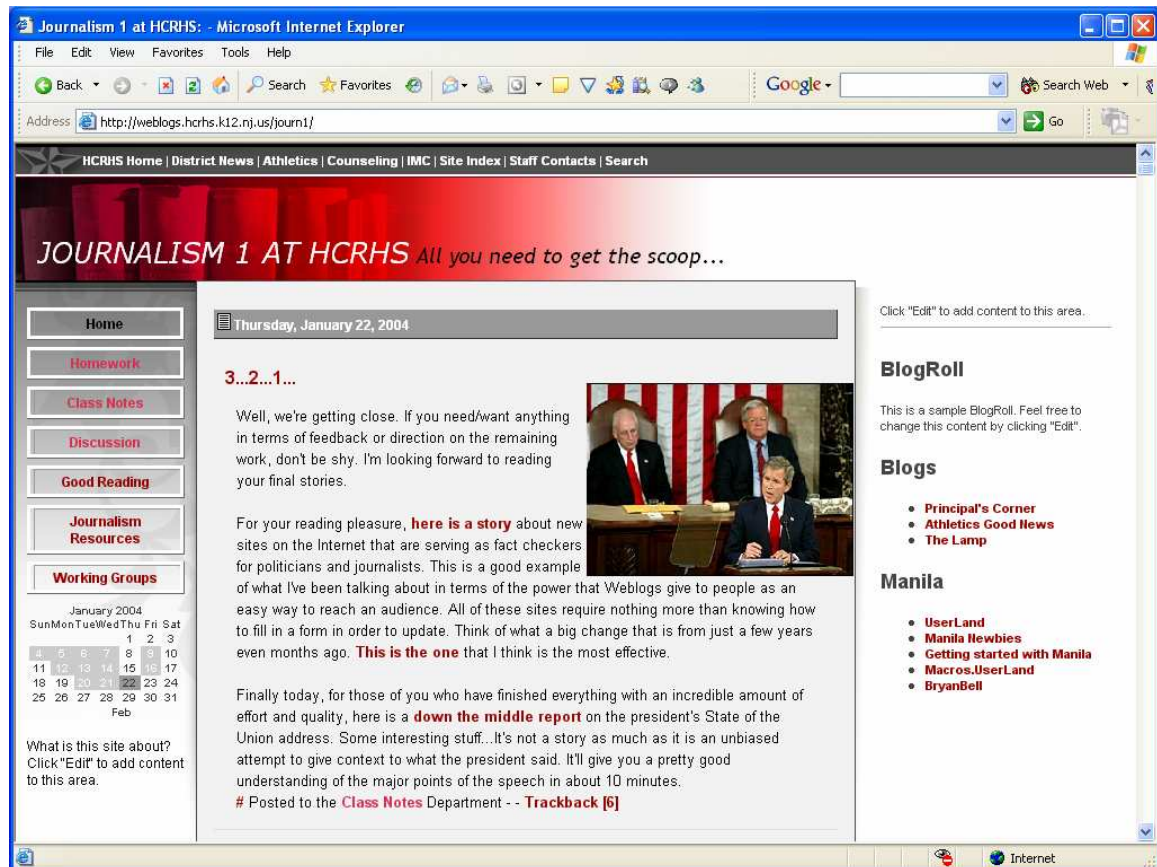


Figure 3: Web blog managed by Will Richardson of American High School for journalism class

- A blog is mainly public. Anyone can see it and post comments on it. Of course most blogs allow the author of the blog to manage malicious postings.
- The main entries on a particular blog come from the author of the blog. Others can post comments on them.
- Old postings are accessible through archives.

How schools can use Blogs

The ability to quickly put up content to spark discussion in a readable, easy to navigate format make blogs a popular education tool. They provide a common interactive platform between student and faculty, both for face to face classes and those that are geographically dispersed. Educators all over the world have found blogs very useful and more and more educators are using blogs as a

medium of communication and collaboration for their courses.

