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Semantic Community Portals

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INTRODUCTION

Many virtual communities have surfaced and come together on the World Wide Web. Web-based community portals serve as a one-stop place for all information needs serving a group of users that have common interests. As organizations become highly dynamic and the people that join them become more geographically dispersed, the need for improved ways to share and distribute data and information amongst the community or organization members has increased dramatically.

These communities of practice (CoPs) or knowledge collaborators often share similar backgrounds, work activities and information, i.e., they share similar ontology items speaking in terms of the Semantic Web (Berners-Lee, Hendler, & Lassila, 2001). Semantic community portals can make use of Semantic Web technology and these shared community terms to create connections between people and people and also between people and the information that they produce. Frequent communal use of Semantic Web-based portals and other ontologically-annotated environments affirm the ever growing importance of the topic.

In the late 1990s and early 2000s, a number of community portals were set up where people and their relationships were explicitly defined through the use of "online social networking" (e.g., SixDegrees.com, Friendster, Tribe, Ecademy, LinkedIn, and Orkut acquiring millions of users). There has been such a rapid turnover and mass production of these online social networking services (SNS) that the term YASNS (yet another social networking service) has emerged to highlight the saturation of the Internet with these sites. Despite an initial surge and swell of interest, however, the growth of SNS sites has tended to level off (Aquino, 2005).

Just as HTML was embraced, it is expected that the number of shallow and useful ontologies will be developed and used on the Semantic Web as people are encouraged to (re)use and develop them. To avoid the limitations of pre-defined ontologies, community-driven Semantic Web portals are expected to come in place whereby a community's goals and structure can be defined and maintained by the community. In these portals, the type of profile information held about members can be added to or modified following an administrative or community consensus-reached decision. Such an application can be referred as a "Semantic Web portal with community-driven ontology management," or more simply as a "people's portal."

The article is organized as follows. In the next section, we present a background on the topic. State of the art and trends in the area of semantic community portals are discussed in the section Semantic Community-Driven Web Portals. In the Future Trends section, we identify challenges in this area. Finally, we conclude the article.

BACKGROUND

Community portals are hubs of exchange where globalization becomes localized and the communities of the world become networked and polarized virtually anywhere. They are ever evolving, constantly growing, embraced by many and yet sometimes abandoned by others. Networks can also be perceived as valuable by connecting together a wide range of experts who can sense market or customer needs, thereby framing any problems identified and rapidly coordinating expertise to meet those needs (Cross, Liedtke, & Weiss, 2005). There are a number of challenges facing the new digital age and also the digital divide within these communities. The "augmented social network" calls for identity within the digital age to be configured to support civil society, and to treat the Internet (in the form of a public territory) as an open and integrated system that the citizens of the planet can hold in common (Hauser, Foster, & Jordan, 2003).

The Semantic Web provides us with tools to create a global dictionary of all shared terms to facilitate the finding of information that is online and is of interest to individuals. The use of ontologies and taxonomies makes searches for matching persons, communities and interests based on meaning and not on the use of keywords.

There is a strong connection between social networking services and semantic community portals. The FOAF[1] (Friend

of a Friend) Semantic Web ontology has been utilized by a number of SNS sites, including Tribe and Ecademy, for describing member profiles and their relationships. The use of the FOAF ontology is leading to interoperability between the various standalone social networking spaces. This will in turn increase the number of happy chances, or serendipity, occurring between people using these online worlds by bringing them all together in a universal social network (as a sum of its SNS parts). For this to become a reality, more SNS sites will be required to use FOAF, SIOC (Semantically-Interlinked Online Communities) and other related ontologies, making the data within them distributed and decentralized as opposed to being locked in to proprietary sites or applications.

SEMANTIC COMMUNITY-DRIVEN WEB PORTALS

In this section, we will describe the type of shallow, widespread ontologies lying in the core area of semantic community portals, list popular community portals which are potentially crucial in respect of the large-scale adoption of Semantic Web technology. Further, we will detail the movement of Web communities towards the establishment and evolution of their own ontologies in semantic community portals.

