

## Comparative Analysis of Collaborative Authoring Tools

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**Abstract:** Collaborative authoring tools offer a relevant support in the context of eLearning, where the collaboration of course authors as well as the collaboration of learners are key activities. The paper aims to give a comparative overview of some of the most relevant collaborative authoring tools with regard to their characteristics and functionalities.

**Key words:** Authoring Tools, eLearning Systems, Collaborative Authoring

### COLLABORATIVE AUTHORIZING AND COMPUTER SUPPORTED ACTIVITIES

Mainly based on the permanent evolution of Information and Communication Technologies (ICT), a lot of activities offer now Computer Supported alternatives of work. As a common characteristic of all these activities we may find out that, regardless of their specific goals, there are always (at least) two kinds of entities involved: the human being and the computer. Thus, the largest field we have to consider is Human-Computer Interaction (HCI).

A very important distinction to be made in HCI is between individual and group specific interaction [4],[5]. As Stahl points out, "The potential of computer support for groups is perhaps even higher than that for individuals because communication within groups has until now suffered from severe constraints that may be eased by computer support." [5]

From a chronological perspective, the first domain having the collaborative dimension who emerged in the larger field of HCI was Computer Supported Cooperative Work (CSCW). The basis of CSCW is the so called Groupware, a collaborative software designed to offer support to people involved in a common task.

Groupware is also the basis of CSCL (Computer Supported Collaborative Learning), concept who was first publicly coined at an international workshop in Maratea, Italy, in 1989. The relationship between CSCW, CSCL as parts of groupware approach is mentioned, for example, by Stahl who remarks that "academically, the exploration of groupware has historically been split into two separate domains: CSCW and CSCL, which address issues of computer support for cooperative work and collaborative learning, respectively." [5]

The most recent field of HCI, strongly related to CSCL and CSCW is Computer Supported Collaborative Research (CSCR). A very useful analysis of the meaning of CSCR and its relationships with CSCW and CSCL inside HCI belongs to Hoare: "The relationships between CSCW, CSCL and CSCR are determined by the differences between work, learning and research. Learning is a specific type of work and research is a specific type of learning. The process of research is a learning process but one which is highly refined and involves learning in a particular way." [11].

Hoare establishes that each of these domains may be specified as containing a number of distinct spaces which contain specific activities. Based on a comparative analysis of different definitions, he identifies the main differences between CSCW, CSCL and CSCR (Table 1).

Regardless of the category their member belongs to: workers, students, researchers, an usual goal of teams is to jointly produce a result (document, project, scientific report, etc.). Considering the groupware perspective, we may call it collaborative authoring (sometimes referred to as *collaborative writing*). Therefore, based on the relative position of collaborative domains inside HCI, we may add the collaborative authoring as a specific part of each of the domains (figure 1).

Table 1 - Differences between CSCW, CSCL and CSCR (apud [11])

<b>CSCW</b>	<b>CSCL</b>	<b>CSCR</b>
<i>Focuses on communication techniques</i>	<i>Focuses on what is being communicated</i>	<i>Focuses on new communications</i>
<i>Used mainly in a business setting</i>	<i>Used mainly in an educational setting</i>	<i>Used mainly in a research setting</i>
<i>Purpose is to facilitate group communication and productivity</i>	<i>Purpose is to support students in learning together</i>	<i>Purpose is to support researchers in working together</i>

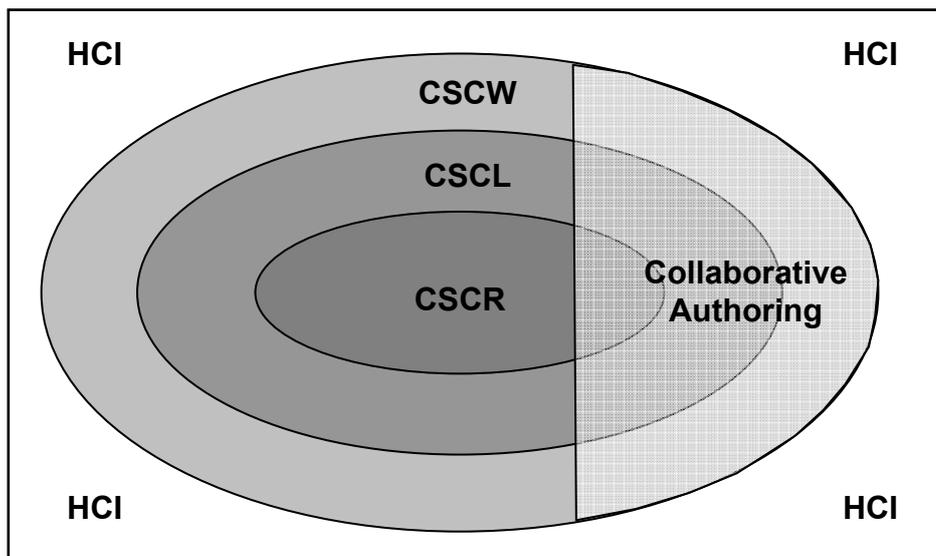


Fig.1. Collaborative authoring and collaborative domains within HCI

Without excluding the other two domains, we consider mainly in this paper the collaborative authoring tools related to CSCL, together with its connection to eLearning systems. About this connection, we consider as representative the opinion expressed by Keenoy et al.: “What should be borne in mind is that CSCL is not the same as e-learning: E-learning is the delivery (by electronic means) of educational content to learners who are not necessarily in the same place at the same time. On the other hand, CSCL can be done by teachers and learners who are together at the same place and time.” [6, p.8]

