A Survey of User-Centered System Design for Supporting Online Collaborative Writing

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Abstrak
Essai kolaboratif (CW) adalah satu cabang kajian baru dalam khasanah ilmu pendidikan yang harus dikaji secara interdisiplin. Banyak program yang dapat digunakan untuk menunjang dan menciptakan iklim kolaboratif dalam menyelesaikan essai sebagai tugas kelompok. Makalah ini akan membahas secara singkat *software* yang berbasis pada Desain Sistem yang Berpusat pada Penguna (UCSD). Makalah ini juga akan menguraikan secara singkat hal-hal yang harus dipenuhi oleh UCSD agar dapat menunjang essai kolaboratif dengan baik berdasarkan pada analisa taksonomi essai kolaboratif dan kesulitan-kesulitan yang mungkin terjadi dalam menyelesaikan essai secara kolaboratif. Bagian akhir dari makalah ini akan mengulas dan membandingkan beberapa *software* yang didesain untuk menunjang essai kolaboratif berdasarkan pada kelengkapan desain sistem yang diusulkan oleh penulis.

Kata kunci: *essai kolaboratif, taksonomi essai kolaboratif, masalah dalam essai kolaboratif, desain sistem yang berpusat pada pengguna*

Abstract
Collaborative Writing (CW) is a new emerging issue in education that must be addressed interdisciplinary. Nowadays there is lot software that can be used to support and enhance the collaboration in group writing. This paper presents the discussion about the recent user center system design for supporting collaborative writing. Based on the taxonomy and collaborative writing and the problems appear in collaborative writing, we will proposed the required design of the User-Centered System Design (UCSD) for CW software. The last part of this paper will be dedicated to examine the recent available CW soft wares based on the required designed proposed.

Keywords: *Collaborative Writing (CW), taxonomy of collaborative writing, problems, User-Centered Design System (UCSD)*

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Introduction

Most authors of documents work collaboratively from time to time. The term *collaborative writing* (CW) refers to projects where written works are created by multiple people together (collaboratively) rather than individually. Lowry, Aaron, & Rene (2004) clearly define CW as an iterative and social process that involves a team focused on a common objective that negotiates, coordinates, and communicates during the creation of a common document. The potential scope of CW goes beyond the more basic act of joint composition to include the likelihood of pre- and post-task activities, team formation, and planning. Furthermore, based on the desired writing task, CW includes the possibility of many different writing strategies, activities, document control approaches, team roles, and work modes.

In social sciences, such as library science, collaborative writing has increased dramatically over the past 25 years (Bahr & Harrison, 2000). In other disciplines, such as the sciences and education, collaborative writing is the norm. Bahr and Harrison (2000) came to the conclusion that "... as evidenced in the sciences and social sciences, collaboration encourages author productivity and enhances article quality. As research becomes more quantitative, collaboration increases" (p. 417).

Wikis, Galaxiki and New Worlds Project are an example of collaborative writing. CW is a useful form of group work because of its many potential benefits, such as learning (Trimbur, 2005); socialization and new ideas (LeFevre, 2007); maximum input, varying viewpoints, checks and balances, experience, joint knowledge, writing expertise, accuracy, and more understandable documents (Ede & Lunsford, 2004); higher document quality (Baeker & Nastos, 2010); and enhanced interpersonal relationships (Rice & Huguley, 2004); but on the other side CW occasionally creates skepticism about the authority of the information.

Several motivations lead people to contribute to collaborative writing. Some people say that online media are becoming ever greater knowledge-sharing resources. Many of these communities are highly cooperative and establish their own unique culture. Kollock (2007) outlines three motivations that do not rely on altruistic behavior on the part of the contributor i.e.: anticipated reciprocity; increased recognition; and sense of efficacy.

Collaborative writing software is software designed to help people involved in a writing task achieve their goals. CW software must allow the groups to produce a shared document and helps CW groups perform the major CW activities. The CW software must be able to deliver the functionality for many participants to augment a common deliverable, such as recording and managing the document; threading discussions, auditing history, and other mechanisms designed.

