

Semantic Web: Upcoming Boon to Librarianship

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Abstract- World Wide Web has transformed society to 'knowledge society'. The whole globe is now dependent on WWW. The thirst of precise and most relevant piece of information is flooding the web with vast ocean of data. This data is required to be processed and structured in a consolidated product and for this 'semantic web' is the advance tool being used today. Our paper concentrates on the basic concept of 'Semantic Web', followed by the 'goal', 'architecture' and 'applicability of semantic web services in libraries'. The paper offers a detailed platform for ten most effective services and operations in libraries, to satisfy the information quest of the information seekers. And thus concludes that libraries are the small scale sharing points for the advancement of semantic web in nurturing and in increasing the efficiency of library services.

Index Terms- Semantic Web. Resource Description Framework, User Generated Content and Semantic Web Services.

I. INTRODUCTION

Today, most of the entrepreneurs are depended on internet for daily activities. The early attempt of ARPANET gave birth to so call "Internet." Web 1.0 is the first generation of internet, now researchers are going beyond this with attempts led to Web 3.0 which known as 'Semantic Web'.

II. NEED OF SEMANTIC WEB

Today, we need to search for information according our preferences and keywords selected from the context only. Keyword based search engines e.g. Yahoo, Google, Dog pile etc. are the main tools for using today's web. But there are serious problems associated with their use, like-

1. High recall
2. Low/no Precision
3. Results are highly sensitive to the vocabulary
4. Results are single web pages
5. Many first time internet users, because of disadvantages, become discouraged and frustrated. (Antoniou and Harmelon, 2004)

To realize above mentioned vision the following are necessary.

1. **Automation:** - It would be nice if computers could do more (on the web) by making information on the web more 'machine friendly'.
2. **Interoperability:** - It can help by combing information from multiple sources and performable on various platforms.

III. WHAT IS THE SEMANTIC WEB?

According to Latin origin 'Semantics' means the 'study of meaning'. The study focuses on the relation between signifiers, such as words, phrases, signs, and symbols, and what they stand for and their denotation. Linguistic semantics deals with the study of meaning that is used to understand human expression through language. It is a collaborative effort led by W3C (World Wide Web consortium) with participation from a large number of researchers and industrial partners. Its objective is to convert all the unstructured documents on web into a web data.

W3C has led down the definition of Semantic Web as-

"The idea of having data on the web is defined and linked in such a way that it can be used by machines not just for display purposes, but also for automation, integration and reuse of data across various applications."

IV. GOALS OF SEMANTIC WEB

The primary goal of the 'semantic web' is realizing the full potential of web, making it cost-effective for people, effectively record the knowledge by giving maximum impetus on machine consumption by designing and adopting the technologies which support such machine facilitated global knowledge exchange.

The basic idea of semantic web/web 3.0 is to define structure data and link them in order to have more effective discovery, automation, integration, and reuse across various applications.

(Aghaei, Nematbakhsh and Farsani, 2012)

The layers of the semantic web architecture are briefly described as follows:

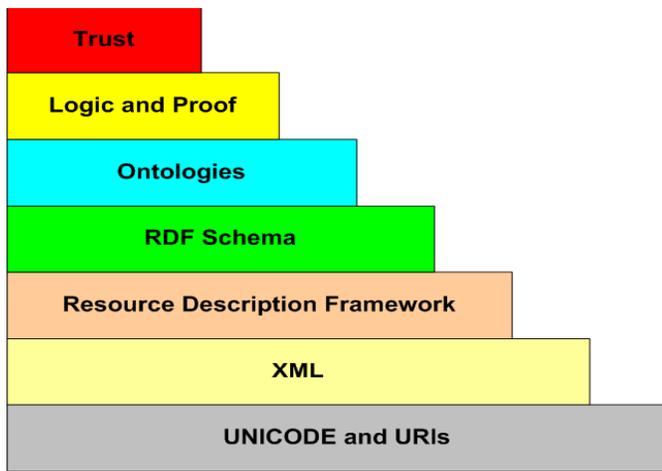


Figure No:1 The layers of the semantic web architecture

1. Unicode and URI

Unicode is used to represent any character uniquely i.e., whether this character was written by any language and 'Uniform Resource Identifiers' (URI) are unique identifiers for resources of all types. The functionality of 'Unicode' and 'URI' could be described as the provision of a unique identification mechanism within the language stack for the semantic web.

2. Extensible Mark-up Language

XML and its related standards, such as namespaces (NS), and schemas are used to form a common means to structure data on the web without any communication between the meanings of the data. XML is used as a base syntax for other technologies developed for the upper layers of the semantic web. NS is used to identify and distinguish different XML elements of different vocabularies. It supports mixing of different elements from various vocabularies to do a specific function. XML schema assures that the received information is according to the sent information when two applications at this level exchange information together.

3. Resource Description Framework

RDF is a simple data model that uses URIs to identify web-based resources and describes relationships between the resources in terms of named properties and values. Generally, the RDF family supports interoperability at the semantic level. RDF developments consist of the base web language, so that agents are able to make logical inferences to perform functions based on metadata.

