

# Representing Virtual Communities for Advanced Services

**Miguel-Angel Sicilia**

*University of Alcalá, Spain*

**Elena García-Barriocanal**

*University of Alcalá, Spain*

## INTRODUCTION: THE VISION OF THE SEMANTIC WEB

The Semantic Web vision described by Berners-Lee, Hendler and Lassila (2001) represents an approach to enhancing the current World Wide Web with machine-understandable semantics. The essential idea is that Web resources identified by Uniform Resource Identifiers (URIs) can be described by metadata with the purpose of enabling automated processing. The precision of logics-based description would allow for the creation of tools that do not rely on natural language processing as current search tools, thus ideally removing the problems associated with ambiguity and implicitness in natural language.

Metadata requires shared semantics in the context of an open Web, so that the proliferation of descriptions and vocabularies do not end up in a Tower of Babel. Ontologies provide the support for the shared representation of such semantics, and ontology mapping procedures could resolve the issues of semantic interoperability in case of disparate representations over the same domain. Ontologies act as descriptions of semantic domains used to express metadata records according to previously agreed definitions. Based on the infrastructure provided by ontologies and semantic metadata, the Semantic Web vision rests in the provision of distributed functionality built on intelligent agents and Web services.

Since a virtual community is no other thing than a phenomenon that takes place on the Web, its elements are thus subject to being described by Semantic Web metadata, so that community-specific Semantic Web functionality could enhance the communicational elements that are part of communities. A typical scenario for such functionality is that of a filtering service that delivers recommended resources for community members according to the interests shared by members with similar interests. Other scenarios may result in the adaptation of the shared space inhabited by the community members; for example, member lists may be reordered according to the strength of social relationships, or mes-

sages could be circulated according to the network of social relationships (Sicilia & García, 2004).

The Semantic Web opens many perspectives to create richer environments for virtual communities, and some specific technologies have already been created to deal with some of the definitional aspects of communities. Here we sketch the main elements that should be taken into account in developing experimental applications of Semantic Web technologies to the specifics of virtual communities.

## FORMAL ONTOLOGIES AND RESOURCE ANNOTATION

Ontologies provide an explicit, shared representation of a domain providing unambiguous definitions for the main concepts and relations describing the phenomena under consideration (Gruber, 1995). Description logics (Baader, McGuinness, Nardi, & Patel-Schneider, 2003) are well-known and thoroughly studied knowledge representations that can be used to develop formal ontologies and systems that use them, enabling reasoning services of a diverse kind. Formal ontologies thus provide a foundation for representing the diverse aspects of virtual communities and the artifacts they deal with in terms of ontologies, which would eventually result in advanced tools that are aware of the structural and cultural issues that are part of a community. Ontologies can be expressed in Web markup languages for ease of processing and interoperability. Notably, the OWL language has reached the status of W3C recommendation, and several tools are already available to edit or process OWL representations.

The annotation of a resource—that is, the provision of semantic metadata for it—is thus considered a matter of using terms or relationships inside an ontology to describe it. For example, it can be stated that a given resource is an image about an “Early Baroque” piece of art. Then, the terms inside the ontology allow an agent to find out that this corresponds to “*European styles and periods*,” which may lead the agent to select the resource

for the ongoing collaborative work inside a community that is constructing Web pages about “*contrast of light and dark*” (a characteristic of Baroque art also described in the ontology) in European paintings. In addition, the agent may choose to deliver the resource to the community member that has the “*role of leader*” of the activity at that precise moment, and also to the community member that is “*most active*” in the ongoing activity. The just-described scenario illustrates the kind of knowledge put into play in Semantic Web applications, which includes general or domain-specific knowledge and also knowledge about the current status and relationships inside the community at hand.

## **DESCRIBING RELATIONSHIPS AND SOCIAL CONTEXTS IN THE SEMANTIC WEB**

Virtual communities are not mere coincidences of individuals in the Web, but are considered to be characterized at least by common interests, frequent interaction and identification. These relatively long-term relationships, thus, have defining characteristics (Jones, 1997) that require an explicit representation for analysis or for the sake of providing tools that are aware of community relationships and cultural elements specific to each virtual community.

The Friend-of-a-Friend (FOAF) project ([www.foaf-project.org/](http://www.foaf-project.org/)) is an experimental Resource Description Framework (RDF) vocabulary for describing personal information and personal relationships that can be used to locate people with similar interests and characterize virtual communities by automated means. FOAF can be used to give personal information (e-mail or postal address, personal Web page and the like) and also to describe “who knows who” or even to describe that two people are in the same photograph. In consequence, it can be used as a basic framework for describing the social relationships inside communities. In addition, some extensions to this ontology exist. Prestes, Carvalho, Paes, Lucena and Endler (2004) propose an extension that can help promote typical virtual community activities in open mobile systems based on spontaneous interaction. Concretely, they extend the FOAF concept «Person» to enable the inclusion of other terms like «InterestLevel», «Proficiency», «Channel», «ShareDirectory» or the relationship «providesServices».

