A Conceptual Model for Collaborative Scientific Writing

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Abstract
This poster describes a conceptual model of a timeline-based mash-up service, which addresses the needs of researchers involved in collaborative scientific writing processes.

Keywords
Research 2.0, mash-up, data aggregation, collaborative writing

ACM Classification Keywords
H.5.3 Group and Organization Interfaces: Computer-supported cooperative work, H.5.2 User Interfaces: User-centered design

General Terms
Human Factors, design

Introduction
Timeliner is an Internet based tool designed to support collaborative scientific writing. The need for Timeliner rises from daily challenges regarding collaborative scientific writing processes. Challenges faced by ourselves but also elaborated upon by both our local research community as well as by members of our international research projects’ teams. The problem we address by offering Timeliner is about supporting...
collaborative scientific writing with minimal disruption of concurrent practices and workflows.

As an activity, collaborative writing is common and often unavoidable in academic work as written documents, such as articles, reports and presentations are mostly produced collaboratively. Although many definitions of collaborative writing exist [8] in this paper we consider that collaborative writing is the process of two or more people working together to create a complex document, irrespectively of locus or synchronicity.

As a research topic, collaborative writing has been approached in a number of contexts [1], [4], [5] and collaborative writing software has been the object of research since the 1970s [2], [6], [9]. In spite of the fact that many comprehensive collaborative writing systems have been developed in the 1990s, they were hardly used and contemporary, mainly web-based, approaches target to a large extent, cooperative writing as an activity and not as a full-feature project-like process [3].

This said, the questions we are now targeting with the Timeliner project, relate to its boundaries, affordances and architecture, namely on how to provide unobtrusive support to scientific collaborative writing.

Social, cognitive and temporal dimensions of collaborative scientific writing
Scientific writing is increasingly a collaborative endeavor, as multi-author research papers have become a mainstream. Greene [3] has illustrated this trend with the authorship data from Nature: "Any issue of Nature today has nearly the same number of articles and letters as one from 1950, but about four times as many authors". The main driver behind increasing number of authors is caused by the need to give credit to all those contributing to discovery. We argue that there are also other, not less important reasons for having multiple authors for one research paper. Collaborative scientific writing is a typical case of knowledge building in the sense of Bereiter’s theory [10]. Bereiter distinguishes implicit learning from knowledge building, which happens in the form of creating or modifying public knowledge. The most fertile zone for knowledge building is on the boundary of different disciplines where collaboration between researcher’s results in updated frontiers: cognitive artifacts, tools and discourses used by different researcher communities [7].

The Computer-Supported Collaborative Work (CSCW) community has been researching and developing tools for asynchronous and synchronous online collaboration, but the temporal dimension of orchestrating collaboration in the context of scientific writing seems to be still understudied.

An initial conceptual model
Designing Timeliner’s overall user experience was based on three complementary approaches: activity-centered design, where we focused on setting the boundaries of Timeliner by identifying the activities supporting scientific collaborative writing; user-centered design, with the twofold goal of validating and refining the previous step and focusing on the user’s needs and goals to identify Timeliner’s expected affordances; and finally system-design, where Timeliner’s architecture was outlined aiming to provide
seamless integration within the user’s own digital ecosystem.

Thus, Timeliner should support collaborative writing by facilitating the following activities: pre-collaborative writing activities (such as describing the goal of the writing task; pulling together the necessary documentation; selecting the tools for the task and participants notification); collaborative writing activities (such as: team formation; writing task planning; document production and conclusion actions like getting the final group approval and sharing the result of the external approval process) and post-collaborative writing activities (such as: reflecting on the accomplished writing task and possible integration with other tasks).

Having established the initial Timeliner boundaries using an activity-centered approach in our initial design iteration, we moved on to a user-centered approach, surveying our local and international research colleagues and partners.

Answers identified tools such as e-mail, Google docs, Moodle, Doodle, Skype, Evernote, Dropbox, blogs, Facebook groups, workflow tools, Gantt diagrams, Google sites, iCal, Trac Wiki, Mindmeister, Yammer/Co-op, Apache Subversion, eGroupware and wikies, which supports our assumption that Timeliner should provide unobtrusive support to scientific collaborative writing without disrupting current work practices and workflow.

Further, answers to our initial survey also show that the approach to collaborative writing adopted by most participants actually falls within the collaborative writing processes framework established by Baecker et al. [2] and also by Lowry, Curtis & Lowry [7].

A final step in our design process was to design Timeliner’s system architecture as a mash-up of external data and functionalities provided by third-party services (see figure 1). This means that Timeliner has almost no concern about storing data but rather focus on the processing of metadata related to external data. By using different types of metadata as glue, Timeliner can bring together, into a new writing ecosystem, resources that were separated before.

![Figure 1 - Layered Timeliner architecture](image)

Further, instead of organizing users into groups we propose the concept of sharing resources in associated timelines. If two or more researchers are ready to begin collaboration, they should share their timelines with each other. By marking own resources as public and private the users can precisely define what
resources they want to share. The process of sharing timelines between two users is illustrated on Figure 2. Gray lines mark resources to be shared; private resources are painted in black color.

Figure 2 - Timelines and visible shared resources

References


Closing remarks

After establishing Timeliner’s frame of reference, we are planning to go back to the field and further check our assumptions with the users’ actual activity patterns, workflows, and best practices in all issues related with scientific collaborative writing. As such, the next steps include experiential contextual inquiry, observing the user in real context while taking the apprentice’s role; and exploration tests for evaluating the user’s perception of Timeliner’s affordances.

The main challenge addressed by the proposed design of Timeliner is scaffolding the process of scientific collaborative writing without intervening into current activity patterns, workflows, and collaboration practices.