A Coauthoring Method of Keyword Dictionaries for Knowledge Combination on Corporate Discussion Web Sites

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Abstract. This paper states the issues faced, and the role played by keyword dictionaries with regard to discussion based web sites which aim to achieve a 'collective knowledge' through the voluntary participation of corporate employees, and proposes a corrective strategy. A keyword dictionary is valuable in that it helps to integrate fragmented accumulated knowledge with generalized knowledge. However, this necessitates a method that allows for coauthoring, and Wiki, BBS and other existing tools are still insufficient in this respect. As well as offering a method for expanding BBS, this paper shows a method for assessing use within an actual corporation.

Keywords: coauthoring, collective knowledge, wiki, bulletin board system.

1 Introduction

In recent years corporate entities have moved to intensify relations and knowledge sharing between employees through the establishment of web sites where the employees can freely exchange opinions [1,2].

The main function of such corporate web sites is often as a Bulletin Board System (BBS) or Diary (Blog). These sites offer a place for discussion and the sharing of personal records through asynchronous text.

Web sites based on these functions (discussion web sites) are capable of fulfilling objectives such as discussion, Q&A, and publicity. However, information inputted on a daily basis is fragmented; often meaning it is only useful at that point in time. For this reason, it is quite difficult to systemize this knowledge to allow for its reuse and the further creation of new knowledge.

It is thought that a keyword function is a valid method for solving this problem. With this method, registering a certain expression as a "keyword" generates a page for the expression (Figure 1). This page subsequently displays an explanation of the expression, along with a list of links to information within the site that contain the

Fig. 1. Overview of Keyword Functions

expression. Furthermore, links are automatically generated, and explanations for each expression are coauthored by the registrant of the keyword as well as other users.

This enables the integration of information within the site centered on keywords, while also allowing for the creation of reusable systematic information based on the integrated information. More specifically, the combination of fragmented information accumulated on corporate discussion sites is promoted, making the creation of new knowledge possible.

Services analogous to this are already on the internet [3]. However, while these existent services presently achieve their information integration function, they have not yet led to the creation of sufficient systematic information. This is thought to be due to the following 2 points.

1. Existence of competitive services: Wikipedia already exists as a systematic information source, and users have an inclination to use these services.
2. Issues with the coauthoring method: as the coauthoring method resembles that of Wiki, there are relative few users who can make full use of its features.

Issue (1) is rarely directly related to corporate web sites covered by this paper due to the existence of specific corporate issues and knowledge that cannot be obtained with on-line services such as Wikipedia (conversely, an overlapping of objectives between corporate sites and on-line services can lead to the inert use of corporate sites). On the other hand, issue (2) is very directly related. From herein, this issue will be addressed.

Although Wikipedia is currently the most successful on-line service utilizing Wiki, it is thought that less than 1% of users join the authoring process on an on-going basis [4]. Despite this, it is thought that the ability to draw many on-line users means that they obtain the assistance of enough overall coauthors. On the other hand, it is thought that relatively small scale services and corporate sites cannot obtain a sufficient amount of coauthor assistance. While even corporate BBS and blog use achieves a certain degree of popularity, Wiki has still not been extensively introduced.

This paper proposes a coauthoring method that expands BBS by investigating the issues faced by the Wiki based coauthoring method and by reviewing existent

research regarding coauthoring. Moreover, these proposals are implemented and introduced in depth along with methods for evaluation their effectiveness.

2 Investigation of Coauthoring Methods

2.1 Wiki and BBS

Users of the current Wiki service are thought to encounter the following 3 problems.

1. A lack of user friendliness as special tags called *wiki markup* have to be used.
2. More strenuous text creation when compared the personal and fragmented text created with BBS and blogs.
3. Difficulty in finding reference information regarding others opinions and past text.

While problem(1) can be solved through the development of additional functions such as GUI featuring editing tools, (2) and (3) are inherent to the basic nature of Wiki, making any ultimate solution difficult as long as Wiki is utilized. (2) and (3) are discussed below.

It is expected that text created by Wiki would encompass documents utilized as knowledge and cross-referenced by a large number of people in comparison to BBS and Blogs. The need for direct editing of this is a great burden on the user. In addition, such methods make it difficult to reference information including past records and discussion processes (Wiki's implementing figuration also means records are sometimes not saved). Therefore, this method may increase the feeling of burden felt by users when creating text.

On the other hand, BBS and Blog do not target a single document, but individually handle each user's multiple fragmented entries. The difference between BBS and Blog is that while the former focuses on mutual Q&A and discussion through entries, blog mainly consist of entries made by a single person¹. These BBS and Blog sites have become extremely popular as a means of communicating on the WWW and other such on-line services. However, they have not been utilized with the aim of creating a single document such as with Wiki.

