

# Dandelion: Supporting Coordinated, Collaborative Authoring in Wikis

Changyan Chi, Michelle X. Zhou, Min Yang, Wenpeng Xiao, Yiqin Yu, Xiaohua Sun

IBM Research – China

Building 19, Zhongguancun Software Park, 100193, Beijing, China

{chicy, mxzhou, yangmin, xiaowp, yuyiqin, sunxiaoh}@cn.ibm.com

## ABSTRACT

Dandelion is a tool that extends wikis to support coordinated, collaborative authoring using a tag-based approach. Specifically, users can insert tags in a wiki page to specify various co-authoring tasks. These tags can then be executed to help drive and manage the collaboration workflow, and provide content-centric collaboration awareness for all the co-authors. Four successful pilot deployments and positive user feedback show the practical value of Dandelion, especially its value in supporting a structured, collaborative authoring process often seen in business settings.

## Author Keywords

Coordination, collaborative authoring, awareness

## ACM Classification Keywords

H5.3. Information interfaces and presentation: Group and Organization Interfaces – Computer supported cooperative work

## General Terms

Human Factors

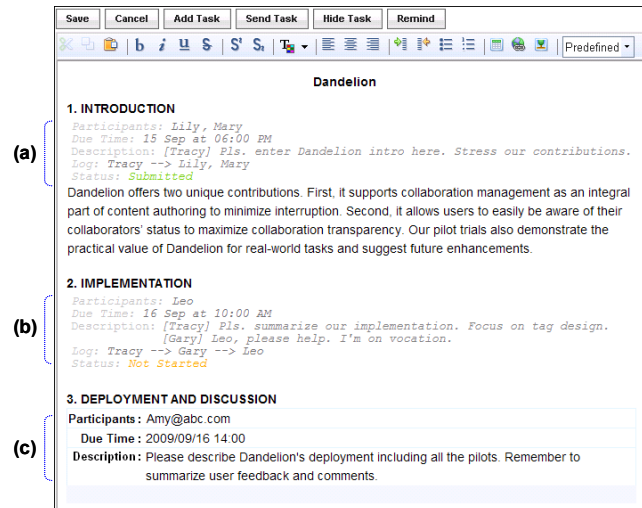
## INTRODUCTION

Wikis have become a common tool used by many to author a document together. For example, a team of engineers may use a wiki to create a product manual together. For various reasons (e.g., efficiency), collaborative authoring especially in a business setting often requires coordination, including assigning authors to specific sections and managing their progresses [3, 5]. Nevertheless, wikis do not directly support coordinated, collaborative authoring. As a result, users often face two challenges in such a process. First, users need to use a wiki and additional tools together to do their work. For example, a lead author may use a wiki to input content, while using email or phone to coordinate the contributions from others. Frequent interruptions on users' writing not only can impact the document quality, but may also raise their level of annoyance and anxiety [1]. Second,

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CHI 2010, April 10–15, 2010, Atlanta, Georgia, USA.

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**Figure 1.** A Dandelion wiki page in edit mode for lead author (Tracy). (a)-(c) task tags for three authoring tasks in different status: (a) submitted task, (b) transferred task, (c) a newly created task.

users have no effective ways of knowing co-authors' activities and status. This lack of awareness prevents an effective collaboration [6].

To address the above challenges, we are building Dandelion on top of a wiki to support coordinated, collaborative authoring. Dandelion employs a tag-based approach that allows users to use tags to specify co-authoring tasks directly *within* a wiki (Figure 1). These tags can then be executed by Dandelion to automatically drive the collaboration workflow (e.g., emailing designated users about their tasks). The tags are also used to record co-authors' activities and status and thus provide users with the desired awareness especially in the context of associated content (Figure 1). As the result, Dandelion extends wikis from two aspects. First, it extends wikis to support tag-based collaboration management with little interruptions on a user's primary task of content authoring. Second, it extends wikis to support content-centric collaboration awareness (e.g., aware of co-authors' work and status).

Since April 2009, we have deployed Dandelion in four successful pilot trials in our company, involving about 70 users. All trials have lasted several months and are still continuing. We have also conducted surveys and interviews of pilot users in various roles (e.g., lead authors and co-authors).

Their overall feedback is very positive and all of them continue using Dandelion in their work.

