# Collaborative Methodologies for Writing Open Educational Textbooks: a State-of art Review

**Ana Casali[1], Antonio Silva Sprock[2], Carlos Henrique Alves[3], Claudia Deco[1], Ismar Frango Silveira[3], Jaime Muñoz-Arteaga[4], Jessica Gomes dos Santos[3], Julien Broisin[5], Rafael Morales[6], Yosly C. Hernández Bieliuskas[2], Xavier Ochôa[7]**

[1]Universidad Nacional de Rosario (UNR)
Av. Pellegrini 250, Planta Baja, Rosario – Argentina
[2]Universidad Central de Venezuela (UCV)
Ciudad Universitaria, Los Charaguamos, Caracas – Venezuela
[3]Universidade Presbiteriana Mackenzie (UPM)
R. da Consolação 930, 01302-907, São Paulo, SP – Brazil
[4]Universidad Autónoma de Aguascalientes (UAA)
Av. Universidad # 940, Ciudad Universitaria, 20131, Aguascalientes, Ags – Mexico
[5]Université Toulouse III - Paul Sabatier (UPS)
118 route de Narbonne 31062, Toulouse – France
[6]Universidad de Guadalajara Virtual (UdG)
Av. Juárez N° 976, Col. Centro, C.P. 44100, Guadalajara, Jalisco – Mexico
[7]Escuela Superior Politécnica del Litoral (ESPOL)
Campus Gustavo Galindo - CTI, Km. 30.5 Vía Perimetral, Guayaquil – Ecuador

{ismarfrango,deco.clau,ana.casali,r.moralesgamboa,jbroisin,jmauaa,
yoslyhernandez,calosalvers,jeh.g.santos,asilva.sprock,xavier.ochoa@gmail.com}

***Abstract.*** *The importance of collaborative electronic textbooks in the context of Open Educational Resources has been growing worldwide. This paper presents an state-of-the-art analysis of collaborative methodologies necessary for the shared creation of collaborative books, with a more specific attention given to open academic textbooks. This paper explore the academic literature of general concept of collaboration to more specific task of collaborative writing and example of successful initiatives of open textbooks around the world. The main conclusion of this study is that the any methodology for such creation should depend heavily on the conformation and cultural context of the writing group.*

## 1. Introduction

Collaboration has been a way for humans to do things from ancient times. Working together to achieve common goals have been a trademark of human beings no less than killing or being cruel to others. They are in our genes for us to choose. The advances in technologies that facilitate communication and information sharing in digital formats seem to have a positive impact in our tendency to collaborate, probably because we can communicate cheaper and faster now than ever, and it is much easier to share digital objects than physical ones. From software freedom initiatives to more recent movements towards freedom of other digital artifacts and nowadays Web 2.0 phenomena, people have got together in digital spaces and have used digital tools and media to create digital things that they can share, among them and with others.

There are many interactions that are commonly called *collaboration*. Some people collaborate in person, others through Internet; some to build, others to destroy. Sometimes they know each other from childhood, sometimes they have never met before, and sometimes they will never do, yet collaboration takes place. Many other cases of collaboration could be brought to light, if necessary, to motivate the questions of what collaboration is in essence, what its dimensions are that allow it to shape in so many ways, and what the forces are that actually make it to happen in particular ways. These questions are important not only for epistemological reasons but for practical ones too, as their answers would allow us to distinguish collaboration from close relatives, to categorize its distinct manifestations, and the factors that selectively triggers them. Furthermore, they would provide a map for systematic exploration and experimentation, and we would be able to use that knowledge to make decisions about the type of collaboration that would suit a particular situation or need, or at least to avoid common mistakes.

