Hundreds of millions of users can now access several billion documents on the Web, and even larger data sets reside in organizations’ intranets and Web-accessible databases (the so-called deep Web). As the amount of available data continues to grow rapidly, it’s increasingly difficult for users to find, organize, access, and maintain the information they require.

At the same time, the notion of the Semantic Web promises to make Web-accessible data more amenable to machine processing. The Semantic Web is about labeling (annotating) information so that computer systems (and humans) can process it more meaningfully. The semantics underlying such annotations usually come from ontologies, which encapsulate agreement among information creators and users with help from common nomenclature and the use of rich knowledge representation. Just as the Semantic Web (also called Web 3.0) is beginning to empower and energize content on the Web, the underlying principles and technologies can energize and enhance the long-standing knowledge-management discipline. In this special issue of IC, we’re particularly interested in the new possibilities the Semantic Web affords for improved knowledge management.

Trends in Knowledge Management

We can distinguish three broad phases in knowledge-management trends in recent years. In the repository-centric phase, we had one or more central information repositories with a set of corporate contributors and reviewers. Second was the move to smaller, facilitated knowledge communities. Finally, a recent trend that includes social computing (the use of wikis, blogs, networking sites, collaborative filtering, and so on) and a less static view of knowledge and its representation has expanded and replaced previous knowledge-management archetypes.

In the business world — characterized by globalization’s effects and demands and the need to support close-to-market business strategies — accuracy, integrity, and availability requirements represent only a subset of what’s needed. Today, knowledge in business settings requires...
both horizontal and vertical integration to business logic and continuous market updates. Furthermore, trends toward business networking encouraged by strategic alliances and mutually beneficial (“win-win”) business collaborations require knowledge sharing at the interorganizational level. Knowledge sharing at a global level requires ontological agreements that support increased interoperability and integration reference layers.

Several frameworks within knowledge-management theory set contexts for scientific debate. Some emphasize the knowledge life cycle, others the knowledge product, and many researchers have recently begun to emphasize the knowledge and social networking perspective, as previously described. The rapid adoption of Web 2.0 and Web 3.0 technologies adds to this picture a tight connection between knowledge management, social networks, and various implicit, formal, or powerful semantics.

Semantic-Based Knowledge Management

Researchers have studied semantics’ role in information integration and analysis for a long time. In the context of recent Semantic Web activity, the availability of methodologies and tools for ontology development has allowed knowledge representation to make practical inroads via successful domain ontology development. In particular, the life sciences, health care, government, and technology-intensive sectors have used ontologies to develop new classes of semantic applications.

Wider adoption of W3C recommendations such as RDF and, to a lesser extent, the Web Ontology Language (OWL) has inspired new tools and products from both emerging and mainstream industries. As semantic technologies prove their value with targeted applications, opportunities to consider applying them as business enablers increase. Knowledge management is a critical enabler for improving organizational performance through the better use of intellectual assets; in addition, many businesses must deal with knowledge services that form larger parts of the global economy. Thus, recent examples exist in which organizations have applied semantics to improve on traditional knowledge-management approaches or realize emerging knowledge-services requirements.

This special issue aims to communicate and disseminate recent research and success stories that illustrate semantics’ power in business strategy. In the context of knowledge management and services, organizational and human issues are perhaps even more important than the technical issues that have received the most attention in the past. The recent emergence of services science reflects the increasing importance of incorporating human and organizational dimensions beyond those considered with service-oriented architectures and Web services.

In this Issue

The five articles selected for this special issue summarize our view of the Semantic Web’s strategic role toward more effective knowledge management. They provide sound propositions for supporting knowledge management at several levels. At the individual and artifact level, they highlight the concepts of automatic metadata extraction and service-oriented metadata management; at the group and organizational level, they promote the significance of peer-to-peer networks; and at the interorganizational level, they investigate ontologies’ significance.

In “Requirements and Services for Metadata Management,” the authors identify general requirements for metadata management and describe a simple model and service to address these requirements, with specific focus on RDF metadata.

In “Extracting Relevant Attribute Values for Improved Search,” the authors propose a new kind of metadata — relevant values — that provides a synthesized view of an attribute’s values directly extracted from the data.

“GridVine: An Infrastructure for Peer Information Management,” describes a semantic overlay infrastructure based on a peer-to-peer access structure. In GridVine, users can query heterogeneous but semantically related information sources transparently using iterative query reformulation. The authors discuss their experiences using GridVine as a substrate for sharing semantic information.

“Using Semantic Web Technologies to Analyze Learning Content” demonstrates how Semantic Web technologies can improve the state of the art in learning environments and bridge the gap between students and learning content authors or teachers. The authors’ ontological framework helps formalize the notion of learning object context.

Finally, in “Harvesting Wiki Consensus: Using Wikipedia Entries as Vocabulary for Knowledge Management,” the authors show that standard wikis are suitable platforms for the collaborative
development of vocabularies that can be used to annotate documents. They prove that Wikipedia entries’ URIs are surprisingly reliable identifiers for conceptual entities.

The latest Semantic Web developments and insights in knowledge management challenge the new era of semantic-based knowledge-management systems. Semantic Web tools and applications contribute significantly to knowledge management’s performance, providing

- a definition for flexible reference mechanisms to knowledge objects and knowledge contributors;
- integration of knowledge creation and use;
- integral human involvement in information- and knowledge-management activities; and
- a definition for and the exploitation of social networks, including social activities and context.

As always, a new convergence requires a key champion. In the business world, those at the executive level must understand semantic-based knowledge management’s benefits. Ultimately, this special issue highlights the need to look beyond the various trees of the new Semantic Web era to see the forest, to define new managerial and business models linked with business strategy. To reach this milestone, various communities must analyze how the Semantic Web fits or challenges current business logic and processes.

We invite the management, business strategy, information systems, computing, and Semantic Web communities to develop synergies that will promote semantic-based knowledge management as a key enabler for a new era of effective business strategies.

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