## RELATED WORK

Researchers have worked on extending wikis to provide awareness for collaborative writing [4, 6]. Similar to these systems, Dandelion also supports group awareness in a collaborative writing process. However, it tightly integrates the awareness features *within* document content instead of separating them as other systems do.

Another piece of related work is to use annotations to guide users in collaborative writing [8, 9]. In these systems, annotations are meant for humans to read and then follow a workflow. In contrast, annotations (tags) in Dandelion are “runnable” and can be invoked to *automatically* drive a collaboration workflow. For example, tags are used to specify authoring tasks and can be invoked to automatically send email notifications to the designated users.

There is also work on supporting collaboration workflows within semantic wikis [2]. While this work focuses on the semantic model of a workflow, Dandelion is on the user interaction aspects (e.g., how users interactively specify a workflow in wikis).

## SUPPORTED ROLES AND TASKS

Wikis are designed to support collaborative authoring, which is a complex process involving various user roles and tasks [7]. For the scope of this work, currently we support two key user roles and their associated tasks that are most common to coordinated, collaborative authoring practices in business settings [7].

### Role of Coordinators and Their Tasks

In many business settings, collaborative authoring often requires the role of a *coordinator*, who initiates and manages the overall process. For example, a sales manager leads his team to co-write a sales report; and a project lead organizes her members to co-author project updates. In such cases, a coordinator often performs three main tasks: (1) define authoring tasks for individual members (i.e., who writes what), (2) manage member progresses (e.g., reminding them of their impending tasks), and (3) write part of content.

### Role of Participants and Their Tasks

Besides coordinators, Dandelion supports the role of a *participant*, who is a co-author invited by a coordinator to write designated sections of a document. A participant’s main task is to handle the received writing assignments in one of the three ways: (1) accept to write the specified sections, (2) reject, and (3) delegate part or whole to others. To support flexible user roles in a dynamic collaborative authoring process [4], Dandelion allows a participant to initiate authoring tasks in the same workflow (e.g., adding new sections). In this case, the participant plays the role of a *local* coordinator, managing the initiated authoring tasks.

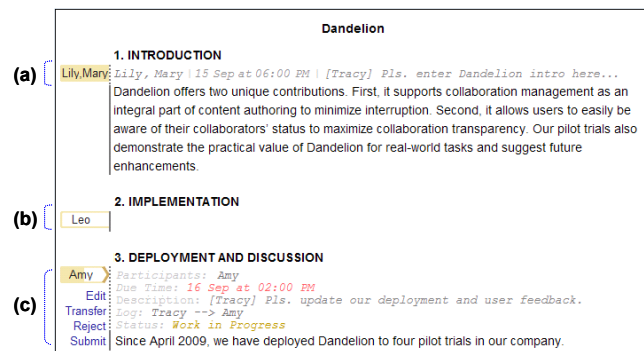


Figure 2. View of a Dandelion wiki page in the view mode for a co-author (Amy). (a)-(c) task tags shown at different levels of detail: (a) summary view, (b) iconic view, and (c) full view.

## DESIGN AND IMPLEMENTATION

To best support the two user roles and associated tasks mentioned above, Dandelion is designed to meet two goals. First, Dandelion must help users better manage a collaborative authoring process (e.g., defining and monitoring co-authoring tasks) to minimize interruptions on their own content writing. Second, Dandelion must help increase users’ awareness of each other’s activities and status for a more transparent and efficient collaboration. Next, we describe how our design guidelines and implementation help meet the two design goals.

### Design Guidelines

To minimize interruptions, our first design guideline is to let a user perform *all* her tasks in the main workspace. In our case, the main workspace is a wiki page where the content is being created, edited, and viewed. To support all tasks of a user in a wiki, we are inspired by a tag-based approach to document authoring. For our purpose, tags are directly attached to the content *inside* a wiki page to indicate related activities and status. Tags can also be executed to drive a collaboration flow (e.g., inviting a participant). Since we now only handle tags that specify co-authoring tasks, we refer to them as *task tags*.

Second, we want the use of tags to be an integral feature of a wiki. To do so, we support tag editing (add, remove, and modify) in a wiki edit mode. This design makes tag editing a natural part of the content editing, minimizing the interruptions on a user’s primary task of content writing. This feature also supports our observed user behavior in practices. Users often define authoring assignments *while* they are writing or editing specific portions of a document.