Stutt and Motta (2004) provide a view on the Semantic Web and virtual communities that emphasizes two elements: (1) the provision of ontologies for communities, community structures, roles, relations, spaces, topics,

tasks, practices and so on; and (2) the provision of semantic Web services that facilitate community building; for example, those that assist community tasks, such as intelligent search. Element (2) critically depends on the understanding of the elements and characteristics of the virtual community described by the ontology (1), and this is still an open issue.

In addition to representing the community itself and its structure, communities share some beliefs and knowledge specific to their setting, which can also be subject to representation through Semantic Web artifacts. For example, Davies, Duke and Sure (2004) describe *OntoShare* as a tool for the creation of knowledge in form of ontology inside a Web community.

The representation of the relationships and elements inside the community itself, combined with a representation of the collective knowledge shared by the members of the community, are the two main directions for further research in this area.

## **CONCLUSION**

Semantic Web technologies provide logics-based tools to deal with Web resources, thus enabling the development of automated services that take advantage of machine-understandable metadata linked to ontologies. Semantic Web technology can be used to develop advanced tools for community-aware services like search or filtering, and they can also be used to develop adaptive behaviors that take into account relationships and cultural issues inside the community.

For that vision to become a reality, an ontology describing in detail the main elements of virtual communities is required. Even though some concrete projects and experimental vocabularies have advanced in such direction, much work is still required to reach a reasonable consensus about such conceptualization.

## **REFERENCES**

- Baader, F., McGuinness, Nardi, D., & Patel-Schneider, P. F. (Eds.), (Eds.). (2003). *The description logic handbook. Theory, implementation and applications*. Cambridge: Cambridge University Press.
- Berners-Lee, T., Hendler, J., & Lassila, O. (2001). The semantic Web. *Scientific American*, 284(5), 34-43.
- Davies, J., Duke, A., & Sure, Y. (2004). OntoShare: An ontology-based knowledge sharing system for virtual communities of practice. *Journal of Universal Computer Science*, 10(3), 262-283.

1 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/representing-virtual-communities-advanced-services/18110](http://www.igi-global.com/chapter/representing-virtual-communities-advanced-services/18110)

## Related Content

---

### Information and Communication Technology (ICT) and Its Mixed Reality in the Learning Sphere: A South African Perspective

Ntokozo Mthembu (2018). *International Journal of Virtual and Augmented Reality* (pp. 26-37).

[www.irma-international.org/article/information-and-communication-technology-ict-and-its-mixed-reality-in-the-learning-sphere/214987](http://www.irma-international.org/article/information-and-communication-technology-ict-and-its-mixed-reality-in-the-learning-sphere/214987)

### Knowledge Creation and Student Engagement Within 3D Virtual Worlds

Brian G. Burton and Barbara Martin (2017). *International Journal of Virtual and Augmented Reality* (pp. 43-59).

[www.irma-international.org/article/knowledge-creation-and-student-engagement-within-3d-virtual-worlds/169934](http://www.irma-international.org/article/knowledge-creation-and-student-engagement-within-3d-virtual-worlds/169934)

### GLARE: An Open Source Augmented Reality Platform for Location-Based Content Delivery

Enrico Gandolfi, Richard E. Ferdig, David Carlyn, Annette Kratcoski, Jason Dunfee, David Hassler, James Blank, Chris Lenart and Robert Clements (2021). *International Journal of Virtual and Augmented Reality* (pp. 1-19).

[www.irma-international.org/article/glare/290043](http://www.irma-international.org/article/glare/290043)

### Inter-Organizational Knowledge Sharing System in the Health Sector: Physicians' Perspective

Kamla Ali Al-Busaidi (2020). *Virtual and Mobile Healthcare: Breakthroughs in Research and Practice* (pp. 351-368).

[www.irma-international.org/chapter/inter-organizational-knowledge-sharing-system-in-the-health-sector/235319](http://www.irma-international.org/chapter/inter-organizational-knowledge-sharing-system-in-the-health-sector/235319)

### Radio B-92 in Belgrade Harnesses the Power of a Media Activist Community During the War to Keep Broadcasting Despite Terrestrial Ban

Robin Hamman (2000). *Community Informatics: Enabling Communities with Information and Communications Technologies* (pp. 561-567).

[www.irma-international.org/chapter/radio-belgrade-harnesses-power-media/6727](http://www.irma-international.org/chapter/radio-belgrade-harnesses-power-media/6727)