Chapter 4

Enabling Intelligence in Web-Based Collaborative Knowledge Management System

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ABSTRACT

This paper presents an approach to enhance various intelligent services of a Web-based collaborative knowledge management system. The proposed approach applies the two widely-used argumentation technologies, namely IBIS and Toulmin’s argumentation schemes, to structurally capture the deliberation and collaboration occurred during the consensual knowledge creation process. It employs RDF and OWL as its underlying knowledge representation language with well-defined semantics and reasoning mechanisms. Users can easily create knowledge using a simple corresponding graphical notation with machine-processable semantics. Derivation of implicit knowledge, similar concept discovery, as well as semantic search, are also enabled. In addition, the proposed approach incorporates the term suggestion function for assisting users in the knowledge creation process by computing the relevance score for each relevant term, and presenting the most relevant terms to users for possible term reusing or equivalence concepts mapping. To ensure the knowledge consistency, a logical mechanism for validating conflicting arguments and contradicting concepts is also developed. Founded on the proposed approach, a Web-based system, namely ciSAM, is implemented and available for public usage.

INTRODUCTION

In recent years, several Web-based collaborative knowledge management systems, also called Social Web, such as wikis, blogs, discussion forums, and online networking sites have become increasingly popular and have attracted a large number of people to participate actively in content creation and knowledge sharing in various domains. However, the current state of the existing systems confront with several important problems:
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• **Unstructured Information:** Although there is a large amount of information on the Web, the user-generated contents are weakly structured and merely formal. The Web information described in plain text with unclear meaning to the computer is hardly usable by external applications or other systems (Krotzsch, Vrandecic, Volkel, & Haller, 2007). Moreover, different online systems employ different data formats that obstruct automatic data gathering and reusing across multiple systems.

• **Ineffective Collaborative Process:** Basically, the more users contributing in editing contents, checking facts, and examining the writing, the more reliable the published knowledge. However, a user might find a difficulty in creating contents, sharing resources, and verifying the evolution of community deliberation due to the lack of explicit and systematic collaborative process. Therefore, a simple yet effective process with intuitive workflow is required to allow users to easily create and share their knowledge, while the user-contributed contents should be intuitively presented or visualized for clarification and further contribution.

• **Poor Quality and Untrustworthy Information:** Since different users have different skills and experiences, the quality and reliability of the user-generated content vary drastically and are difficult to manually evaluate. The poor quality and untrustworthy information of the published content are obstacles for effective reading, understanding, and learning which have been found in many collaborative systems such as *Wikipedia* (Giles, 2005; Hu, Lim, Sun, & Lauw, 2007; Lam & Riedi, 2009; Orlowski, 2005; Stvilia, Twidale, Smith, & Gasser, 2005; Wilkinson & Huberman, 2007), and *Yahoo! Answers* (Agichtein, Castillo, Donato, & Gionis, 2008; Bain, Liu, Agichtein, & Zha, 2008; Bain, Liu, Zhou, Agichtein, & Zha, 2009).

• **Community Conflict:** With a large-scale community deliberation in a geographically distributed online community, the complete agreement is impossible. Thus, the community conflicts occurred during the deliberation are unavoidable. By analyzing the growth of direct work (creating/editing articles) and indirect work (discussions and maintenance) in Wikipedia, Kittur et al. (2007) found that instead of creating new articles, the Wiki’s community is currently focusing on conflict resolutions and maintenance. Several collaborative systems like *Yahoo! Answers* (www.yahool.search.com), *Flickr* (http://www.flickr.com/), *Del.icio.us* (http://delicious.com/), *Youtube* (http://www.youtube.com/), and *Digg* (http://digg.com/), employ voting system to determine the group agreement. However, the systems that apply vote without community deliberation thwarts the capability of a community to create collective knowledge. Moreover, “one man, one vote” or single vote is an inefficient technique due to various reliability and expertise of the voters (Maleewong, Anutariya, & Wuwongse, 2010c).

• **Information Inconsistency:** The same information is often created and changed during the collaborative process which then leads to an inconsistency problem and requires a large amount of human effort in consistency checking. For instance, by searching an issue “Best internet browser” in Yahoo! Answers, almost 2,000 similar questions have been retrieved with different best answers. The variation of the best answers is due to a lacking of effective mechanism to facilitate community deliberation and collaboration.

• **Searching Problem:** Many collaborative systems present their user-generated con-
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