Third, we want task tags to have simple and unambiguous semantics. This is to allow tags to be easily defined and understood by intended recipients (users and Dandelion). Specifically, Dandelion needs to extract task parameters (e.g., author name and due time) to drive the collaboration process (e.g., notifying participants about their tasks). To do so, we decide to use a tag widget with structured fields instead of a plain text-based tag (Figure 1).

Fourth, we want to use task tags to provide collaboration awareness for all the co-authors. This is because task tags already contain information about collaborators' activities and status. They are to be dynamically updated and visually encoded to reflect the evolving task status.

Last, we are careful about preserving standard wiki features to make Dandelion a natural extension of wikis. Like working in a regular wiki, coordinators can enter and modify content *anywhere* in a wiki page. Similarly, participants can enter content in their designated space or any unrestricted areas of the page. However, they can only view but not modify others' work unless they are invited to do so.

### Implementation

We have implemented Dandelion on top of Lotus Connections 2.5 Wikis. On the client side, we used JavaScript and Dojo to augment Wikis with task tags and support user interaction with the tags. On the server side, we implemented collaboration management functions in Java and added them to Wikis. We describe our implementation of task tags and then the functions that support the use of the tags.

In our current implementation, a task tag has five fields that describe key aspects of a collaborative writing process [8, 9]. Three of them are user-defined: *participants*, *due time*, and *task description*. The remaining two are reserved for Dandelion to track and update a collaboration flow: *status* and *log* (logging the task delegation path). Although we could use more fields to describe collaborative authoring [8, 9], so far the five fields are sufficient for Dandelion.

The appearance of our task tags is inspired by Post-it® flag, a plastic strip that is widely used to attach to the side of a document to flag its specific sections. A user can toggle among its three display modes: full, summary, and iconic view (Figure 2). Additional visual cues (dotted versus solid sideline) are used to differentiate the tag content from the document content. For example, we use arrow direction to indicate the task flow related to the current user (Figure 2c).

To support the role of a coordinator, Dandelion allows a user to: (1) *Add Task*: creating a task tag to assign participants to a specific section, (2) *Send Task*: triggering Dandelion to email task recipients, and (3) *Remind*: triggering Dandelion to send an email reminder to designated participants. Once a tag is added, our current implementation permits only the tag creator to edit its fields.

A valid authoring task must have *participants* specified. Dandelion allows users to specify participants' names or email addresses (Figure 1). It eventually maps all names to email addresses before emailing designated participants about their tasks upon a *Send Task* request. On the server side, we implemented an event-driven finite state machine to handle various user requests (e.g., *Remind*) and drive the collaboration flow (e.g., emailing reminders to designated participants). Currently, we restrain Dandelion not to act on its own. For example, Dandelion does not send users automatic reminders for overdue tasks. This is to leave users

with options to take actions and avoid adverse consequences (e.g., flooding the inbox of an out-of-office user).

Upon receiving the email notification of a writing assignment, a participant can follow the URL link embedded in the email to open the wiki page. The participant is directed to enter content in the designated area right below the task tag. S/he can also reject or transfer the task by clicking on the corresponding button next to the tag (Figure 2c). When a task is transferred, Dandelion automatically updates the *participant* field of the transferred task with new participants (Figure 1b). The corresponding *log* field is also updated to indicate the transfer path (Figure 1b). This information is useful for users to keep track of re-routed tasks.

We have also added the *Submit* button to allow a participant to submit her finished work (Figure 2c). Once the work is submitted, it is available for the coordinator and other co-authors to view. Currently, Dandelion does not allow others to view one's writing prior to its submission. This decision is mainly based on our preliminary user survey, where most users did not want others to view their work in progress.

### FIELD DEPLOYMENT AND DISCUSSIONS

We deployed Dandelion in our company in April 2009 and about 70 users used Dandelion by the end of August. Among Dandelion usage scenarios, we have closely followed five pilot trials, each of which has lasted several months. These five pilots are: (P1) composing monthly department newsletters by a manager and her 20+ team members; (P2) writing quarterly lab highlights by a communication specialist and 12+ managers; (P3) synthesizing weekly project meeting agenda by a manager and her 10+ members; (P4) creating daily scrum notes by a project leader and a team of 20+ software developers; and (P5) writing a product proposal by 10+ researchers and business people.

Among the five pilots, the first four were considered successful as the users routinely used Dandelion to create target documents and continue doing so. However, the users of the fifth pilot abandoned Dandelion before the proposal was completed. We examined the five pilot usages closely to better understand the rationale behind the outcome.