2.2 Coauthoring Related Research

The research of text coauthoring by multiple users in an electronically aided environment has been mainly carried out in the groupware field. Here, it is believed that communication between participants is important.

As a result of investigating various jobs and organizations, Couture and Rymer (1991) state that text authoring through the direct participation of several persons (group writing) is actually not undertaken very frequently, but rather it is more often the case that a single person authors the text based on the opinions of coworkers (interactive writing)[5]. Our experiences also persuade us to come to the same conclusion.

Therefore, there is little proposal of group writing with groupware research, and a greater emphasis is placed on authoring through the division of responsibilities into

¹ There are cases where readers can comment on blog entries as with BBS, but it is generally the case that the blog writer has the ability to reject such comments.

the form of multiple authors, commentators and reviewers[6-8], or commenting on text (annotation)[9-11].

Note, however, that the existent groupware research covers complex and special systems, and is not well suited to popularization through simple implementing via WWW technology.

Moreover, methods proposed by this research set a certain user within the group as the author. Therefore, this is well suited to use within a small group aiming to create text in a certain period of time, and where responsibilities are clearly divided. However, these methods are not suited to text creation wherein an unspecified number of persons contribute steadily over a long period of time. For the latter, a method where text creation rights are equally shared amongst a large number of users, such as Wiki, is well suited.

In addition, related methods that emphasize annotation necessitate the creation of an initial document by a specified author before other participants can comment on the text. Therefore, the existence of some kind of document is a prerequisite of group work.

2.3 Authoring Method That Expands BBS

This paper applies a deliberative model [12] that expands BBS based on the problems faced by existent systems such as Wiki, and related research.

Figure 2 is a pattern diagram showing the deliberative model. Firstly, each individual enters information as with a BBS or blog (1). Any participant can play a part in integrating this and creating a proposal (2).

Proposal creation in (2) is undertaken in the same way messages are posted on BBS. This allows the user to create a proposal based on the BBS discussion utilizing a method that is almost identical to general BBS use.

This type of process is similar to that used in meetings where issues are first discussed, and conclusions are made after all opinions are heard and then integrated. The creation of text through discussion allows users to create content with considering multiple aspects, and to share responsibility. This is why our method is called the deliberative model.

Fig. 2. Schematic Diagram of Deliberative Model

The proposal is made official through adoption by the user group(3). A vote is generally taken to decide on adopting the proposal. However, in the case there is no set number of users with voting rights, voting is not always undertaken and the document can be adopted when proposed at (2). It is not problematic because proposals can be made any number of times and results can be renewed.

In addition, another proposal (document) is created if the proposed document is not adopted upon voting (4). Moreover, the created document is commented on once again (5) and a cycle of renewal based on this is repeated. Therefore, the deliberative model is an iterative process and it this cycle of iteration that makes it possible to increase document quality.

3 BBS Expansion

The deliberative model is realized by expanding existing BBS. An example of such an expansion is shown in Figure 3, screens from the system utilized by this paper for actual evaluation.

In this figure the left side is the main BBS screen, showing a list of messages posted, and the screen on the right side is for entering messages to post.

First, one clicks the "Input button [A]" on the main BBS screen and opens the message editing screen. Comments posted from here in the same fashion as a general BBS are displayed on the main BBS screen(1). This is how comments are posted. In order to propose a document, one selects "Proposal" under "Message selection field [B]" on the same message editing screen. The posted document proposal is displayed along with comments, and at the top of the main BBS screen(2). A button [C] connected to the voting function is displayed with the document proposal shown at the top. The voting function executed with this button allows for approval rating, inputting of reasons, and voting. Adoption of the proposed document is generally decided by a majority vote. The text of the adopted proposal is newly displayed at the top of the BBS as it stands at the time (3).

Fig. 3. BBS Expansion

Note, however, that in the case it is immediately adopted without voting at (2), the present text is immediately replaced with the proposed document. Accordingly, in such a case, the present text and the newly proposed text are not displayed along side one another.

Upon implementing, standard plugins (modules) used by XOOPS [13] powered BBS were modified. XOOPS is an open source CMS (contents management system) that can incorporate a variety of functions, including BBS. XOOPS is a relatively easy to install, widely used tool that is equipped with broad range of functions required by the on-line community beginning with user administration. Implementing as this type of CMS module increases user-friendliness during actual use. The tool created is called EMCOT (evolution manual coauthoring tool) and is available from a dedicated download site [14,15].

4 Significance and Research Issues

Table 1 explains the characteristics of the deliberative model proposed by this paper.

The deliberative model is similar to the process used in meetings to draw a conclusion after finishing discussions, allowing the user to create a proposal while referring to other user's opinions. Therefore, it is easy to undertake discussions centered on text. On the other hand, authoring with the Wiki method (Wiki model) involves the direct editing of text without discussion between users. For this reason, it is thought that text creation based on the deliberative model is more user-friendly than Wiki.