Today's software applications need to be both useful and usable, supporting simple and efficient completion of tasks by the intended user audience. User-centred system design (UCSD) is a widely accepted methodology for designing usable applications, for producing software that truly meets the needs of its users.

A lot of research on collaborative writing has been conducted. Yet, very little is understood about how people write collaboratively and very few UCSDs are available to support this activity. By learning how people write together, knowing the problems with collaborative writing and knowing the needed design requirement of collaborative writing, we can design better UCSD for supporting the collaborative writing. This paper will discuss the taxonomy of collaborative writing, the list of needed design requirement of collaborative writing software in brief. The last part of this paper will be dedicated to discuss the survey of the user-centred collaborative writing software available today.

Taxonomy of Collaborative Writing

Collaborative writing is highly complex process because it is frequently unstructured and includes multiple roles, sub tasks and activities-which can be performed interactively (Lowry, Aaron, Rene, 2004). Lay & Karis (2009) provides several other reasons why CW can be complex, including (a) CW documents are complex artifacts, (b) processes of preparing documents are more multifaceted under collaboration, (c) writing processes generate strong emotions, (d) groups can revise CW documents infinitely, (e) it is challenging for collaborative writers to converge toward a common goal and understanding of a document or even use a common language, and (f) success in CW is difficult to predict and guarantee.

Considering that CW is interdisciplinary knowledge and its importance, practitioners and academics need to use a consistent nomenclature and taxonomy of collaborative writing. A common taxonomy and nomenclature will increase the communication quality of CW research and training, CW issue resolution, conducting CW activities and building CW supportive technologies.

Taxonomy of CW consists of four categories in CW, i.e.: roles, activities, document control, and writing strategies. Each of the four categories of the taxonomy provides a different perspective for

examining the writing process. Roles look at process from the individual's point of view, at the part played by each individual on the writing team. Activities categorize the actions performed while working on the project. Document control methods describe how the writing process is managed and coordinated. Finally, writing strategies focuses on the text creation process.

Table 1. Summary of writing approaches

Category	Components
Roles	• Writer
	• Consultant
	• Editor
	• Reviewer
Activities	• Brainstorm
	• Research
	• Plan
	• Write
	• Edit
	• Review
Document Control Methods	• Centralized
	• Relay
	• Independent
	• Shared
Writing Strategies	• Single Writer
	• Scribe
	• Separate Writers
	• Joint Writing

Problems in Collaborative Writing

CW is a complex document that involves social and intellectual complexity (Neuwirth, Kaufer, Erion & Mories, 2000). Socially, collaborative writing requires that group members establish shared achievement goals, that they divide tasks among themselves keeping in mind both concerns for fairness and differences in individual skills, and that they resolve questions of authority within their group. Intellectually, it requires that group members establish shared rhetorical goals and a common understanding of the facts on which the document is to be based. They must also solve high-level writing problems such as deciding on a document structure that is consistent with their rhetorical goals, as well as the local sentence, paragraph-and section-level writing problems associated with creating the text needed to fulfil their goals.

To meet these social and intellectual challenges, group members must also contend with considerable procedural complexity (Nastos, 2011). That is, they must adopt procedures that will enable them to get their work launched; to circulate draft versions among group members; and to refer to specific portions of their documents as pieces of text are created, revised, and incorporated into a unified whole.

People had different expectations about the effects of collaboration, yet most felt that having several co-writers would improve the final product. The relative status of group members, either similar or different, can lead to problems in working groups. Equal status groups may experience struggles for leadership and the problem of confronting members who are not contributing their expected share of work. In groups of unequal status participants may feel pressured to conform not on the basis of the alternative arguments but on the basis of the status of the individual proposing the alternative. Different individual working styles can also cause problems. Some individuals like to leave the work till the last minute, while others prefer to complete the task in advance of the deadline. Individual preferences often need to be suppressed for the benefit of group harmony.