Ontologies in the Core of Semantic Portals

In this subsection, we describe popular ontologies, which are most typical for semantically-enabled community portals, and are used for information aggregation as well as the descriptions of communities and social networks.

vCard, FOAF, Dublin Core, RSS

There are several examples of ontologies that became widely accepted and reused for the purpose of distributed data exchange and integration for semantic community portals. Very often these ontologies were organically grown and quickly found a large number of creative users, even though for a long time they were not endorsed by any of the popular standards committees. Two examples of the most often described domains are represented by ontologies describing a *person* and ontologies describing a *document*. We provide typical examples of the person and document ontologies that gained a high degree of popularity:

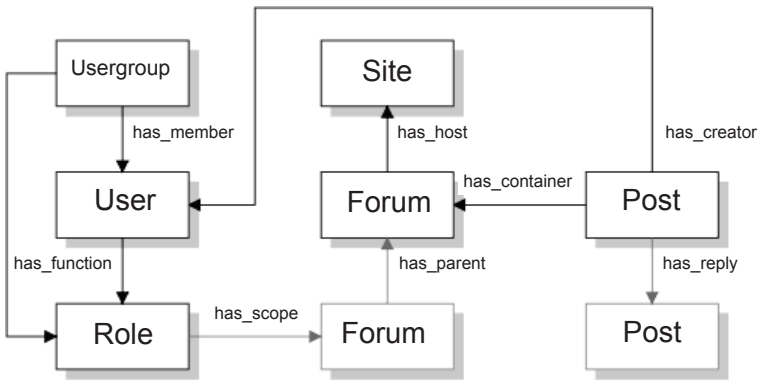
- Person ontologies:
  1. **VCard**[2] is a schema to specify electronic business card profile. Factually, vCard is a simple ontology to describe a person with 14 attributes such as family name, given name, street address, country, etc. The ontology provides a precise way to describe the instance data using RDF.
  2. **FOAF** (Friend of a Friend, as mentioned above) is a schema which is similar to VCard in a way that FOAF also is a wide-spread ontology to describe a person. FOAF schema provides 12 core attribute types, that are similar to the attribute vCard provides: first name, last name, e-mail address, etc., and the precise way to describe the instance data using RDF is also proposed by the FOAF-project.
- Document/Web publication ontologies:
  1. **Dublin Core**[3] stands for a vocabulary aimed to be used to semantically annotate Web resources and documents. The vocabulary consists of 15 attributes to describe a document or a Web resource and contains parameters that express the primary characteristics of the documents (e.g., title, creator, subject, description, language, etc.).
  2. **RSS**[4] is variably used as a name by itself and as an acronym for RDF site summary, rich site summary, or really simple syndication. The RSS ontology specifies the model, syntax, and syndication feed format and consists of four concepts: channel, image, item, and text input, each of them having some attributes like title, name, description.

The reasons why staying within the scope of simple ontologies (e.g., exchanging FOAF profiles and posting cross linked news stories from RSS) is not enough and far too limited for the existing Web are as follows:

- Embedding and personalizing rich content and behavior from remote Web applications are becoming necessity for catering to specific user needs.
- Extension of simple ontologies, discovery and communication of these extensions are becoming necessity for bringing semantics to a larger amount of Web content.
- Mapping between simple ontologies and their alignment with other extendible ontologies are becoming necessity for large–scale data integration.

Thus, preserving the successful approach of simple usable ontologies and resolution of the issues above are clearly to be considered as major challenges in the practical state-of-the art semantic community portals. These challenges start to be addressed by initiatives in the area (e.g., SIOC).

Figure 1. Terms in SIOC that can be used to connect community portal discussions



SIOC

The SIOC (semantically-interlinked online community) ontology (Breslin, Decker, Harth, & Bojars, 2005) aims to capture as much information as possible which is relevant to community Web sites and the discussions contained therein. The ontology itself covers a broad range of information, yet the ontology is simple enough for users to be able to browse and navigate the modeled concepts.

One of the issues with the SIOC ontology is that if mappings are to be provided to existing ontologies such as RSS, then algorithms will be required to perform the mapping and data needs to be transformed from one format to another. The SIOC ontology has linkages to a more general purpose ontologies, namely FOAF, SKOS[5] and RSS/Atom[6]. There are a number of terms that are needed to describe the core concepts of user, usergroup, forum, post and site and how they are all related to one another (Figure 1). One of the major benefits of using SIOC is the ability to link all sorts of entries from and amongst various community sites (Weblogs, forums, mailing lists, etc.). With SIOC, it is possible to produce leverage from links in an HTML document or between discussion items (replies, trackbacks, follow-ups, etc.) by making them explicit in a machine-processable format. SIOC therefore enables community information to become available for machine consumption.

Web Communities: What They are, How They are Formed and Evolved

"Increasingly these work-based communities are using collaborative technologies to augment traditional face-to-face interaction and supplement the exchange of knowledge among non co-located or distributed workers" (Millen, 2003). Many portals can hold online community documents in electronic repositories, which can be added to in the form of wiki-like interfaces, or downloaded and shared for a whole host of customer information and community related activities. "The frequent use of Web sites and other document collections affirm the ever growing use of information communities for portals" (Millen, 2003).

