Research on Web 2.0-Based Enterprise Knowledge Management Methods: Postprint

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Abstract

Purpose/Significance: Leveraging the advantages of Web 2.0—such as convenience, speed, mass participation, and strong interactivity—and applying them to the acquisition, sharing, evaluation, and utilization of enterprise knowledge to improve knowledge management efficiency represents a key research issue in enterprise knowledge management.

Method/Process: This paper analyzes the characteristics and main technologies of Web 2.0, discusses the role and application patterns of Web 2.0-related technologies in enterprise knowledge management, and proposes Web 2.0-based approaches for enterprise knowledge management, including methods for knowledge acquisition, classification and organization, and sharing and evaluation that utilize Web 2.0 technologies.

Result/Conclusion: By introducing Web 2.0-related technologies into enterprise knowledge management, this provides convenient and low-cost tools and methods for knowledge management activities, enabling internal and external enterprise users to participate in these activities quickly, conveniently, and in real-time.

Full Text

Research on Enterprise Knowledge Management Methods Based on Web 2.0

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Abstract

[**Purpose/Significance**] A critical challenge in current enterprise knowledge management research is how to leverage the advantages of Web 2.0—such as convenience, speed, mass participation, and strong interactivity—to improve the efficiency of enterprise knowledge management by applying it to knowledge acquisition, sharing, evaluation, and utilization. [**Method/Process**] Based on an analysis of Web 2.0 characteristics and key technologies, this paper discusses the role and application patterns of Web 2.0 technologies in enterprise knowledge management, and proposes Web 2.0-based enterprise knowledge management methods, including knowledge acquisition approaches, knowledge classification and organization methods, and knowledge sharing and evaluation mechanisms. [**Result/Conclusion**] By introducing Web 2.0 technologies into enterprise knowledge management, this research provides convenient, low-cost tools and methods for knowledge management activities, enabling internal and external users to participate quickly, conveniently, and instantly in enterprise knowledge management activities.

Keywords: Web 2.0; enterprise knowledge management; knowledge acquisition; knowledge classification and organization; knowledge sharing and evaluation

1. Introduction

In 2006, J. Musser and T. O'Reilly first defined Web 2.0, proposing that it represents a foundation for 21st-century networks formed by a series of economic, social, and technological trends—a more mature and distinctive medium characterized by user participation, openness, and network effects [1]. The currently accepted concept in industry is that Web 2.0 is a new generation of internet models centered on social software applications such as blogs (Blog), wikis (Wiki), Really Simple Syndication (RSS), Digg, Witkey, Social Networking Services (SNS), tags (Tag), and Instant Messenger (IM), implemented based on new theories and technologies including six degrees of separation, fractals, XML, and Ajax.

The rise and development of Web 2.0 models and technologies have significantly promoted knowledge and information sharing and exchange through the internet. As knowledge management has gained increasing attention from enterprises and organizations, Web 2.0 technologies have gradually expanded from personal applications to organizational applications. Blog, Wiki, and Witkey have begun to be applied to enterprise knowledge sharing platforms [3], facilitating the development of enterprise knowledge management. For example, IBM utilizes Web 2.0 technologies to develop employee creative resources [4]. Academia has also recognized the convenience and value of Web 2.0, attempting to introduce Web 2.0 technologies into enterprise knowledge management applications and conduct research on them.

Zhu Chunyan and Hua Weina [5] mapped the evolution trend of Web 2.0 research hotspots over ten years, concluding that the main research areas of Web 2.0 include libraries, information services, information exchange and social networks, knowledge management, and user behavior. Liu Nian [6] introduced Blog as a personal knowledge management tool into enterprises to improve knowledge management efficiency and implemented and verified its effectiveness at Ruili Group. Li Gang et al. [7] and R. Ramanau & F. Geng [8] studied the implementation process of internal organizational knowledge sharing based on Wiki. Xu Xiangbin et al. [9] elaborated on the applications of SNS in internal enterprise knowledge management, customer relationship management, and enterprise precision marketing, and established a microblog customer value evaluation model to provide references for enterprises implementing microblog-based network marketing and customer relationship management. Cheng Tao et al. [10] constructed an enterprise knowledge sharing mechanism and prototype system based on Blog and Wiki, providing an approach to knowledge sharing and management adapted to network economic development. Zhao Ying et al. [11], based on research on the relationship among "Web 2.0 usage—enterprise social capital—knowledge management capability," proposed countermeasures and suggestions for enterprises in different industries, with different property rights and scales to better apply Web 2.0 technology to enterprise informatization and knowledge management practices. Xu Hongyu [12] introduced the application of Web 2.0 in knowledge management and argued that knowledge management personnel making full use of this more open and personalized Web 2.0 environment would promote the development of knowledge management.