Figure 3 shows a blog managed by a teacher for a class. As can be seen there are links for homework, class notes, discussion, reference readings and other resources. Also there are links to other blogs as well. Blogs for classes are often hosted on free services such as blogger.com. However, this does create some administrative problems, since course work is located on machines that do not belong to the university, leading to thorny management problems. For example, are students required to conform to appropriate use standards for their course blogs hosted at blogger.com? An alternative is the use of a blog hosting service that includes tools for authenticating users and administrative management. Companies such as 21 Publish (www.21publish.com) offer a low cost blog hosting service that gives administrative control to the school or teacher setting up the web site. It also allows schools to

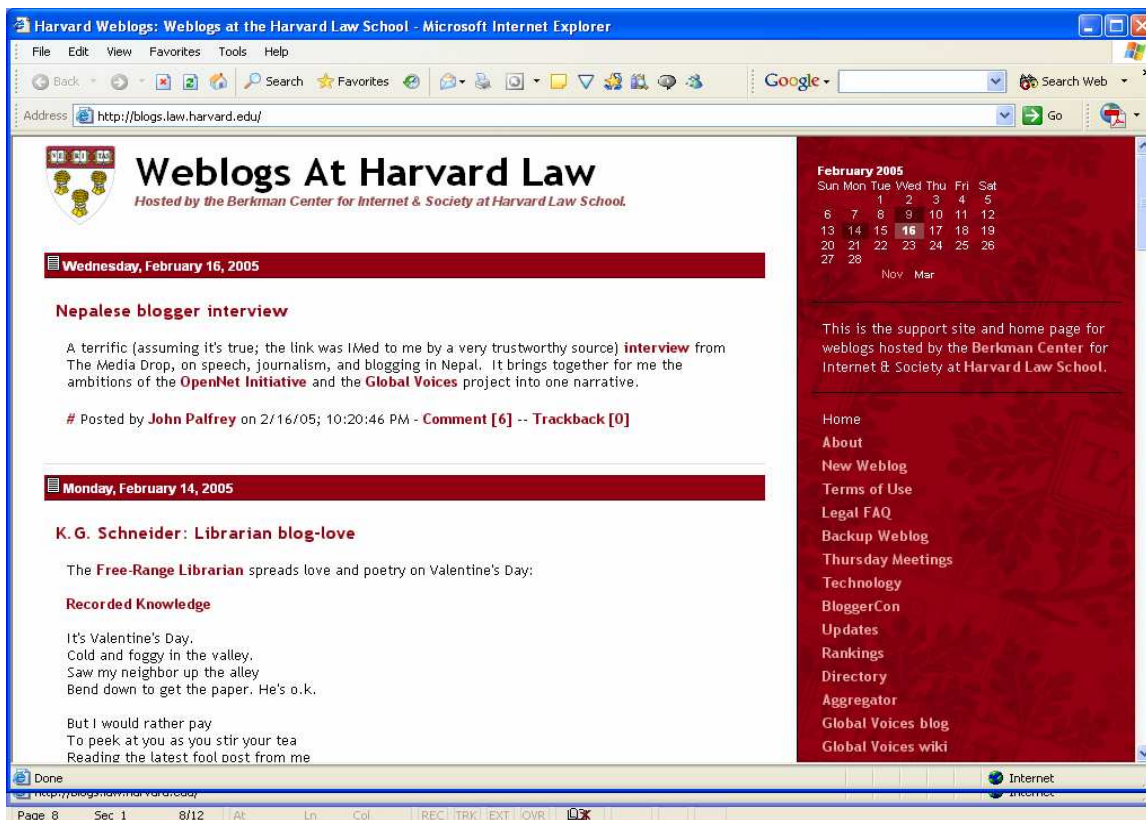


Figure 4: Weblog maintained by Harvard Law School

create a standard blog format or template that components of the university, such as clubs, departments, and student organizations, can use to create their sites.

This allows very easy web publishing with the same look and feel for an organization, while allowing departments and sections editorial control over their blogs. 21 Publish also supports private discussion within a closed community, such as a university committee structure.

For example, Dresdner Kleinwort Wasserstein, the German investment bank, has set up about 120 internal blogs to promote discussion and distribute information. "We think of it as the open-source marketplace for ideas," says JP Rangaswami, chief information officer. "It lets us expose concepts or issues to a wide audience and discuss them dispassionately." (Hobson, 2004) Blogs also have the additional benefit of allowing authors to be identified with their ideas. This gives credit to those who participate and contribute to a discussion. Schools are also using blogs as interactive web sites to facilitate better internal communication. As

shown in figure 4 the Harvard Law School has its own web blog used for various announcements and discussions.

4. MICROSOFT SHAREPOINT

Microsoft SharePoint Products and Technologies is an enterprise level collaboration and document management platform. It provides very sophisticated functionality through a web portal, allowing group, department, or public access to information resources. SharePoint is a much more robust tool compared to blogs or wiki. It has functionality for document management, including versioning and check out facility that locks out changes to a document while it is being worked on. SharePoint can serve as a development tool for private and public portals, and handles user administration and role management (English, 2004). Although SharePoint is not a free product, it is included along with many other Microsoft products in the Microsoft Developers Network Academic Alliance subscription, available to schools for \$799 a year (<http://msdn.microsoft.com/academic/program/overview/>).

