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# Necessity for Semantic Web Development in User Interaction

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**Abstract**
Cyberspace compiles an enormous "network" of data created, transformed and informational resources designed to disseminate its products by users. Most of this data is designed to respond to users' requests, information that is often not hierarchical or structured. In an attempt to identify a number of concepts or information from the virtual environment, users are faced with the problem of accessing a large amount of data, and their "comprehension" and processing by the computer do not coincide with those of users. Although the amount of structured data available on the Web has increased significantly over the past few years, there is still a significant difference between the amount of structured and unstructured data available online. This has resulted in an acute need for accessible data identification, as well as a need for filtering, interpreting and summarizing information for the benefit of its users, with the help of newly developed programs and technologies. Semantic web eases the process with which large amounts of data is collected and distributed. Such programs that have the ability to "describe" user-entered content in the virtual environment. Semantic Web, through its standards and technologies, is constantly searching to provide solutions for such a paradigm while using the RDF data model. By introducing Semantic Web in the user, as well as the computer, disentangle the enormous amount of data available online. This, in turn, helps the user to better surf de internet. The current article concentrates on the process of how Semantic Web is used and created in order to help the user get more accurate results while surfing the web.

**Keywords**: Semantic Web, Social Media, ontology.

**JEL classification**: M31

## 1. Introduction

The current article focuses on the creation of ontologies with regard to the type of information that is consistently increasing throughout cyberspace. Taking into account the fact that every internet user is capable of creating new content very easy in the social web, this is mostly the type of ontologies that the article will focus upon. A main factor contributing to the data being created today is social media. Due to the increasing number of users and also the enormous amount of data created by them there is an increasing need to systematically store and sort it in a way that can be easily accessible and understood by computers.

Until a few years ago, most communication was usually written. More recently, audio and video content has taken the stage. However, this type of content is more difficult to be classified by computers.

Although the social media offers endless possibilities of communication and provides a platform that can be used by its users in order to better communicate and share information among one another, the story is completely different when it comes to computers. Data created

in this manner is largely unsorted and because of this, people rarely find the things they are searching for. This in turn, only sustains the idea mentioned earlier whith regard to the low accuracy of results.

The versatility of social media is almost endless, also due to its great number of in-made apps and other possibilities of personalization. Taking this into consideration, one must also find a way to classify all the elements that can be encompassed in social media. In order to do this, there are three criteria to be taken into consideration as they have been mentioned by the Berners-Lee (2001):

• Collaboration: As per its name, here, social media users work together in creating new content. This can include elements such as evaluation, information, findings and so on.

• Information: This is usually first hand content created and shared by the user. In this category one can include images, videos, text and even comments and statistics.

• Relationship: This last aspect refers to the interconnectivity of social media users. It focuses on meeting other users in virtual space and other people in real life. And the result of this interaction will be more data.

Due to the large quantity of information created via social media it is easy to sort through it but there is a large proportion of it that still is potentially useful. However, sorting the data can prove to be very difficult. Therefore, "advanced filtering techniques are needed" (Pirolli, 2009). Most importantly, with the help of different sorting mechanisms users can interact better with one another and this can prove to be very beneficial for both people as well as the popularity of the social media networks. Another aspect worth mentioning is the one should not look at user interactions solely through links between them._"Apart from "friendship" relationships, users are able to join groups, follow other users and institutes, or they can share information" (Moi et al, 2016a) which can be seen by other users.

The search for information in social media is based on identifying words and matching them. For example, should one start a search for the word 'bat' on the internet, they will most likely entern their request in search engine, such as Google, Bing or even DuckDuckgo. However, based on the search term, on the Web the search engine will refer to the animal – "bat" or to a bat in the sense of a baseball bat. The search engine cannot differentiate between these homonyms if the user does not add additional information to the online search.

Search engines can encounter a similar problem as the one mentioned earlier in the case of acronyms, too. For example, UE can stand for Unit of Employment, whereas EU is most commonly used for the European Union. In other languages, more specifically Latin languages, UE almost always means European Union. Using more search terms will improve results and help the user better websites to respond the search. Unfortunately, search results will not present web results containing words that are synonymous to the terms that have been searched.

However, Semantic Web may just be the answer to better "comprehension" of information by computers. The idea of a Semantic Web involves shifting from the unstructured, to the structured. This involves moving from the more basic HTML website version, to the RDF coding. In doing so the new versions will also be available for the machine to understand and in turn, this will help computers understand user commands better. The semantic vocabulary is based on concepts defined in ontologies.

## 2. Short review on ontologies

The term ontology (derived from Greek) is defined in philosophy as the territory of existence. Using the term in computer science helps encompass new meanings in the "territory" vocabulary. Ontologies are artificial constructs, meaning that they are created by man. In doing so, man helps computers understand different terms by giving specific particularities to any given term. This is done easiest by creating links or connections inside the word family of a

specific term. Through these ontologies, words are defined by what is closest to them and the link words are also defined by their closest definitory term and so on. In this manner, computers offer the best results to their users by following previously made correlations.