Existing research results indicate that Web 2.0 technologies such as Blog and Wiki have begun to be applied to enterprise knowledge management activities. However, systematic analysis of the application of various Web 2.0 technologies in knowledge management is still lacking, and research on how to use these technologies for enterprise knowledge acquisition, organization, sharing, and evaluation remains insufficient.

2.1 Web 2.0 Technologies and Characteristics

Forrester Research surveyed 119 chief information officers and over 500 company employees, with results showing strong demand for Web 2.0 technologies in areas including Blog, Wiki, RSS, SNS, and Tag. From this, the main Web 2.0 technologies can be summarized as: Blog, Wiki, RSS, Digg, Witkey, SNS, Tag, and IM. Web 2.0 can apply these technologies to information sharing, knowledge sharing, and collaborative task completion.

Regarding the main characteristics of Web 2.0, scholars have summarized them from different perspectives. T. O'Reilly [13] proposed seven basic design principles of Web 2.0: the web as platform, service-oriented development, active user participation, automatic service improvement, collective intelligence, content-centeredness, perpetual beta, and rich user experience. L. Colin [14] summarized three basic characteristics of Web 2.0: self-service websites, rich user expe-

rience, and lightweight programming models. L. Moira [15] demonstrated the relevance of O'Reilly's seven principles of Web 2.0 to knowledge management. Wang Weijun and Sun Jing [16] identified the theoretical foundations of Web 2.0 as the long tail theory, social software and social networks, and six degrees of separation.

Based on a comprehensive summary of current domestic and international perspectives on Web 2.0, its most important basic characteristics can be summarized as follows:

(1) **User-centeredness**: Decentralization with the broad user base at the center, where users are no longer passive recipients but active participants in construction. Each user is simultaneously a reader, publisher, disseminator, and modifier of information.

(2) **Openness and interaction**: Encouraging open discussion among users, creating an atmosphere of information sharing, and continuously enriching users' knowledge and network resources. Users can experience group atmosphere, the joy of knowledge learning, and self-value realization.

(3) **Self-organization**: Enabling full interaction among elements such as people, groups, content, and applications in a self-organizing manner for virtuous cyclic development. Various forms of self-organizing architectures are formed between individuals, between content, and between groups aggregated by individuals.

(4) **Collective intelligence of the masses**: James Surowiecki proposed "The Wisdom of Crowds" in his 2004 SXSW conference speech, where the collective intelligence of broad users creates new internet systems and content [17].

2.2 The Role of Web 2.0 Technologies in Enterprise Knowledge Management

The core concepts of Web 2.0 are openness, interaction, and sharing, encouraging deep user participation and leveraging the collective intelligence of the masses for knowledge creation and sharing. These characteristics give Web 2.0 technologies numerous advantages in supporting enterprise knowledge management:

(1) **Harnessing collective intelligence to broaden enterprise knowledge acquisition**: Employees can participate in building enterprise knowledge repositories, recording and sharing their learning experiences and knowledge through Blog and other methods at any time.

(2) **Associating knowledge with employees to facilitate locating knowledge and experts, enabling timely feedback on knowledge sharing and application effects**.

(3) **Facilitating employee participation in knowledge reading, recommendation, and evaluation activities, which indirectly promotes**

knowledge renewal and elimination in enterprise repositories and fosters self-organizing optimization of knowledge bases.