The literature provides plenty of definitions for collaboration, but we restrict ourselves to cite some recent ones. Patel, Pettitt & Wilson (2012) describe collaboration as a community activity in which it coordinate itself to communicate and achieve common goals. The Oxford Dictionaries Online define it as the action of working with someone to produce something (Oxford University Press, 2012), and Wikipedia defines it as working together to achieve a goal (Wikipedia Contributors, 2012). Finally, the Collins COBUILD Advanced Dictionary, which has been produced based on a large collection of English usage, establishes that Collaboration is the act of working together to produce a piece of work, especially a book or some research (HarperCollins Publishers, 2012). Based on these definitions, we can see that collaboration has to do with people working together (that is to say, they coordinate themselves to communicate and interact) in order to achieve some common goals, especially when those goals involve the production of something, and even more especially when that something is a book or some research. This definition distinguishes collaboration from closely related phenomena such as when people work towards a common aim but without any sort of coordination, communication or interaction, through individual and isolated contributions (e.g. the construction of a large repository of things, such as in YouTube and fund raising). It also distinguishes collaboration from cases in which two parties work together towards independent goals.

Patel, Pettitt & Wilson (2012) carried out an extensive study of collaboration, both observing people and organisations collaborating and through the literature, so they identified thirty six factors of collaboration that they grouped in seven categories: context, support, tasks, interaction processes, teams, individuals and overarching factors, which are shown in Figure 1 (next page) in the form of a concept map that show main relationships between them, with some additions (marked in green).

Each factor, and sub-factor, can be seen as a variable along which collaboration moves in its diverse instantiations. In other words, the factors provide the dimensions — the metadata elements— to describe any collaboration model. They make easier to identify commonalities, differences, and hence patterns of collaboration that could be turned into collaboration models: general descriptions of ways to frame, organise, and carry out collaboration that are worth imitating. So the collaboration framework proposed above can be used to analyze collaboration cases, to discover collaboration patters, to describe collaboration models, and even to invent some.