Windows SharePoint Services is a collection of services that you can use to share information, collaborate with other users on documents, and create lists and Web Part pages. You can also use Windows SharePoint Services as a development platform to create collaboration application and information-sharing applications. SharePoint includes these key features:

- Document check in/check out, versioning
- Shared calendars, discussions, surveys
- Templates for sites
- Integration with Office 2003, which allows users to edit documents directly on the SharePoint server
- Granular security roles and access control

How schools are using SharePoint

SharePoint is used to support the curriculum of the Eugene M. Isenberg School of Management at the University of Massachusetts/Amherst. All the school's core courses are using SharePoint. Students have one-click access to information resources and faculty members can identify curriculum assignments from the thousands of journals in the University of Massachusetts/Amherst Libraries. SharePoint also supports workspaces for individual student teams. These are used to post and collaborate on documents and project requirements. All material posted either in group workspaces or anywhere in the SharePoint portal is searchable (Microsoft, 2003).

5. COLLABORATIVE VIRTUAL WORKSPACE

Collaborative Virtual Workspace (CVW), an open source tool available at <http://cvw.sourceforge.net/>, provides a common platform through which geographically dispersed team members can collaborate using video, audio, and text. CVW was developed in 1993 for the US department of defense by the Mitre Corporation (Spellman, Mosier, Deus, & Carlson, 1997). Military planners recognized the critical need for a responsive and flexible communication tool connecting globally dispersed actors. The complexities of dynamic international upheavals require a shortening of timelines for decision making, a heightened demand for

sharing assets, and an increase in coordination within the intelligence community. The ability to respond quickly and appropriately focuses attention on the importance of team building and the flexible use of suitably skilled personnel. The need for a powerful, flexible communication platform was the primary motivation for the development of CVW (Mitre, 1997). The Mitre Corporation made the tool available as open source in October, 2000. It is testament to the influence of the open source movement and the culture of the internet that this product, costing millions to develop, is now in the public domain.

CVW provides the metaphor of "rooms" to describe the workspaces where information can persist, and team members can "enter," similar to ones provided by chatting applications. Rooms are the places where team members come together and exchange information as well as documents. A member can put any document in the room and all the members signed into that particular room can read as well as can view details of the document (author, date created, last change etc). The most valuable feature of the room is "persistence". Persistence means that a particular room and all information associated with it will exist on the server even when all the members have signed out of the room. Documents in the room will remain there until some authorized member moves or deletes it.

CVW supports various documents types, such as word processor, spreadsheet as well as notes, URLs and whiteboards. All the documents are managed by a document server within CVW. This server keeps all the documents on a separate file space different from user's file space and also enforces single user editing by check-in check-out facility. Tracking of all changes made to a particular document is also maintained and a summary is provided to the user at the end of saving after editing.

While CVW shares some similarities with chatting application there are many salient features of CVW that enhances its potential as a tool that can be used by students of a class or a group of faculty. This can also include groups of geographically dispersed members.

Rooms allow people to share documents of various types. Students can share their notes and materials through this medium.