We observed that the nature of the task in P1–4 differs from that of P5. In P1–4, there has been a clear leader who played the role of a coordinator (e.g., the manager of the department). The leader also knew the outline of the document and easily divided up the writing among the members. In contrast, there was not a clear leader in P5, nor was the outline of the proposal crisp. In addition, both the content and structure of the proposal changed rapidly from time to time. In this case, Dandelion's key features such as adding task tags were hardly used. The users only used the basic wiki features to list to-dos or summarize discussions.

Overall, Dandelion seems better at supporting more *structured* collaborative document authoring, where the role of a coordinator is clear and the document outline is more or

less known. For free-formed collaborative authoring, Dandelion adds little on top of a standard wiki.

To better understand users' behavior in Dandelion and their attitude toward various Dandelion features, we conducted a preliminary user survey. Based on the logged usage data, we surveyed ten Dandelion users. All of them have routinely used Dandelion for their activities in one of the four successful pilots. Two of them acted as coordinators and 8 were regular participants. Our survey mainly probed the users for feedback on usability (ease-of-use) and usefulness of Dandelion. We devised a set of statements to describe the ease-of-use and the usefulness of each Dandelion key feature (e.g., *Add Task* and *Send Task*). Our sample statements included: "It is easy to add a task during my content editing" (ease-of-use), and "It is useful to have Dandelion send emails to participants about their tasks" (usefulness). We then asked the users to rate how much they would agree with the statements on a 7-point Likert scale (1 being "completely disagree" and 7 being "completely agree"). Finally, we asked the users about their most and least liked features of Dandelion and suggestions for enhancements.

All users thought Dandelion was easy to use (mdn=6). Both coordinators believed that the most useful awareness features (mdn=7) were their participants' working *status* and the *task delegation path*. The eight participants also believed it was useful (mdn=6) to be aware of their peers' status. One user said: "I like to know others' status. If everyone has submitted their work, I'd better hurry up to finish mine." Another user also mentioned "I think that wikis support similar features but it may not put people and their content together as Dandelion did. So we can easily see who wrote what and what their status is".

The users didn't think the feature of hiding task tags useful (mdn=2). They mentioned that tags should always be visible to provide collaboration awareness. We noticed that all documents created so far in our pilots were short (about 1000 words per document) with about 10 tags. In such cases, task tags didn't seem interfering with the content flow. The situation might be different in longer documents especially with a number of distributed authoring tasks.

It is also interesting to note the opposite opinions on making one's work in progress available to others. Coordinators strongly preferred to view the participants' work in progress (mdn=7). Their main rationale is that "I'd like to see it earlier so I can give them my feedback". On the opposite, participants strongly opposed to disclosing their unfinished products (mdn=2) until they were ready. Another conflict of opinion is on the use of reminders. Coordinators very much liked the feature of having Dandelion send reminders to designated participants (mdn=7). However, the participants did not think reminders much useful (mdn=3.5). From these two sets of conflicted opinions, we sensed that there was a need of balancing both coordinators' and participants' preferences. Further studies are warranted to better understand what these preferences are and how to balance them.

When asked their most and least liked features, coordinators liked the use of tags to manage a co-authoring process. One user commented "I often work with more than 10 people on our weekly meeting agenda. In Dandelion, I just need to draft an outline and add a bunch of tags to assign people to write different parts. All gets done at once." For other users, their most favorite feature was that Dandelion directs them to the designated area after opening a wiki page. Most users did not list the least-liked features.

However, all users suggested that it is desirable to abstract templates or template fragments from composed documents for their reuse. One user said "I don't want to start from scratch every time. It would be great to get a template from my previous compositions and I can then use it to start the new one". Since Dandelion records both task tags and content in a document, it would be interesting to explore whether both data are needed in generating a template.

## CONCLUSIONS

We have presented Dandelion, a tool that extends wikis to support coordinated, collaborative authoring. It lets users insert task tags in a wiki page to specify co-authoring tasks for a group of people. These tags can then be executed to drive the collaboration flow. Task tags are also used to provide collaboration awareness for all users involved in the process, including co-authors' activities and status. Moreover, four successful real-world pilot trials demonstrate the usefulness of Dandelion especially in structured, collaborative authoring situations with designated coordinators.

## ACKNOWLEDGEMENTS

We would like to thank many of our colleagues for their participation and feedbacks, especially Hazel Gao, and Maggie Zhang.

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