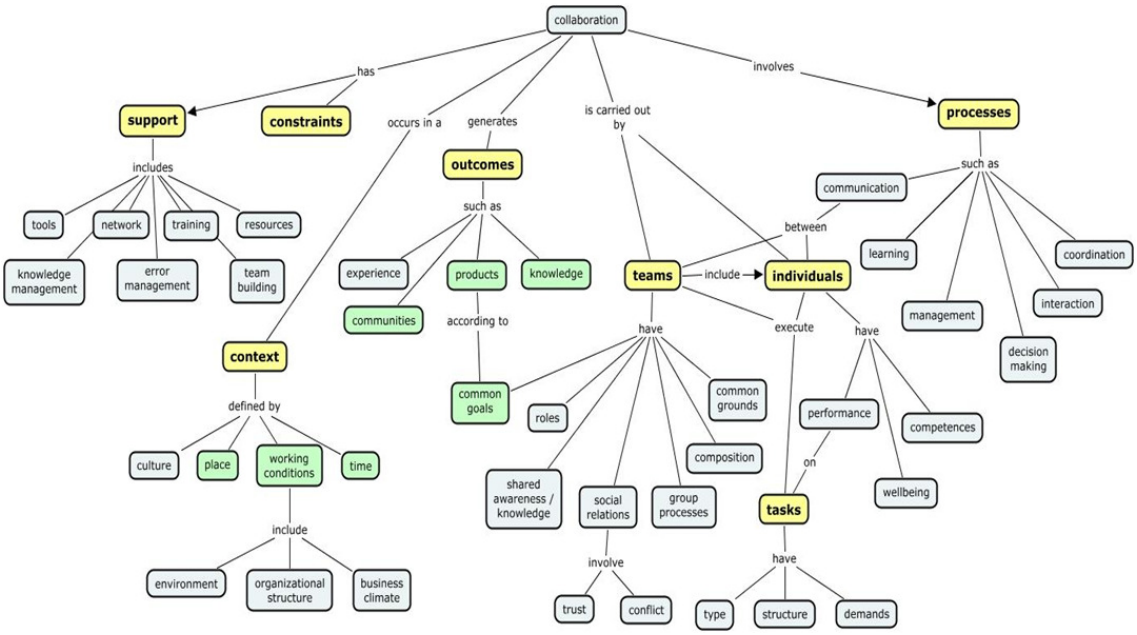


**Figure 1. A concept map for collaboration factors identified in Patel, Pettitt & Wilson (2012).**

## 2. Computer-supported collaboration

One of the most recent and studied support system for collaborative work and the coordination activities involved is the use of computers and computer networks. This field of study is know as Computer-Supported Cooperative Work (CSCW). The CSCW is computer-assisted coordinated activity carried out by groups of collaborating individuals (Baecker, 1995). The CSCW is a very broad interdisciplinary area, where we can find different software intended to support collaborative work. One type of these software is Groupware, which, according Chaffne (1990), are computer-based systems that support groups of people working on a common task, and that provide an interface to a shared environment. It can also be said that, in general, Groupware is a type of collaborative software that helps workgroups to conduct its activities through a computer network and services embedded in them, such as email, transfer electronic files, newsgroups, chats, hypertext, and other discussion groups.

Groupware is distinguished from normal software by the basic assumption it makes: groupware makes the user aware that he is part of a group, while most other software seeks to hide and protect users from each other. Groupware is software that accentuates the multiple user environment, coordinating and orchestrating things so that users can "see" each other, yet do not conflict with each other." (Lynch 1990, in Baecker 1995). To Engelbart (1988), is a system of logical tools to facilitate cooperation of people at work. Coleman (1992) defines it as computer-aided cooperation that increases the performance of interpersonal communication processes. Sosa, Zarco and Postiglioni (2006) say it is software and hardware that supports and helps the group work. While Goldberg (1994) argues that it is the software that helps groups of people communicate electronically. Several authors (Geronimo and Canseco, 2002; Ortega, 1998 and Ramirez, 1998) mentioned important features about Groupware:

- Facilitates group interaction through technological tools that manage matters of common interest.
- Provide a collaborative environment, which really is perceived that the group work is carried out.
- Keep the information in one common place for all members.
- Provide user interaction, in writing, voice or video.
- Groupware systems allow perceive who's in it, what changes were made and who made them.
- It is based on communication, coordination and collaboration.
- Enables collaboration with members who are anywhere in the world.
- The systems allow the recognition of the location of the user, since they can be distributed.
- Ideally, the groupware must be able to help each person in a collaborative project to perform specific work in a more efficient manner.

Nowadays, there are numerous possibilities provided by today's web-based tools for editing, publishing and sharing content in a palimpsestic way: instead of planning a hypermedia product as an amalgam of statically planned content, new pieces of information are meant to be constantly added, as well as any content inside such an aggregation is likely to be modified, updated, deprecated, substituted or even removed.

For the collaborative writing of Open Educational Textbooks, special types of Groupware are needed. The Groupware platform should provide the functionalities needed to support the methodology for the collaborative creation of book sections and chapters. It will also provide tools to mix these sections and chapters into customized textbooks to be used in an specific course. The system should then provide tools for the users to read the books online, to download them in different electronic format, such as PDF, or to be printed for off-line reading. The system will facilitate the creation of new versions of the materials (adaptations) or translations to other languages or cultures All modules and books are also meant to be reused, sliced, joined and remixed in new modules and books, to become parts of brand new books, according to the needs. The system will also provide recommendation tools for the creation of new communities and for relevant new textbooks or chapters. This system of Groupware is known in the academic literature as Computer Supported Collaborative Writing.

## 3. Collaborative Writing

The writing process is not simple. It is author's responsibility to define the subject, conduct researches on the topics, organize ideas and viewpoints which will be handled, decide how to structure the text among other steps. When trying to perform this task collaboratively, it becomes even more complex, because it is necessary to deal with the common difficulties to any process that involves collaboration and the steps of creating a text.

With a group of people engaged in this task, there is the challenge of writing a high-quality text with different writing styles, ideas, vocabulary and even culture. It is essential that the aim of the text is well defined and there is a certain level of commitment to it, identified roles between the group members, a strong task division, discussions about the content covered and credit the authors properly.