In our vision, the authoring process extends beyond the condition of "the same place" and sometimes "the same time" too, because we may identify different approaches in the area of collaborative authoring tools production.

**REQUIREMENTS FOR COLLABORATIVE AUTHORIZING TOOLS**

Collaborative authoring requires an effective and efficient communication between all the members from the authors group [1]. In order to accomplish this, authoring tools should be used for creating collaborative content documents. To ensure a high quality of the final result, these tools must comply to certain standards. The lack of standards determines the deep fragmentation of collaborative authoring products market by reducing the number of available options and the binding of authors to specific systems.

One of the most used standards for content reuse and interoperability is SCORM (The Shareable Content Object Reference Model) which represents a set of technical specifications correlated with the activities of AICC (Aviation Industry Computer-Based

Training Committee), IMS (Instructional Management Systems) and IEEE (Institute for Electrical and Electronics Engineers / Learning Technologies Standards Committee), allowing the creation of documents with unique and unitary content. [7]

In order to provide the basis for analyzing collaborative authoring tools it is helpful to identify the most important functional requirements for such tools, taking into account the way they should support the process of collaborative authoring. Beside the actual editing of documents, a lot of activities are going on in the authors group, in order to ensure a common view of the developed result.

The typical requirements for a collaborative authoring tool are:

- support for different documents formats;
- the possibility to make comments connected to specific parts of the document;
- concurrent editing of the document: the tools should guarantee the consistency of a document which is simultaneously changed by a number of authors; eventual conflicts should be managed;
- revision management, i.e. the possibility to track the changes and to maintain versions / revisions of a document;
- communication support within the group, either synchronous or asynchronous, voice- or text-based;
- group membership management in a dynamic way throughout the collaborative activity;
- organization tools, like calendars and task lists, for easy coordination of the common and individual activities.
- capturing unstructured information, like notes, sketches etc.

This list is used in the following for a short characterization of specific tools.

### **A COMPARISON OF SELECTED TOOLS**

Nowadays there is a broad range of software tools which include relevant functions for collaborative authoring; in the following, a selection of tools to be analyzed is made, including the most well-known ones, both commercial and open-source / free. These are described shortly, and a comparison table is elaborated.

**Google Docs** is an online collaborative platform for creating and editing documents. Several document types are implemented: text documents, spreadsheets, presentations and PDF files. These can be edited fully online through Google Apps, without the need for an office-like software on the client side. There are size limitations for the documents, e.g. 500 KB (without the pictures) for text documents, or 10 MB for PDF files.

The documents can be shared with other Google users, which are specified either as "collaborators" or "viewers". The platform supports simultaneous editing and viewing by the collaborators. The versions of text documents are maintained as "revisions", which can be visualised and describe the change and the user who made it. The different revisions can be compared for easy identification of the changes.

Google Docs does not include other facilities like discussions, instant messaging, task planning or calendars, but these are available through other specialized Google services. The disadvantage is that the "collaboration workspace" is not defined and centrally managed, so the users have to navigate in turn to the necessary pages.

The **Microsoft Word** text editor supports several functions for collaborative authoring, such as: tracking changes, inserting comments and maintaining document versions. "Track changes" can be activated, having as effect the highlighting of changes made in the document (both content and formatting). The changes are colored and related to the author. There are further possibilities to accept or reject a change when generating the final form of the document.

Comments can be inserted and linked to a part of the document, in order to

provide the collaborators with additional information related to that part. The comments include the author identification.

Different versions of a document can be saved in an explicit way. The authors are then able to access both the current version or a previous one.

The Microsoft Word editor is integrated with other Microsoft product, like SharePoint or Office Groove, in order to facilitate the sharing between authors in a common workspace.

The **Microsoft Office Groove** collaboration application is part of the Microsoft Office product family. It is a desktop software application that enables the creation of shared "workspaces", which can be flexibly composed of different "tools". The Files Tool, a basic file repository for sharing documents, is the most relevant one for collaborative authoring purposes. The Discussion, Calendar and Notes tools can offer additional support for collaborative work. The authors need to have the software installed locally and to create a Groove account; then they are able to create a new workspace or join an existing one, based on an invitation.