4. RDF Schema

It provides a predefined, basic type system for RDF models. It describes classes and properties of the resources in the basic RDF model. RDF Schema provides a simple reasoning framework to infer types of resources.

5. Ontology

The ontology layer describes properties and the relation between properties and different. Ontology can be defined as a collection of terms used to describe a specific domain with the ability of inference.

6. Logic and Proof

This layer is on top of the ontology structure to make new inferences by an automatic reasoning system. The agents are able to make deductions as to whether particular resources satisfy their requirements by using such the reasoning systems

7. Trust

The last layer of the stack addresses is 'trust' in order to provide an assurance of quality of the information on the web and a degree of confidence in the resource which is providing these information. Semantic web is not limited to publish data on the web; it is about making links to connect the related data.

Resemblances between Semantic Web and Libraries:

"Internet [Web] has been described as a library with all the books tossed on the floor" (Wilson, 2000). Semantic Web and Libraries shows quite good percentage of resemblance for each other because of following reasons:

1. Information Explosion has resulted to the development and modification of both.
2. Making Information easily accessible to remote information seekers, satisfactory services on demand and in anticipation and discovery of knowledge are the key missions of both 'Library and Semantic Web'.
3. Collaborative and Cooperative spirit are the most depended factors for the effective facilitation of both.
4. The need of 'national and international standards have led to the advancement in 'libraries as well as semantic web'.
5. Semantic Web as well as Libraries both forms the base as society's fabric.

Above five similarities are concrete enough to justify the work on application and inclusion of semantic web in library operations and services.

V. SEMANTIC WEB SERVICES IN LIBRARIES

Due in part to rapid changes in technologies and their enthusiastic uptake by manyparts of the community, libraries are in a constant state of flux when it comes to engaging with and utilising new technologies in ways that are relevant to our users and our key goals as organisations. We cannot afford to lag behind, and barely keeping up is not a satisfactory outcome either. Web 3.0 has already integrated itself into our online lives, through new generation social media applications, the semantic web, and easier information finding and sharing. Library 3.0 is still under development. The semantic web has changed the face of the internet, and will continue to change and develop the way libraries conduct their online business and deliver services such as OPAC and federated searching. Some of the semantic web services initiated by libraries as-

1) User-generated content

The use of social media in libraries for incorporating 'user-generated content' (UGC) is not a new concept. Social media uses web-based technologies to turn communication into interactive dialogue. A library OPAC/website was previously just one-on-one experience, but now is 'many to many' interaction. Libraries should embrace 'user-generated content' as a way of positioning themselves as an online community space. Users are already generating their own content – so why not to direct more of this traffic to libraries? There are many advantages of user generated content. The technology is usually cheap; it can be included as an add-on in many 'Library Management Software' and will probably become an automatic inclusion within ten years. A benefit of 'user-generated content' is that it is an easy

way for library users to have their say on a topic and to have an online presence in their local community. Social media also provides an online community that extends beyond the physical space of the library. Libraries need to examine new ways to interact with their users through the use of programs that allow for user-generated content. This is an opportunity for libraries to develop more of an online presence and become more integrated with the semantic web.

2) Federated Search and Beyond

Beyond library, searching is now a part of everyday life as people spend increasing amounts of time online and use mobile devices to connect with people and information. Search will be everywhere, but invisible, contextualised, and personalised. Federated Search can help users

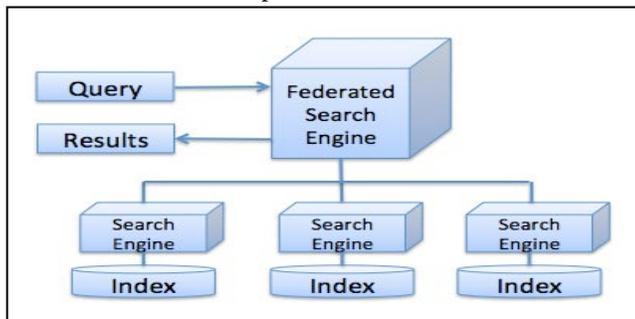


Figure No:2 Federated Search of Three Search Engines

search over a wider range of resources instantly, and helps users take greater advantage of online resources offered by libraries; many users don't go beyond the catalogue. Many online databases need different logins, look vastly different and search displays result in different ways. It would be easier for users to have all the search results displayed in one place and in one way, much as a Google search does. This would mean faster search results for users, and a better range of resources used, as often the online resources libraries subscribe to are top peer-reviewed journals.

Libraries need to move towards 'federated search' to come in line with what people are doing on the web now. This more democratic approach to information searching means that library resources are more accessible to a wider range of people. As more users log into library websites using mobiles and/or mobile devices, it also makes more sense to have a quick and easy search facility. Libraries can help be a part of this process by re-examining the way our users search our collections and how they use these search results, then, most importantly, use this information to lobby for changes in library management systems.