Based on what was mentioned earlier one can easily how computers "think". In the field of information and technology terms are a model that help with the "thinking process" or, better aid, the processing capabilities of computers. These terms are created through relationships between and through properties given to each one. Should the ontology be created correctly, it will respond to a set of criteria that will make it easily understandable by machines. According to (Gruber, 1993), an ontology is a "formal, explicit specification of a common conceptualization". In creating an ontology one might expect for a certain term to be connected in real life however, a term can be used to describe a much vaster domain. A domain refers to a concept or an object together with all the links in between them and their characteristics. In specialized literature, but also in practice, there are a number of strong but weak ontologies.

"Ontologies can unify and normalize data from different resources, e.g. social media, syntactically and semantically and to associate them with knowledge in the field of interest." (Grolinger et al., 2011). This is even more important in the sense that given web search results can return with more accuracy. (Galton & Worboys 2011).

The importance of semantic web and ontologies per se, derives from the fact that it makes a promise to help humans and machines better understand each other. Because the ontology is about knowing the consensual domain, its development is often a process of cooperation that involves different people, possibly in different locations. "Ontology is a formal representation of knowledge through a set of concepts in a domain and the relationships between these concepts" (Giri, 2011).

Cyberspace can allow people and organizations to come in direct contact with citizens and to transmit important information – this is mostly dome through the use of social media.

Ontologies are divided into several categories according to their destination. High-level ontologies are general ontologies that aim to hierarchize terms that will appear in any field at the top of the hierarchy. The ontologies specific to a domain contain particular terms and relationships for the described domain.

## 3. Methodology

The current article focuses on exploratory research regarding the creation and use of ontologies in cyberspace. Moreover, it will classify the existing ontologies and present a perspective on how to create a new ontology.

The table below focuses on the main criteria used in the development of ontologies. By following these requirements, it would be easier to create a more comprehensible ontology for the computer.

A common feature of ontologies is that they are formal. Due to this feature, the construction of an ontology is particularly complicated, because it must contain a large number of correct logical relationships based on a strict set of rules. Probably the most important one being that terms or instances should not be contradictory.

The figure bellows simplifies the logical steps that need to taken in order to create an ontology.

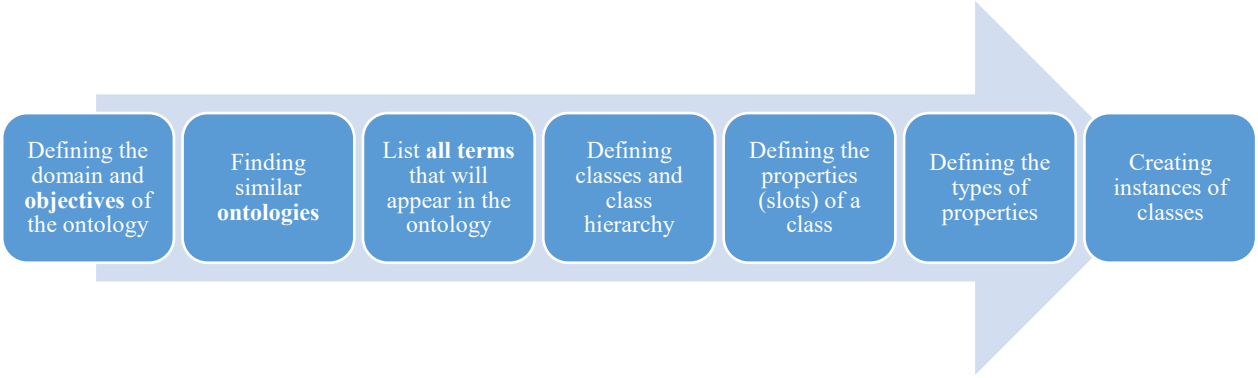


***Figure 1 Creating an Ontology***
***Source: Interpretation from Noy and McGuinness, 2001***

Noy and McGuinness (2001) present a methodology for the rapid and correct development of an ontology.

1. Defining the domain and objectives of the ontology. This can be easily done by answering the questions below:
   - What is the domain that the ontology has to cover?
   - What will we use it for?
   - What kind of questions does the ontology have to answer?
   - Who will have to use it and maintain it?
2. Finding similar ontologies for the purpose of reusing concepts or even using the existing ontology in case it exists
3. Make a list of the terms that will appear in the ontology
4. Defining classes and class hierarchy through:
   - top-down approach (from general concept to particular concepts)
   - bottom-up (categorization of simple concepts) or mixed.
5. Defining the properties (slots) of a class
6. Defining the types of properties (cardinality, domain and co-domain of values)
7. Creating instances of classes

All of these steps as well as the criteria listed in the table above need to be taken into consideration when creating an ontology. This is due to the fact that the computer needs to have a very logical basis with the help of which to better understand the meaning of the terms. For this, listed below, there is a simple schematic of a family ontology that can aid in understanding how the comprehension process works, when it comes to computers.