Earlier studies, like Ede and Lunsford (1990), already pointed out seven organizational patterns for collaborative authoring: 1) the team plans and outlines the

task, then each writer prepares his/her part and the group compiles the individual parts, and revises the whole document as needed; 2) the team plans and outlines the writing task, then one member prepares a draft, the team edits and revises the draft; 3)one member of the team plans and writes a draft, the group revises the draft; 4) one person plans and writes the draft, then one or more members revises the draft without consulting the original authors; 5) the group plans and writes the draft, one or more members revise the draft without consulting the original authors; 6) one person assigns the tasks, each member completes the individual task, one person compiles and revises the document; and 7) one dictates, another transcribes and edits.

Results of the study indicated that the percentage of writing groups that used these methods at that time often or very often range from 3% (method 5) to 31% (method 3).

Another in-deep study of Collaborative Writing was presented by Posner and Baeker (1993) in their nicely title paper "How people write together". The main contribution of this study was the creation of a taxonomy to analyze the collaborative writing process. This taxonomy is divided in four categories: roles, activities, document control methods and writing strategies.

The different roles that people could take are: Writer, the responsible for transforming abstract ideas into coherent and organized text; Consultant, works very closely with writers but does not take part in the writing of text; Editor, makes changes to documents that were written by someone else; Reviewer, gives comments about document that could be accepted or ignored by the writer. Adkins et al. (1999) added two extra roles to this taxonomy: Leader-facilitator, structures and controls the project; and Copy editor, polishes the final draft for publication. Adkins et al. mentions that a person could take different of these roles during the execution of the writing process.

The activities that are usually taking place during the writing process are: brainstorming, planning, researching, writing, editing, reviewing. The writing process does not necessarily include all the activities and the order in which they are executed is not sequential and depends on the organization of each group.

The document control methods, that is, the organization of who manages the document and how is classified in four types: Centralized, one person controls the document during the whole project; Relay, one person at a time controls the document but it is not always the same person; Independent, each person controls the section on which he or she is working; and Shared, everyone has equal access to the document. This methods are not fixed, they usually change at different stages of the writing process.

The writing strategies are the different ways in which the members of the group cooperate together in the writing process. There are also four types of strategies: Single writer, one person writes, the other play other roles in the group; Separate writers; each person works on a different part; Joint writing, authors work together synchronously in close collaboration on the text; and Scribe, based on group discussions, one individual writes the document.

The patterns and the taxonomy allows the easy comparison of the methodologies for collaborative writing used by different groups. However, the no-existence of Web 2.0-based tools at that time influenced the conclusions of these two studies. The advent of Web 2.0 brought a wide range of possibilities and collaboration became much easier. New tools of writing appeared, such as blogs, online encyclopedias, forums among others, we present some of the most used:

### 3.1. Academic blogging versus traditional academic writing process

Walker (2008) identified different types of academic blogs; he noticed that some are closer to traditional forms of academic publication than others.

- Blogs of the first type are aimed at what she calls public intellectuals, and are forums for social debate based on theories of political science, feminism, media analysis, and so on.
- Blogs of the second type are used as research logs, and serve as "a record of research conducted and ideas that might be pursued". Such blogs have traditional roots, and are similar to a sociologist's notebook or a laboratory scientist's record of experiments.
- The third type includes "pseudonymous blogs about academic life" that frequently demonstrate "a tongue in cheek refusal to revere the ivory tower experience". In such blogs, researchers tend not to focus on their work, but to discuss personal aspects of academic life.

### 3.2. Wikis

Wiki is a Web page that can be viewed and modified by anybody with Internet access and a Web browser. This concept extend the idea of computer-based collaborative writing. Unlike blogging, wiki-based collaborative writing requires that scholars work together. In contrast with academic blogs, where the identity of the main contributor is clear, wikis tend to downplay individual identity in favour of the group. Surowiecki (2004) recognizes three types of problems in this situation: Cognition (when there is just one right answer to a problem or a question), Coordination (members of a group have to figure out how to coordinate their behaviour, knowing that everyone else is trying to do the same) and Cooperation ("the challenge of getting self-interested, distrustful people to work together").