(4) **Supporting knowledge collaboration and mutual assistance**: Employees can conduct collaborative creation of enterprise knowledge through Wiki mode, or publish questions, provide help, or recruit project members through Witkey mode.

An analysis of the correlation between Web 2.0 technologies and the main functions of knowledge management reveals that Web 2.0 technologies promote different knowledge management functions to varying degrees, as shown in Table 1 :

Table 1 The Role of Web 2.0 Technologies in Enterprise Knowledge Management

Web 2.0 Function Category	Knowledge Acquisition	Knowledge Description	Knowledge Evaluation	Knowledge Organization	Knowledge Cooperation	Knowledge Sharing	Knowledge Application
Blog							
Wiki							
Witkey							
Digg							
Tag							
SNS							
RSS							
IM							

Note: *indicates very significant effect;* *indicates relatively significant effect*

3. Application of Web 2.0 Technologies in Enterprise Knowledge Management

With the widespread use and maturation of Web 2.0 technologies, they have gradually begun to be applied to and influence knowledge management. The application of various Web 2.0 technologies in enterprise management can help enterprises acquire internal and external knowledge, establish and manage knowledge repositories, achieve collaborative design and manufacturing, create a favorable knowledge sharing atmosphere, discover valuable knowledge and experts, and promote knowledge application.

(1) **Blog**: Enables employees to write, share, and modify personal knowledge anytime and anywhere, including domain expertise, project experience, development technical knowledge, etc., and allows other employees to discuss and evaluate the knowledge. The Blog approach can both organize explicit knowledge and promote the excavation and expression of tacit knowledge.

Introducing Blog tools into enterprise knowledge management can serve as an important supplement to existing enterprise knowledge management systems [6].

(2) **Wiki**: A collaborative knowledge carrier developed through open-source methods, where anyone can actively participate by adding content and co-creating to continuously accumulate, improve, and share knowledge. Employees can use Wiki mode to collaboratively edit and share domain terminology and professional knowledge, and continuously improve it.

(3) **Witkey**: Enterprises can use Witkey tools to post reward-based questions for difficult knowledge and project knowledge urgently needed in the organization, incentivizing the collective wisdom of broad users to provide solutions to current urgent problems, and can also recruit project members for specific projects within the organization.

(4) **Digg**: A user-initiated knowledge mining and evaluation method that facilitates the discovery and sharing of high-value knowledge. Employees' mining of interesting knowledge through Digg helps enterprises discover useful knowledge from massive knowledge repositories, and Digg itself is also a form of knowledge sharing and evaluation.

(5) **Tag**: Helps employees conveniently manage and share various knowledge, and employees setting tags on knowledge they are interested in can also help enterprises collaboratively classify massive knowledge. For example, Douban.com uses a combination of categories and free tags to organize and manage website information [17].

(6) **SNS**: Enterprise SNS tools can help employees expand their social circles, promote the formation of professional domain groups or knowledge circles within the enterprise, facilitate knowledge exchange and sharing, and help discover experts among employees.

(7) **RSS**: Achieves knowledge sharing through information filtering, subscription, and push delivery. Employees can use RSS to subscribe to domain knowledge they are interested in, improving knowledge retrieval and application efficiency.

Figure 1 [Figure 1: see original paper] illustrates the role of Web 2.0 technologies in enterprise knowledge management and the relationships among them.

4. Web 2.0-Based Enterprise Knowledge Management Methods

4.1 Enterprise Knowledge Acquisition Methods

Overall, enterprise knowledge sources have two aspects: internal and external. Internal knowledge is self-generated, while external knowledge is absorbed from outside. Internally generated knowledge mainly includes experience, systems,

and patents accumulated from previous operations, as well as knowledge possessed by employees. Externally absorbed knowledge mainly includes knowledge accumulated from cooperation with external customers and useful knowledge absorbed from public networks [18].

Enterprise knowledge acquisition has two main methods: user-uploaded manual methods and machine-based automatic web crawling methods.