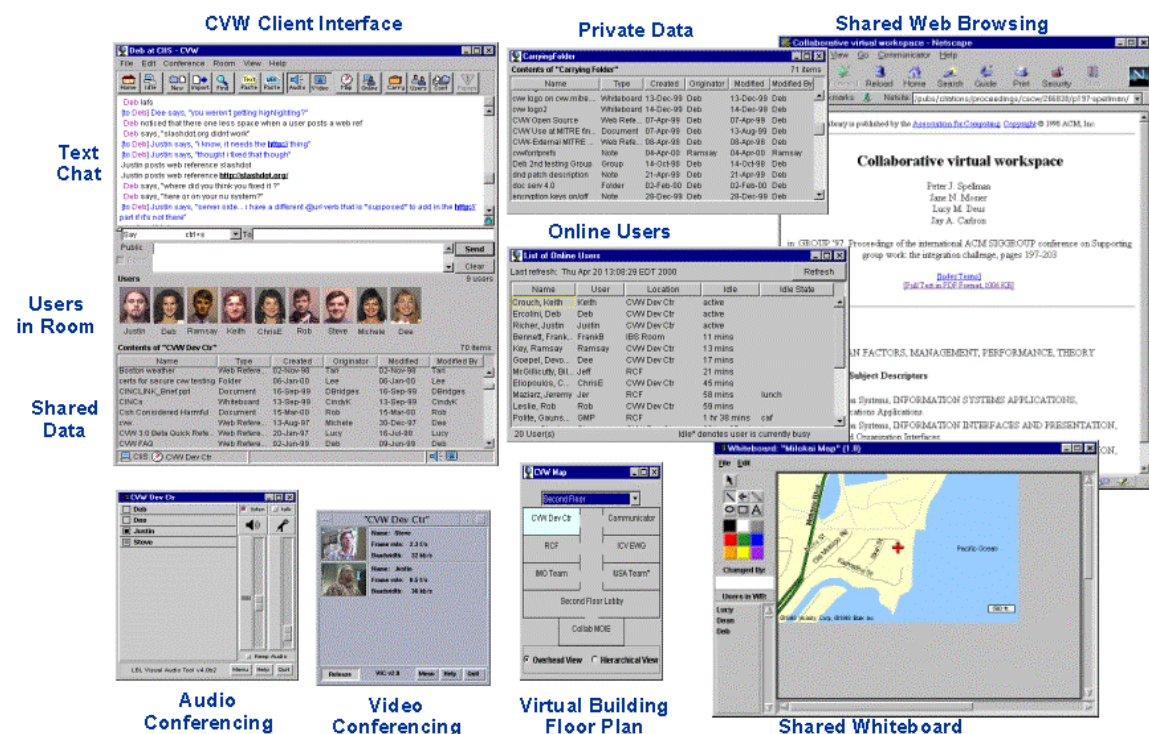


Figure 5: Overview of CVW functionalities

An author can set a lock on his documents so as to restrict other members from editing them or set access in such a manner so as to share them with his group members only. This provides privacy and security for documents. Also a faculty member can put a lock on student submissions so that no one can copy them or view them.

Messages from many to many, one to one, one to a selected few are facilitated. This enables a particular student to student, student to faculty, faculty to faculty, student to group communication during a meeting or discussion.

There is a facility called **"room recorder"** through which students and faculty can keep track of the points and agendas discussed in a particular meeting or discussion since they are saved automatically by this recorder in a file.

CVW has a feature known as the **"shared whiteboard"** that allows multiple users to view an image (a map, process diagram, blueprint etc.) and annotate the image in a real time. The whiteboard is persistent and remains even after the discussion ends. Annotations from different users are marked so as to facilitate the contributor's identification. Also the contents of the white board

can be printed and exported to a file so that it can be included in a file or report. This facility can be exploited by students doing a project in a group to discuss various issues and later include them in the report. In addition, several students -- located in different places -- can work simultaneously on a particular diagram or a process plan.

CVW provides multipoint audio and video conferencing capabilities. The audio and video conferencing is self-configuring on a per room basis, providing conferencing capabilities with other the other people in the room. Users do not have to establish conference sessions or know other users' locations to use audio and video; they need only enter a room. CVW also provides a phone capability for private audio discussions between two users. This facility along with whiteboard makes multi location meetings and conferencing a real fruitful experience.

A search capability allowing search of different users as well as documents make it easy to determine a particular student or faculty's availability and search of a document based on its description.

Figure 5 shows various windows and features of CVW. The look and feel resembles that of instant messenger but the functional-

ities are having a much wider spectrum in case of CVW.

6. CONCLUSIONS

Tools like wiki, blogs, SharePoint and Collaborative Virtual Workspace (CVW) contribute towards the purpose of virtual collaboration, although achieved differently by each of them with some specific additional features and capabilities.

Wiki's open editing feature makes it suitable for use as a common whiteboard for serious and knowledgeable brainstorming. Blogs, where posts are identified by author, can be used to discuss openly topics of similar interests, express individual viewpoints, as well as to make announcements. SharePoint is an enterprise level document management tool, which can also be used as a knowledge management portal that delivers information regarding courses, contents, faculties and other offerings from a particular institution in a very organized manner. SharePoint supports both public and private view of the contents as well as authentication and role management. CVW is like a virtual classroom or boardroom where participants have the facilities of audio and video conference, whiteboard, public recorder and personal or public conversation. Sharing and exchanging documents of different types is also an integrated feature that makes CVW an exciting tool to work with.

It is hard to imagine any professional career where collaboration is not an integral part of work. The continued growth and dependence on virtual collaboration is inevitable. Ten years ago software such as Mitre's CVW cost millions of dollars and was only available to military and intelligent experts. Today CVW as well as other tools of collaboration are available for free or little cost.

Colleges and universities need to explore and implement these low cost options and work to integrate collaborative tools into all parts of their curricula. Virtual collaborative skills are a necessity for the modern information worker. This pressing need along with the existence of inexpensive solutions makes a compelling argument for the deployment of low cost collaborative tools in higher education.

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