The workspace window shows the documents which are new or modified by other users as unread, helping the user to identify the changes since the last working session. There is a facility for simultaneous navigation of the users in the workspace, which is helpful when the users are communicating directly (e.g. via Instant Messaging or telephone). The local workspaces of the users are synchronized by means of background data communication.

The workspace includes activity indicators of the other users (called "contacts") and has functionality for instant messaging and voice communication. More structured discussions can be hosted in the Discussion Tool.

**Microsoft SharePoint** is a web-based content management system which enables the creation of collaboration websites through the combination of "web parts". The installation and configuration effort is significant: the SharePoint Server (or SharePoint Services, which offers a subset of functionalities) has to be installed, the website has to be configured and the users must be defined by an administrator. This makes SharePoint an option mostly for larger organizations which want to provide their workers with a way of collaborating online.

SharePoint includes functionalities for document management, web content management and business processes (workflows), as well as enterprise search and reporting facilities. Collaborative work facilities include shared document libraries and communication tools like wikis, discussion boards etc. The documents in a document library can be modified concurrently; the users perform explicit check-out/check-in operations when they open a document for editing. A "document workspace" can be created for each document that is written in collaboration. This is a sub-site with functionalities for tasks, discussions, announcements and links. The document management facilities include document versioning.

The most known SCORM-based authoring platform used for creation of documents with collaborative content is **SELF**, acronym for Science, Education and Learning in Freedom [8]. SELF represents a web-based platform containing multi-language documents written collaboratively by experts and interested users. Its main objective is to bring together public institutions like universities, governments, regardless of their profile or country, providing tools for the evaluation, adaptation and translation of electronic documents it contains. This way, SELF provides support for documents presented in different languages and forms: plain text, presentations, software tutorials, e-books, videos and manuals. The collaborative authoring process for these resources is based on the organisational model of Wikipedia combined with the guarantee that the content is scientifically and academically correct, through quality assurance mechanisms [8].

**Mindquarry** represents an open source collaborative platform which provides

sharing of different types of files (documents, images, video and audio files), organizing information, e-mail integration, wiki editing and forums. Initially, the platform was designed as a web application but now it also has a desktop client which facilitates file synchronization and the work offline. Mindquarry could be used as alternative to SharePoint because of its user and task management features, allowing users to connect from anywhere and to change and synchronize information, thus increasing the efficiency of the teams using the platform. [9]

**Moodle** (Modular Object-Oriented Dynamic Learning Environment) is another collaborative platform, based on social-constructivism principles. The basic idea for social-constructivism is that the students learn more when they have to create documents and materials that they have to explain to other persons. For instance, it is easy for someone to read a text, but someone can understand a text better if it tries to explain it to somebody else [10]. Moodle encourages communication between authors through its communication and collaboration tools, like chat rooms, forums, wikis and reviews which can be edited using the embedded WYSIWYG editor. Also, Moodle can export and import documents according to SCORM and IMS standards.

**Etherpad** is fully web based solution for creating collaborative content in real time. It does not provide functionalities for uploading or saving documents, but it allows up to 8 people write at the same time on the same article by simply accessing the link of the article, stored on Etherpad server. Thus, it has a greater portability, allowing people having different operating systems to collaborate. Etherpad is the only authoring tool allowing authors to see in real time the changes made to the document by the other authors, by highlighting text according to the user that changed it. Also, Etherpad keeps the entire history of the documents so that each change made to the document can be undone no matter when it was made. [3]

The findings of the above analysis are summarized in Table 2.

Table 2. Summary of characteristics of collaborative authoring tools

Tool	Characteristics			
	License type	Web-based / Desktop	Work-spaces	Functionality
Google Docs	free	fully web-based	no	- synchronous editing, sharing, comments, revisions - other functions as separate services
MS Word	commercial	desktop	no	- text editing, comments, tracking of changes, versioning
MS Office Groove	commercial	desktop	yes	- file repository, messaging, discussions, calendar, notes - group membership, read/unread status of items
MS SharePoint	commercial	web-based (except document editing)	yes	- document library, check-in/check-out mechanism, versions - discussions boards, wikis, calendars
SELF	free	web based	yes	- management of documents in collections, secure web server, content management system - shelf management, internationalization
Moodle	free	web based	yes	- site, user and course management; - embedded WYSIWYG HTML editor, mail integration, file management, chat, wikis
Etherpad	free	Fully web based	no	- real time editing, highlighted author changes - chatting, syntax highlighting for editing code
Mindquarry	free / commercial	Web based , optional desktop client	yes	- file synchronization, tracking of changes, wiki editor, RSS feed - user and task management

## **CONCLUSIONS**

There is a broad range of available tools for collaborative authoring, which differ significantly in terms of architecture and functionality. Most of these tools are covering a larger area of CSCW and are not restricted to collaborative authoring only; therefore, the extent to which the specific requirements of collaborative authoring are supported is also very different. It would be helpful for the end-user that a standard set of functionalities/requirements is defined, as a basis for a consistent characterization of such tools.

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