There are various different types of thematic community portals available on the Internet at present, including many location-specific portals (such as portals for towns and cities all over the world). Many of these types of portals contain regional specific information such as weather forecasts, street maps and business and social events that are specific to that portal and the area it is related to.

- **Government E-Portals:** Government e-portals are another type of portal which have a strong presence on the Internet. Many governments have committed to share their in-house information with their citizens, and to provide public service information from the government including government news. With added semantic technologies embedded within government e-portals there is more quality content and an ability to search for data and applications across departments (Hutton, 2003).
- **Enterprising or Business Community Web Portals:** At present many business are using Web portals for e-commerce and for generating profits for themselves, thereby increasing their level of service to their general Internet public. Web portals for e-business can be one specific stopping point for all e-business needs (Hofreiter, Huemer, & Winiwarter, 2002). They are an instant delivery mechanism where members can collaborate instantaneously for the preferred community of interest.
- **The Yahoo! Community Portal:** The Yahoo community portal[7] evolved out of an idea that was to become

a hobby that went on to become a large scale online directory of the Internet. It has become a major Internet portal on the Web and has a large presence within the Internet community. It has now become an essential one stop portal for many surfers.

- **The DMOZ Community Portal:** The Open Directory Project[8], also known by the domain DMOZ ("Directory Mozilla"), is also a community portal for the construction and maintenance of directory links on the World Wide Web. It is edited by a group of people who volunteer their services online. It is an extremely comprehensive directory of Web links it is a directory of links that offers a search query for searching for relevant information within the portal.
- **The Wikipedia Community Portal:** Wikipedia[9] is a highly social structured community portal. The Wikipedia community portal is attempting to build an encyclopedia online. Members of this community portal can edit submit and create new articles on the Wikipedia once they have created an account. There is a special section within the Wikipedia portal called Wikipedia Signpost, where community information is posted to inform and make aware its contributing members.

Communities Contributing to the Portals' Ontologies

Another recent trend is where portals are allowing communities to create their own vocabularies and tag the items/information they want to exchange with arbitrary keywords from their vocabularies. The following applications fall into the category of such portals:

- **del.icio.us:** This community portal allows users to tag and share their bookmarks, and to also search other's bookmarks on the basis of these tags.
- **www.43things.com, www.43people.com, and www.43places.com:** These community Web portals allow the structured entry of information on what things people do (www.43things.com), of who people meet (www.43people.com), and the places where people travel or want to travel (www.43places.com), again all annotated using tags.
- **www.flickr.com:** This community portal allows community members to tag images with arbitrary tags, so that they can search for and share photos.
- **base.google.com:** This community-based application allows Web users to contribute their arbitrary items (pictures, text, ads, Web-sites) for searching and sharing and allows them to annotate these items using pairs of an arbitrary attribute and an arbitrary value. Most popular/shared attributes and attribute values come up in the upper level of Google search interfaces, and are proposed to be used for searching and browsing the available items.

Though none of the portals aforementioned is directly based on Semantic Web technologies, they clearly show the massive trend of the Web in becoming more structured and annotated in a community-driven manner, via social processes and contributions of regular Web users. Certain portals are also starting to employ semantic technologies to reach their communities. For example, www.43places.com provides RSS feeds to get updates on the information appearing at the portal (e.g., on entries about a particular place, entries from a particular user, etc.).

However, a full-fledged framework for community-driven ontology management would go beyond simple tagging and merge community portals with established practices for ontology management. The objective of community-driven ontology management is to provide means and motivations for a large number of users to weave and adopt the Semantic Web, via ontology management practices (i.e., construction, matching, version ontologies in a community space).

The People's portal infrastructure (Zhdanova, Krummenacher, Henke, & Fensel, 2004) allows end users to define the content structure (i.e., develop ontologies), populate ontologies and define the ways the content is managed on Semantic Web community portals where the People's portal infrastructure is applied. Content management features on the People's portal include ontology matching support, personalization support (at the personal and community levels) and dynamic reaching of a consensus on the basis of heterogeneous ontologies.

The People's portal was deployed as a part of an intranet at DERI (Digital Enterprise Research Institute) (Zhdanova et al., 2005) and as an extension to the portal of a Semantic Web community[10]. Ontology acquisition from regular community members is an adding value practice that has not yet become a common on the Web, but current trends convince that it will become among common practices.