Wei (2005) points out some pros and cons of wikis:

- All members have writing and editing privileges and there is no gatekeeper.
- There is no need for a webmaster.
- Little effort is necessary for editing and updating.
- Specific writing tools are not needed.
- Anyone can edit content, even anonymously
- Larger projects like Wikipedia and Wikibooks show that poor quality content and cases of vandalism are rare
- Contributors must learn wiki syntax and editing rules.
- Editing wars: some collaborative communities dealt with this problem by introducing a rule that dissenting individuals could not alter a page more than three times within a 24-hour period.
- Needs constant maintenance: all members of the group must share an enthusiasm to make regular contributions.

### 3.3. Some reasoning about collaborative writing in academic environments

Collaboration has the potential to ensure that the quality of the final product is higher than that produced by individual authors, providing also a new kind of peer review. But in an academic setting this will happen only if Surowiecki's collaboration and cooperation problems (Surowiecki, 2004) are resolved. Surowiecki also presents four

key conditions for successful wise crowds: 1) Diversity; 2) Decentralization; 3) The ability to summarize opinions into one collective verdict, and 4) Independence.

Traditional academic writing culture does not support such a bottom-up approach to knowledge gathering, and this may be difficult to achieve with the notion of authorship so firmly engrained in academia. Resistance to its adoption makes sense: It represents a radical departure from traditional ways of publishing. Academics still revolve around the idea of transparent authorship, such as getting credit for their work in an obvious way.

Some questions arise, first posed by Ward (2009), and they remain unanswered:

- Is there an ideal number of researchers who can be involved in a collaborative writing project?
- Is it better to include a diverse group of scholars or individuals, including from outside academia?
- How would universities react to such a development - would collaborative writing in this context be acknowledged and rewarded, or would it continue to be regarded as an extracurricular activity, shunned or reserved for administrative purposes only?

## 4. Collaborative Open Textbooks

Given that the academic analysis of collaborative writing leaves open more questions than provide answer, this section present the analysis of existing collaborative methodologies for creating Open Textbooks. According to the state of our knowledge, there are not many proposals focused on the methodological aspects: how the team in charge of a book creation is conformed, the different roles in the group, how the work is distributed, how to manage the different versions, the authoring policies, etc. We reviewed different projects and experiences related to the collaborative creation of books, and below, we present a brief description of the works more relevant for our purpose.

Baker et al. (2009) present a proof-of-concept via Connexions. Such paper shows the feedback returned by professors and students explaining each of the lessons learned about Open textbook production. Also, it documents a workflow process that would support adoption of open textbooks. Challenges to the production and adoption of open textbooks include (1) faculty members' and students' expectations of high production quality, (2) methods for documenting and maintaining control over various versions, and (3) the process of converting existing open content to digital and accessible formats. Authors identified lessons learned about open textbook production, they emphasized the importance of:

- interactivity,
- assembly-line workflow (the project team regrouped and adopted an assembly-line process for module creation),
- a style guide (it is critical in order to effectively distribute content entry efforts among several team members, who must format the content consistently) and
- naming conventions and standard math authoring tools.

Horner & Blyth (2008) present a project to address the huge shortage of accessible and affordable educational resources in South Africa. The vision of the founders was to write the textbooks in a collaborative way using contributions from many volunteers. They pointed how to get a core team following cohesion-oriented

guidelines for a multi-skilled team, whose roles should be very well defined. These authors emphasize the importance of open and regular communication between team members cannot be stressed strongly enough. During the main content creation phase of the project they held weekly meetings between the team members involved using Skype to cut telephone costs. These meetings were always run with an agenda and included feedback sessions as well as team brainstorming sessions.