3) Mobile library catalogues

The use of mobile phones and mobile applications has increased dramatically over the past 10 years. This is an era of information access that libraries need to support and engage in more fully. Users can also text themselves the details of an item, rather than printing or writing down the details. All libraries should cater to users who access their library through their phones or other mobile devices. Developing an app is not necessary in most cases; rather, making the website/catalogue clear and easy to move around should suffice. It is important for

libraries to be aware of this trend and make changes to their web presence to meet this transformation in library user practice.

4) Knowledge management

Application of semantic web will allow much more advanced knowledge management system. Knowledge will be organized in conceptual spaces according to its meaning. Automated tools will support maintenance by checking for inconsistencies and extracting new knowledge. Query answering over several documents will be supported. Defining who will view parts of information (even parts of documents) will be possible with semantic web knowledge management.

5) Library Portals

The use of semantic web technologies in developing Library portal facilitates users search, access, and retrieve learning resources. The portal should aim to provide access to a coalition of learning repositories with learning resources available in different formats. The large collections of learning resources are semantically annotated adopting various technologies that facilitate user's access to the content in one or more learning repositories.

6) Downloadable

An iPod and Smart phone devices are in multi-use. These are becoming e-readers, GPS units, cameras, and information storage units as well as communication devices. Worldwide consumer behaviour suggests that downloadable books are becoming as popular, or more so, than print versions, although any prediction that downloadable will completely replace the print copies does not seem likely. They are existing and will exist side by side. We can expect the demand for the instant supply of content and information to impact on our collections and loans. Libraries must consider many things while introducing downloadable material to their collections, not the list of which is the current shortage of online content and digital rights management challenges. Publishers, authors and book sellers are sorting their way through the questions of ISBNs for eBooks, Meta data, territorial rights, orphan works and rights standards. Libraries also need to strategize, how they manage things like publishers introducing 'Non-library-friendly policies'.

7) Print on Demand

Print on Demand (POD) model is diversifying to include projects for out-of-print, rare, precious and inaccessible product.

8) QR Codes

QR codes, or 'quick response codes', might just be that little thing. Although they have been around for years, with the increased ownership of Smartphone they seem set to become commonly used for all sorts of reasons. QR codes are 2 dimensional barcode when scanned by a mobile device; gets linked to the resource the creator intended, it could be website, email address, phone number, coordinates on a map. There is need of a mobile device, with a camera, an Internet connection and QR code reader (an app) to make use of QR codes. And thus are used a lot in advertising, real estate signs etc.

Potentially, QR codes can be used to give direction to where items are on the shelf and if necessary, used on the shelves themselves if the physical item is out – our customers could scan the code and reserve the item via the catalogue, or download the item immediately in the form of an eBook. Currently, the main use of QR codes in libraries around the world could be /is for following activities:

- Promotion and advertisement of library services
 - Act as a bridge between the physical and the digital information.
 - Make access to information and resource easier.
 - Providing information at the point of need.
 - Video guide on how to use the print management system.
 - A map of the library layout.
 - Library audio tours.
 - Catalogue records, with links to specific location information.
- QR codes within the collection, to link to online resources – particularly to the mobile version of them.
 - Marketing appeal – makes the library look tech savvy

9) Cloud Computing

Cloud computing relies on a large number of computing devices working together. It is location and device independent; users don't have to download their work onto respective PC or device; it can be stored and worked on remotely. The term 'cloud computing' has at its core as a single element: computing services are delivered over the internet on demand, from a remote location, rather than residing on one's own desktop, laptop, mobile device, or even on an organisation's servers. For an organisation, this would mean that, usage-based fee—or even possibly for free—it would contract with a provider to deliver applications, computing power, and storage via the web.

The advantages of Cloud computing for libraries is the possible reduction in the cost of computing and the ease of connectivity between library services encouraging greater collaboration as well as unlimited storage capacity.

10) Semantic Digital Library

Semantic Digital Libraries are distinct from traditional digital libraries. These make easier to find information in the vast ocean of available data. This is facilitated by ontology-based search and facet search. Access is not confined to only one digital library; to the contrary, it provides a mechanism of interoperability between different systems. Some of the Semantic

Advantages of Semantic Digital Library:

1. It makes it easier to find information from the huge heap of available data. This is facilitated by ontology-based search and facet search.
2. Access is not confined to only one digital library; to the contrary, it provides a mechanism of interoperability between different systems.

VI. CONCLUSION

In coming years the web technologies will infuse the ability of semantic structures in documents to create structured vocabularies and ontologies to establish relationship and explain the concepts in more rational and precise way. Semantic Web is

able to improve data management, support accessibility of mobile internet, simulate creativity and innovation, encourage factor of globalization phenomena, enhance customers' satisfaction and help to organize collaboration in social web. It provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. And this will surely give rise to unique power to informational seekers to interpret documents and infer meaning without human intervention, possible by application of "Semantic Web" in all type of 'information centers'.

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