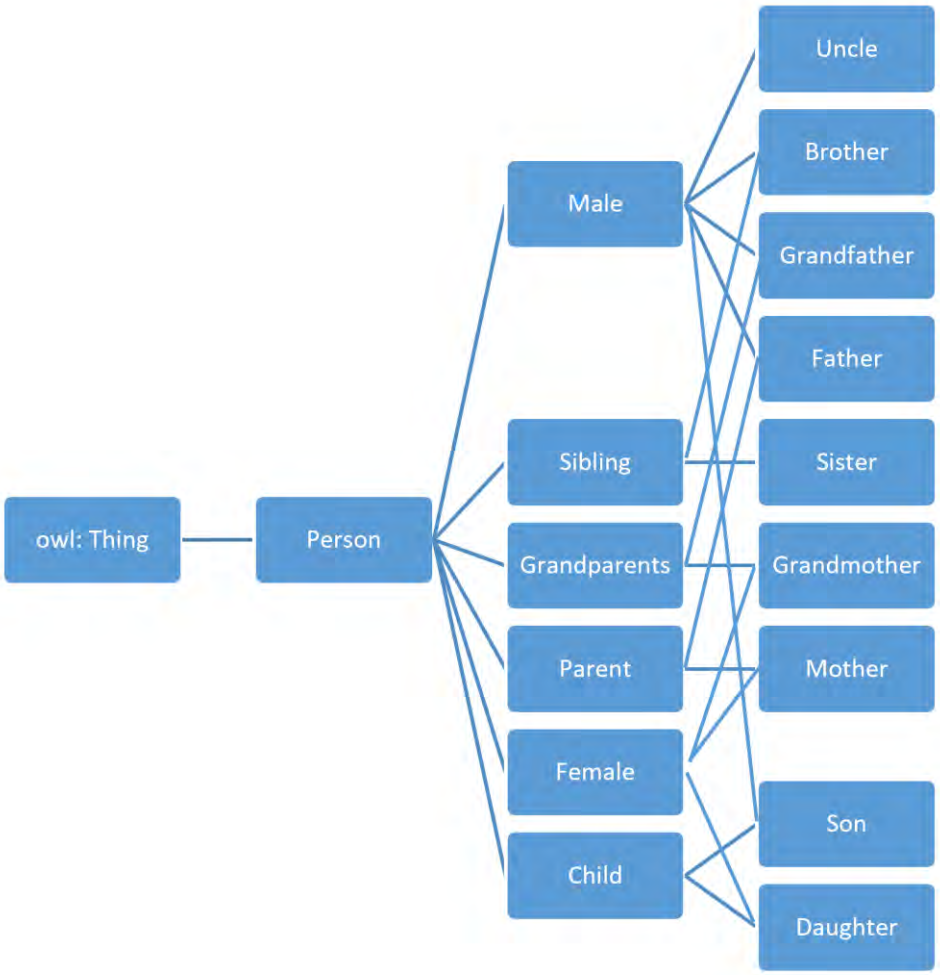


***Figure 2: Family ontology***
***Source: Ontology-based modeling, available at: shorturl.at/iqYZ5***

The Semantic Web is a problem such as authentication technology, and it is currently difficult to use it on open networks such as the Web. If the Semantic Web is fully realized on the Internet, information scattered on the Web can be integrated and used as a single database, and efficient information processing can be performed. The semantic web is a web for computers, but the process of creating and maintaining it is a social one. To make semantic Web creation possible, W3C is actively working on defining open standards such as RDF and OWL. Although computers are useful in manipulating symbols according to predefined rules, only Semantic Web helps machines interpret language thorough "commonly agreed" methods so that both ends can raise their efficiency.

## 4. Conclusions

The semantic web is not a separate web, but an extension of the current one, in which information and services have a well-defined meaning. The semantic web is for computers, but the process of creating and maintaining it is a social one. To make semantic Web creation possible, W3C is actively working on defining open standards such as RDF and OWL. Although computers are useful in manipulating symbols according to predefined rules, only

users of the Semantic Web have the necessary interpretation and association capabilities to create and maintain ontologies.

In creating ontologies, one must take into consideration a set of guidelines and link these with pre-existing knowledge. In this manner, computer "comprehension" will be more efficient. What is more, there is a great need for these ontologies as they create the environment for better understand between man and "machine". Through this, one should understand the capability of the computer in assisting the human in daily tasks and decision making.

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