Contingency theory in term of media choice and media consequences states that the more people are dealing with uncertainty, the more likely they are to use interactive communication modalities to solve problems and coordinate their work (Neuwirth et al., 2000). Further, the more they use interactive modalities, the more they will be able to communicate effectively. Task equivocality and media richness states that when equivocality is high, individuals are likely to have different interpretations of problems and may disagree as to what information is needed to shape a solution (Nastos, 2011). Collaboration heightens the equivocality of the writing process, particularly those

aspects that require intricate communication (Neuwirth et al., 2000). For instance in planning stages, co-authors must share poorly formed ideas to agree on a unified plan.

Writing technology can also cause problems for groups. Use of different machines by collaborators introduced difficulties when the document segments had to be merged into a single format. Participants complained of problems keeping track of different versions of the document. Communication bandwidth was a problem for groups working at a distance.

Interactivity in CW is absolutely important because it allows a speaker to monitor a communication partner's behaviour and modify a message on the basis of the reaction Neuwirth et al., 2000). Interactivity also preserves the momentum of the discussion. Lack of interactivity may lead to coordination and communication problems in CW group. There are three main problems in term of coordination and communication problems in CW, i.e.: (a) *Problems in achieving consensus.* The absence of interactivity made it difficult for group members to achieve consensus, a predictable result given the preference for face-to-face planning observed among the scientists we interviewed and in the previous study. *(b) Problems in coordinating activities.* Even after group members had agreed on a set of goals and a division of labour, they found it difficult to communicate about project details. *(c) Problem in communicating about text content.* When group members were unable to meet to review their draft documents, they sometimes found it difficult to identify the referent of their remarks.

Required Designs for Collaborative Writing Soft wares

The development of the CW soft wares has enabled us to reduce or overcome the problems in the collaborative writing mentioned above, especially in term of coordination process. However, we must be aware that how far the CW software can reduce/overcome the coordination problem in CW will be heavily depend on the phase of the writing project.

The problem of communicating about the text itself can be fixed easily as long as the systems provide support for annotation so that the people will be able to point to locations in a text and talk about changes that need to be made jointly. Recent development in CW software has enable us to resolve the coordination problem by developing schedules for checking in with each other and provide notification about current changes, new task etc. However the CW software has not been able to tackle the problem of achieving consensus about how to proceed yet. So this area is still open for advance or further investigation.

In term of annotation, the study conducted by Lowry, Aaron, and Rene (2004) shows that expensiveness component of the media is very important. The expressiveness of the media will enable the CW group member to express their own views about how the texts should be revised, and their comments were seen as more likely to be helpful to their fictitious co-author.

Baeker, Nastos & Lowry (2010) explain in detail the design specification needed for the CW system in general. Neuwirth, Kaufer, Erion, & Morris (2000) and Neuwirth et al. (b) (2004) list the things need to be considered in so that the CW can fully support the interaction among the CW group members. Table 2 below summarizes the key points of the design requirement needed for good CW soft wares.

Table 2. Design requirement for CW soft wares

Characteristic	Description	Component
System	Basic system features for individual writing process.	- Basic word processor (bold, italic, underline, cut, copy, paste, etc.). - Seamless with other work media. - Compatibility - Consistency - Flow. - Transmission speed. - Grain size. - Storage model.
Collaborative Writing	Things that must be supported by the software to create the sense of collaborative instead of cooperative	- Preservation of identities. - Enhanced communication. - Enhanced collaborator awareness. - Annotation. - Undo

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		• Session control.
		• Authoring test.
		• Interactivity.
Roles	Roles individual may play in the CW process	• Explicit roles.
		• Task management.
Activities	Concerns so that of the CW software allow different group member to perform different activities at the same time.	• Variety of activities.
		• Transitions between activities.
		• Permeability
Document Control Methods	How the system allows the user to access and work on the document.	• Several document access methods
		• Separate document segments.
		• Version control.
Writing Strategies	Strategies and the way the CW group member used to create the document.	• One or several writers.
		• Synchronous and asynchronous writing.