FUTURE TRENDS

In addition to the trend towards community-driven ontology management on community portals, development of community portals with semantics includes addressing the following challenges:

Community Discovery

On the (Semantic) Web, large number of community Web sites and social networks make it difficult to choose and find the ones a community member needs to take part in. To

assist community discovery algorithms, ontology matching techniques, and ways to aggregate and visualize information about communities need to be developed. Flink (Mika, 2005) is an example of current semantic community portals addressing the challenge of aggregation, visualization, and presentation of community information.

Single Sign On and Digital Identity

There is a need for a persistent identity online as people move in and out of communities. Identity itself in the online world is fairly straightforward but in the online world it can be fairly ambiguous and far more complicated. Many online communities require a user to register and a digital profile is created from this registration. Most community sites are standalone and many individuals struggle to remember the passwords for the number of accounts or struggle with the lengthy registration of logging into yet another social network (Hardt, 2004).

The SXIP Network[11] is a digital identity network that offers an open source identity management architecture that places the user at the center of their identity transactions. The SXIP Network or simple exensible identity protocol is an identity management protocol which offers a type of balanced solution that meets the community needs.

FOAFRealm[12] is another initiative in this area that combines the management of digital identities with the sharing of resources through collaborative filtering on a semantic social network.

Trust, Security, Policies

Content of semantic community portals is easier to aggregate, reuse, and misuse than content of conventional Web portals. Therefore, additional trust and security policies and practices need to be established for semantic community portals. Within such practices, ontology-based algorithms can be applied to describe, analyze and adequately render aggregated information. For example, after analysis of social networks of trust (Golbeck, Bonatti, Nejdl, Olmedilla, & Winslett, 2004), information from less trusted sources can be automatically displayed in a less highlighted manner comparing to the information from more trusted sources.

Community Information Aggregation, Visualization and Delivery to an End-User

Once the people, objects and processes are being annotated, and the Semantic Web is being easily extended by the communities of users and developers, delivery of massive volumes of semantic content and workflows to the community members is a major challenge. The solution is expected to stem from the active research fields in the Semantic Web area. For example, Decker and Frank (2004) address this problem by combining the current Semantic Web developments in a social semantic desktop, which will let individuals collaborate at a much finer-grained level as is possible and save time on filtering out marginal information and discovering vital information. Delivery of community-driven Web content will also interoperate at a semantic level with mobile devices, first projects start to appear (e.g., Semapedia[13]: an application of Web-based Wikipedia to mobile environments).

CONCLUSION

State-of-the-art and trends in community portals and user-centered personalized environments are presented in this article. Web portals in general are detailed, and the contributions of Semantic Web technologies to these portals have been discussed, including the creation of social networks and the interlinking of community sites. Specific attention is paid to user-driven portals, where information is augmented by tagging and structured data entry. Future challenges in this area have been outlined, including digital identities, trust, and information delivery.

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KEY TERMS

Community-Driven Semantic Web Portal: A community Semantic Web portal that is maintained by a community of users who have an interest to define and manage content of a Web portal.

Community of Users: A group of individuals that use the same ontology. The community of users is characterized by summing up characteristics of all its members. Actions of the community of users are sum of the actions of all its members.

Community Semantic Web Portal: A Semantic Web portal that is maintained by a community of users.

Digital Identity: The online representation of your identity. It also extends to include those distinguishing characteristics specific to the online world, such as a link to an online digital photo album or journal.

Semantic: A Web portal that is based on Semantic Web technologies.

Semantic Web Portal with Community-Driven Ontology Management: A community-driven Semantic Web portal the goals and structure of which can be defined and maintained by a community.

The People's Portal: See Semantic Web portal with community-driven ontology management.

Web Portal: A Web site that collects information for a group of users that have common interests.

ENDNOTES

1 **FOAF:** http://www.foaf-project.org
2 **VCard:** http://www.w3.org/TR/vcard-rdf
3 **Dublin Core:** http://dublincore.org
4 **RSS:** http://Web.resource.org/rss/1.0
5 **SKOS:** http://www.w3.org/2004/02/skos/
6 **Atom:** http://www.atomenabled.org
7 **Yahoo:** http://www.yahoo.com
8 **Open Directory Project:** http://www.dmoz.org
9 **Wikipedia:** http://www.wikipedia.org
10 **KnowledgeWeb on the People's Portal:** http://people.semanticWeb.org
11 **SXIP Network:** http://www.sxip.com/sxip_network
12 **FOAFRealm:** http://www.foafrealm.org
13 **The Physical Wikipedia**: http://www.semapedia.org