(1) **User-uploaded methods** include dedicated knowledge administrator editing and uploading, and broad employee self-uploading. The administrator-uploaded method has two main problems: First, the number of dedicated enterprise knowledge administrators is limited, and enterprise knowledge repositories involve massive amounts of knowledge, making it difficult for them to manage and be familiar with all categories of knowledge. Second, administrators can only acquire and manage publicly available knowledge but are powerless regarding employees' private knowledge.

The employee self-uploading method leverages the collective wisdom of broad employees, allowing them to summarize and share knowledge in their areas of expertise, which can solve the problems of limited administrators and narrow knowledge scope. However, it also faces issues such as low employee sharing enthusiasm and non-standard knowledge uploading.

Therefore, a combined approach of knowledge administrator editing and uploading with broad employee self-uploading is generally adopted. On one hand, it leverages employee enthusiasm, allowing them to independently edit and upload knowledge in their areas of expertise. On the other hand, enterprises establish dedicated knowledge administrators to review and manage the standardization of employee-uploaded knowledge, promoting standardization of knowledge in enterprise repositories for easy employee use.

(2) **Network automatic crawling acquisition** refers to using "web spider" software to automatically download domain knowledge that enterprises care about from designated websites through keywords or tags, such as patents, journal papers, dissertations, and web articles. This method can automatically acquire large amounts of public knowledge from networks but may have issues such as non-standard formats and duplicate knowledge, requiring further manual review by knowledge administrators before repository entry.

Based on the above analysis, using Web 2.0 tools and adopting different acquisition methods according to different knowledge sources, a Web 2.0-based enterprise knowledge acquisition model is presented, as shown in Figure 2 [Figure 2: see original paper]:

Figure 2 Web 2.0-Based Enterprise Knowledge Acquisition Model

The model identifies four knowledge sources with corresponding Web 2.0 acquisition methods: (1) **Individual knowledge of internal employees**: Use

Web 2.0-based Blog, Wiki, and Digg forms to encourage employees to actively publish personal knowledge through knowledge sharing incentive mechanisms. (2) **Organizational knowledge within the enterprise**: Can be regularly organized and uploaded to the enterprise knowledge repository by departmental knowledge administrators. (3) **Knowledge from external organizational users (partners, suppliers, and customers)**: Provide external users with a channel to publish their suggestions (such as Blog) so they can conveniently publish knowledge regarding suggestions on enterprise services and products. (4) **Knowledge from external public network media**: Use web spider technology to regularly and automatically crawl network patent databases and industry websites, which enter the enterprise knowledge repository after knowledge administrator review.

4.2 Enterprise Knowledge Classification and Organization Methods

While Web 2.0 tools continuously introduce new knowledge to enterprises, they also bring new challenges to enterprise knowledge repository construction. Knowledge posted by employees through Blog is often non-standard, mostly personalized and emotional descriptions, while knowledge obtained through Witkey mode typically involves comprehensive knowledge across many domains. Traditional classification directory structures can no longer cope with the classification and organization needs of different types of knowledge in the Web 2.0 environment. Moreover, employees also hope to conduct personalized knowledge classification and organization according to their needs, posing challenges to enterprise knowledge classification and organization.

Generally, knowledge association methods mainly include domain categories, keywords, tags, attributes, clustering, behavior, and diagnosis/reasoning [19]. Attributes and diagnosis/reasoning methods require building ontology libraries based on ontology technology, which is costly and engineering-intensive, while clustering requires analyzing the relevance of knowledge to establish associations. For enterprises, the emphasis is on simple and effective knowledge management. Using a combination of domain classification trees, keywords, and tags for knowledge classification can both retain the advantages of traditional directory classification structures and meet users' personalized classification needs, as shown in Figure 3 [Figure 3: see original paper]:

Figure 3 Integrated Knowledge Classification Method Using Domain Classification Tree, Free Tags, and Keywords

(1) **Domain classification tree**: A traditional directory classification structure that hierarchically divides knowledge according to professional domain, knowledge attributes, and knowledge type to form a complete tree system with clear structure and distinct levels, facilitating employee knowledge retrieval. Employees can search the knowledge repository through multiple directories such as professional domain, author, and knowledge type. For example, employees can discover the knowledge document "35kV

Transformer Installation Instructions" under both the professional domain directory and the knowledge type directory. However, domain classification trees require clear and accurate knowledge division and struggle to manage knowledge with vague domains or cross-domain knowledge.