Orange Grove Text Plus (OATTF, 2010) is a joint initiative of the University Press of Florida and The Orange Grove repository. This report presents a study about the development of Open Textbooks in Florida. It has solutions to improve its usage and it presents a detailed plan to promote open access textbooks and their use in Florida. This plan addresses six essential components: Strategies for production and distribution, Open Textbook production and review protocols, Awareness campaign, Adoption and use, System security and Sustainability. In particular, the two first components are related to methodologies. The authors found that the factors involved in the development of open materials were, in order of priority: 1) time to review, find, select materials; 2) hardware and software to facilitate development; 3) desire to reduce student costs; 4) assurance that their materials are peer-reviewed and edited; 5) availability of the review criteria to the authors; and 6) administrative support for efforts. Henderson et al. (2011) describe this open textbook initiative and present a discussion of Software Tools for authoring and editing for this projects.

Hohne et al. (2007) present an approach to teaching whereby students and faculty collaborate to explore subject matter through the creation of articles for an open-source textbook viewable using the wiki format. In this approach teams of students wrote sections of a new textbook for a senior level Chemical Engineering Process Controls course. The resulting text is available online. The writing and presenting of articles provides opportunities for students to learn by teaching. Each article was also formally reviewed by other students in the class to provide suggestions and correct errors. The wiki authors then offered specific rebuttals where appropriate to the reviewer comments. Throughout this process, the instructors acted as advisors, gave the general topic outlines, provided reference material and made connections between the various student topics through short lectures. The paper presents evidence of the good results of this approach in the form of standard course evaluations. Another similar experience is shown in [Ravid et al., 2008] where wiki technology was applied to the development of an introductory academic textbook on information systems which was developed collaboratively by faculty and by students, and was made available online free of charge. After about two years of activity, the wikitextbook accumulated 564 sub-chapters, co-authored by undergraduate and graduate students in more than 20 classes offered by seven academic departments across three Israeli universities. Authors discuss the potential of wikitextbooks as vehicles of empowerment to students, teachers, and the discipline. They conclude that the implementation of wikitextbook should be augmented by a careful study of cultural, societal, behavioral and pedagogic variables.

From the experiences above mentioned, we can highlight that the first task to face the collaborative writing of open textbooks is to establish the working group. Some authors recommend that the core team may be small, 5 to 10 well-motivated persons, and the different roles and responsibilities must be defined clearly. The interaction between team members is very important and they should maintain an open and regular

communication. Besides, some standardization issues may be set as for example, the style guide and the use of math authoring tools.

## 5. Conclusions

This paper studied various methodologies dedicated to collaborative writing of open textbooks, the aim of the LATin project in which the authors are involved in. We studied those methodologies from the very general concept of collaboration to the very specific task of the creation of collaborative textbooks.

The collaborative creation of open textbooks falls into the realm of study of CSCW and more specifically of Collaborative Writing Groupware tools. After the literature analysis it can be conclude that collaborative writing, while well understood, is still a process that is re-discovered by each group involved in the task. There exist some guidelines, such as the ones presented by Ede and Lunsford (1990) and Posner and Baecker (1993), but their general nature make them more useful to analyze existing collaboration than to guide the development of a methodological strategy. The advent of whole new ways to communicate and interact, brought by the advent of Web 2.0 technologies, reopen the discussion about how to organize successful collaborative writing groups.

To better understand how the collaborative writing of open textbooks takes place in reality, several successful examples were analyzed. It can be conclude that the range of strategies vary accordingly to the needs and context of each initiatives. However the role of the fluent communication between participants seems to be the main factor cited for their success.

The main conclusions that could be derived from this work is that to implement a methodology for the collaborative creation of open academic textbooks, the context and composition of each group should be taken into account. There is no one-size-fits-all type of methodology that could be useful in every case and situation. Any possible proposal of methodologiesmade for the any collaborative open textbook initiative, as LATIn Project [Ochôa et al., 2011] for instance, should be adaptable to the different workings each group and should incorporate recent collaboration types derived from new Internet technologies.

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