Moreover, while the annotation method (annotation model) often used by coauthoring tools in groupware research is suited to text centered discussions, it is not suited to text created over a long period of time with the assistance of multiple users, such as a keyword dictionary, as responsibility for proposal authoring and proposal adoption is allocated to a specific participant.

Table 1. Comparison of each type

	Text centered discussion	Responsibility for proposal creation	Responsibility for proposal adoption
Wiki model	difficult	Any participant	Any participant
Annotation model	easy	A specific participant	A specific participant
Deliberative model	easy	Any participant	Majority vote, or Any participant

Accordingly, it is the Wiki model and the deliberative model that can be utilized in the creation of this paper's objective, a keyword dictionary. And upon comparison of these two, it is predicted that the deliberative model facilitates easier text creation due to the nature of its user-friendly text centered discussion. Note, however, that it not yet confirmed whether this is the case with actual use. The research issue of this paper is to actually apply the Wiki model and the deliberative model, and comparatively evaluate them. Methods of application along with evaluation techniques for these models are explained in the next section with regard to keyword dictionary coauthoring.

5 Corporate Evaluation Method

5.1 Applicable Subject

A given IT company has been running web site where employees can exchange opinions since 2004.

Mainly discussion (opinion exchange) is undertaken at this site, with frequent Q&A exchanges carried out. Recently, as user numbers increase along with an increase in accumulated postings it has become difficult for newly participating users to know what kind of discussion previously took place, subsequently making it difficult to utilize information.

By introducing a keyword function to the site users become able to integrate information containing the expression which the user is interested in. The keyword function utilizes a modified version of XWORDS, a XOOPS module.

5.2 Comparative Experiment

A function for coauthoring expression explanations was introduced to the above keyword function in the following way.

The coauthoring function introduced is based on either the Wiki model or the deliberative model. When a user registers a certain expression as a keyword, one of the above two models is randomly assigned as the coauthoring method for that expression.

Fig. 4. Keyword Page

A keyword page is as shown in Figure 4. An expression heading and explanation are displayed at the top of the page, while a list of links to internal information containing that expression is displayed at the bottom left. An explanation of the authoring method is displayed at the middle right hand side. An edit button for jumping to the editing screen is also displayed here for expressions assigned the Wiki model as the authoring method. Expression explanations can be directly edited at the editing screen.

An indexed list of BBS comments for the expression is displayed below the explanation of the authoring method. This is common to both the Wiki model and the deliberative model. With the Wiki model, clicking a link in the list jumps to a regular BBS screen where there is no coauthoring function and only message posting is undertaken. On the other hand, with the deliberative model, clicking a link jumps to a BBS screen with coauthoring functions described in section 2.3. Both these BBS are realized by altering the EMCOT operational settings. Therefore, there are almost no differences except the presence/absence of a coauthoring function.

Moreover, the markup language utilized during the authoring of explanations was introduced to both models through XOOPS.

As you can see, all functional conditions except the comparative subject, the coauthoring method, have been made identical to every possible extent.

5.3 Evaluation

This evaluative experiment evaluates logs automatically recorded by the system along with users' subjective analysis. Table 2 shows a simplified representation of these indexes and research items.

The result of this evaluative experiment which began in late January 2009 was not yet available at the point this paper was being written. This evaluative experiment is to be continued for a given period of time into the future and the result reported in a separate paper.

Table 2. Indexes & Research Items

Index	Research Item
Log	
No. of comments	Discussion vitality
No. of revisions	Amount of contribution to the text
Text count	Text adequacy
No. of text references	Text usefulness
Subjective evaluation	
User-friendliness	Ease of operation
Ease of authoring	Authoring model evaluation
Burden on user	Authoring model evaluation
User satisfaction	Authoring model evaluation
Text adequacy	Text adequacy

6 Summary and Future Research

This paper stated that a keyword dictionary is valid for the discussion web sites being employed by corporate bodies of late, and that the adequacy of text content is currently an issue. Then the deliberative model, which is a coauthoring method that expands BBS, was shown as a solution to this problem.

A method based on the deliberative model is similar to Wiki's method (Wiki model) in that it is well suited to creating text over a long period of time through the steady contribution of multiple participants. In addition to this, another characteristic of the deliberative model is that it facilitates easy text centered discussions. It can be anticipated that creating a proposal after it is thought that sufficient information has been gathered through text centered discussions simplifies text authoring for participants. On the other hand, it is thought that this cannot be sufficiently achieved with the Wiki model.

Along with applying an authoring method based on this deliberative model to the keyword dictionary, this paper explained an evaluative experiment method for its comparison with the Wiki model. This evaluative experiment will be continued for a fixed period of time and the result reported on in the future.

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