(2) **Keywords**: Keyword classification uses keywords in knowledge content as association links to automatically connect knowledge with the same keywords [20]. Knowledge in the repository establishes association relationships through keywords, and when employees query a certain keyword, all knowledge related to that keyword can be retrieved. Enterprise knowledge repositories can establish keyword libraries based on professional terminology or allow employees to add keywords when publishing knowledge. Keywords have strong relevance and widely exist in various forms of professional knowledge content, but compared with massive enterprise knowledge repositories, the number of keywords reflected in professional terminology is still limited and not flexible enough.

(3) **Free tags**: Also known as folksonomy, refers to a tag classification method with flat rather than hierarchical structure, spontaneously defined by broad employees. This method determines knowledge tags through the frequency of definition by user groups. For example, employees can define two tags, "35kV transformer" and "installation instructions," for the knowledge document "35kV Transformer Installation Instructions." If among all tags defined for this knowledge, "35kV transformer" and "installation operation specifications" have the highest frequency, then they become the free tags for this knowledge. Although free tags are relatively less rigorous and accurate, they are flexible, convenient, and unrestricted, meeting employees' personalized cognitive needs.

Moreover, knowledge in Blog and Witkey is relatively casual and may involve broad domains, making it more suitable for keyword and free tag methods, while knowledge in Wiki requires strong standardization and clear classification, making it suitable for domain classification tree methods.

4.3 Enterprise Knowledge Sharing and Evaluation Methods

Enterprise knowledge management does not stop at knowledge acquisition and repository entry; it also requires knowledge classification, organization, sharing, and evaluation to promote knowledge ordering, enabling employees to conveniently and quickly retrieve high-value knowledge, thereby promoting enterprise knowledge application and innovation [21]. With Web 2.0 technologies such as RSS, Tag, Blog, Wiki, and SNS, broad enterprise employees can conveniently achieve knowledge acquisition, organization, sharing, evaluation, and application, overcoming defects in traditional knowledge management methodologies and providing a series of effective technologies and methods for knowledge management.

Based on the above concepts, a Web 2.0-based enterprise knowledge sharing and

evaluation system model can be constructed, as shown in Figure 4 [Figure 4: see original paper]:

Figure 4 Web 2.0-Based Enterprise Knowledge Sharing and Evaluation Model

Individuals (employees) or groups (employee teams, knowledge groups) with knowledge in Web 2.0 enterprises can use Web 2.0 technologies to create, write, and share knowledge through tools such as Blog, Wiki, and Witkey; conduct knowledge exchange, collaboration, and sharing through SNS and IM to form knowledge exchange communities and interest groups; classify and organize knowledge through interactive tags, keywords, and domain classification trees, and use RSS to achieve knowledge retrieval and push delivery; and evaluate knowledge through Digg and self-rating forms. These Web 2.0 technologies enable knowledge users to conveniently create, share, evaluate, and apply knowledge anytime and anywhere, promoting the construction and application of enterprise knowledge repositories.

5. Conclusion and Future Outlook

This paper analyzed the role of Web 2.0 technologies represented by Blog, Wiki, and Digg in enterprise knowledge management, elaborated on the main applications of various Web 2.0 technologies in enterprise knowledge management, and focused on proposing Web 2.0-based enterprise knowledge acquisition methods, classification and organization methods, and sharing and evaluation methods. The research aims to provide references for enterprise knowledge managers and promote the development and level of enterprise knowledge management. The limitation of this research is the lack of actual enterprise application cases; the application effects of Web 2.0 technologies in enterprises require practical verification. Future research will consider conducting empirical studies through questionnaire surveys to understand users' attitudes toward and influencing factors of different Web 2.0 technology applications in enterprise knowledge management.

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Author Contributions

Le Chengyi: Determined the research topic and research ideas, wrote the paper; Lu Ting: Revised the paper.