Survey of Recent UCSD for Supporting Collaborative Writing

The contributions of human factors or usability practitioners to application development begin with a functional specification handed down from an external source including the users. User-centred system design (UCSD) is a widely accepted methodology for designing usable applications, for producing software that truly meets the needs of its users. The usability design process is a UCSD (user-centred systems design) approach for developing usable interactive systems, combining usability engineering with interaction design, and emphasizing extensive active user involvement throughout the iterative process. User-centered design methods are commonly applied to *how* function is delivered but not *what* functions will be delivered.

Neuwirth et al. (a) (2000) mentioned in detail the 12 UCSD key principles, which include: (a) user focus, (b) active involve user-involvement, (c) evaluating system development, (d) evaluate use in context, (e) simple design representation, (f) prototype, (g) explicit and conscious design activities, (h) a professional attitude, (i) usability champion, (j) holistic design, (k) process customization, (l) a user-centered attitude.

Nowadays there are a lot of CW soft wares available in the market. Some are free, some are not. This paper will compare some CW soft wares that are used in higher education setting for educational purposes.

PREP (Neuwirth et al. (b), 2004) is a writing tool that provides asynchronous access to documents and can be thought of as a 'spreadsheet for documents', because it provides a column based interface where text is presented in columns of visually linked chunks.

SASE (Baeker & Nastos, 2010) was designed to support highly interactive synchronous collaborative writing. It supports for focused collaboration and independent work, collaborator awareness and conflict resolution. WYSIWIS (What You See Is What I See).

SASSE (Nastos, 2011) is an extension of the SASE. It supports for a variety of activities and enhances communication and collaborator awareness. SASSE was designed to support the asynchronous writing; but leaved support for explicit roles.

Glosser (Villalón, Kearney, Calvo, & Reimann, 2008) is a system that was design for supporting collaborative writing for academic writing purposes. This system works based on text miming techniques (Latent Semantic Analysis). The glosser workspace almost looks like the Wiki space, it also provides indirect feedback to students so that the students can revise and do reflection on their collaborative writing product.

Table 3 below summarize the key point on how good the CW software discussed above can enhance and support CW based on the proposed required UCSD software on the previous section.

Table 3. Design requirements and comparison of CW tools

Requirements	PREP	SASE	SASSE	Glosser
Individual Writing				
- Basic word processing	++	+	++	++
- Seamless with other media	++	+	++	+
Collaborative Writing				
- Preservation of identities	+	++	++	++
- Enhanced communication	-	+	++	+
- Enhanced collaborator awareness				
• Focused collaboration	-	++	++	++
• Peripheral awareness	-	+	++	++
- Annotation	++	-	+	++
- Undo	+	-	-	+
- Session control.	-	-	+	++
Roles	++	-	-	++
Activities				
- Variety of activities				
• Brainstorming	++	+	++	++
• Researching	-	-	-	-
• Planning	+	-	++	+
• Writing	+	-	-	++
• Editing	++	++	++	++
• Reviewing	++	++	++	++
- Transaction between activities	++	-	++	+
	++	-	++	++
Document Control Methods				
- Several access methods	++	-	-	+
- Separate document segments	+	-	-	-
- Version and change control	-	-	++	++
Writing Strategies				
- One or several writers	++	++	++	+
- Synchronous writing	-	++	++	-
- Asynchronous writing	++	-	++	++

Notation: ++ System provides good support
+ System can handle
- System does not support

Conclusions

The data show that collaborative writing could often benefit from rich media, at least for some of its constituent tasks.

From the viewpoint of individuals concerned with selecting or designing information technologies to support group work, collaborative writing presents a significant challenge. We need the tools that enable co-authors to communicate about their text in richer ways, without the need to be in the same place at the same time, could be a significant asset for the many people who write collaboratively.

While the CW soft wares provide a lot of support, students must realize that most of the system required the access to a networked computer with the CW software installed, and the interface metaphor is contextually limiting. While most of the CW soft wares claim they provide "collaboration with a context," the context in one situation is quite different with other context; there are a lot of factors and considerations to measure and determine the context in a particular CW group.

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