WEB 3.0 in EDUCATION

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Abstract: The emergence of Web 2.0 has marked a change in how the Internet users benefit from a number of tools that allow them to browse for information, exchange data, collaborate and interact with others. Web 2.0 has been a turning point in human interaction via computers, fostering social networks and even more personal environments for educational purposes such as PLEs or VLEs. Now, a leap forward is represented by Web 3.0, which should provide computers with the possibility to extract meaningful information from the Internet so that the inordinate number of data obtained after one search will be filtered, contrasted, and collated to better suit users' needs. The advancement will consist in the fact that the search for information will not be just a sheer display of websites, chosen based on the key words entered, but meaningful information tagged with descriptors like mailing addresses. The implication for users are numerous as the new web search could function as a personal learning assistant and may help one reduce the amount of time spent looking for relevant data, be it educational or otherwise. Thus, the users interested in learning will be assisted by an agent, which will select the required information, and tailor it according to the individual learning needs. In this paper, the concept of Web 3.0 will be examined to find its possible educational uses and benefits. Moreover, the author will look into the impact of Web 3.0 on course design, on the one hand, and on the learners' ability to identify and attend several courses provided by institutions, on the other hand.

Keywords: Semantic web, E-learning, knowledge, course design, education

I. INTRODUCTION: TOWARDS WEB 3.0

The Semantic Web (Web 3.0) has been present as a concept for more than 10 years. It is regarded as a sign that the Web is evolving gradually to a form that will transcend the uses of the current Web 2.0. According to Berners-Lee, who first envisaged its presence: "The Semantic Web will bring structure to the meaningful content of Web pages, creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users." [1]

It is considered that Web 3.0 will change people's perception and interaction on the Internet with the introduction of features and tools that go way beyond those provided by the social media:

- Personal assistants,
- Intelligent agents,
- 3D gaming,
- Virtual worlds,
- Open educational resources etc.

In this context, the most used term in connection with the implementation of Web 3.0 is the ontology. The term ontology was first used and defined by Tom Gruber in the 1990s. In his view an ontology "is an explicit specification of a conceptualization. The term is borrowed from philosophy, where an Ontology is a systematic account of Existence. For AI systems, what "exists" is that which

can be represented. When the knowledge of a domain is represented in a declarative formalism, the set of objects that can be represented is called the universe of discourse. This set of objects, and the describable relationships among them, are reflected in the representational vocabulary with which a knowledge-based program represents knowledge. Thus, in the context of AI, we can describe the ontology of a program by defining a set of representational terms. In such an ontology, definitions associate the names of entities in the universe of discourse (e.g., classes, relations, functions, or other objects) with human-readable text describing what the names mean, and formal axioms that constrain the interpretation and well-formed use of these terms. Formally, an ontology is the statement of a logical theory." [2] Ontologies contain meaningful data and are meant to bridge the differences between various systems, languages, and formats. They also provide a common ground for understanding, conceptualization, representation and interpretation of domain concepts, and are subject to change and evolution.[3]

The element of novelty brought by the Semantic Web is the adaptation of content to a specific user. The search on the web does not come with a vast list of web sites in which the user has to look for the information needed, but with a multi-media file in which the content is translated, personalized and adapted for the use of that particular person. The Semantic Web also involves the creation of virtual personal assistants or agents to help the user find the relevant information in a short period of time.

According to D. Jones [4] several content models can be used for Web 3.0. The Service Model involves the generation of content by a human user, followed by the transformation of the content in order to make it understandable to another, the addition of meta-data, the organization of operations on *sets of content,* and the creation of a service and training of an SMT engine.

Another model, The Content Model, involves the generation of content, the analysis, the alteration and the localization:

- **GeneratedContent**: content produced by a person.
- **AnalysedContent**: content analyzed before adapting it
- **PreparedContent**: content modified.
- **LocalisedContent**: content subject to the localization processes.

However, building the Semantic Web is not an easy task as it requires interoperability, standardization and harmonization which are difficult to achieve today. So far, the groups involved in the creation of standards have not been working together as one of the challenges of the Semantic Web is the creation of a common language that could be understood by any kind of technologies, computers, cell phones, tablets etc.

II. CHAPTER I WEB 3.0 FOR EDUCATION

The Semantic Web seems to be a leap forward in the Internet browsing as it connects not only people, but knowledge. It will be less social than its current version (Web 2.0) because it will introduce the virtual intelligence and the personal assistants, which will change human-to-human interaction to human-machine one. Their function will be to assist users in finding relevant information or in making decisions. The search result will consist of a multimedia report which will contain the information collected from different sources, such as websites, but also from books, blog entries, and videos on YouTube by using a number of devices, computers, mobile phones, tablets etc. According to Steve Wheeler, Web 3.0 will have four key drivers [5]:

- Distributed computing
- Extended smart mobile technology
- Collaborative intelligent filtering
- 3D visualization and interaction

Besides other benefits, smart computers, tablets and mobile phones, those for education will be numerous and challenging with the possibility to access virtual reality and 3D games. 3D Web provides the access to a completely new and demanding reality where the students have the possibility to impersonate other people with the use of avatars. This opens new perspectives to teaching as it

encourages collaboration, role-playing, and group work and makes learning more interesting and different from traditional education. Through virtual reality and 3D games, students can access places they have never been (E.g. ancient civilizations), or practice in an environment that mimics reality and which constitutes a valuable asset to medical students etc. as it fosters simulation and scenario building.

Besides its advantages, virtual reality is difficult and costly to create, and requires a lot of time and expertise to implement. Still, organizations are interested in investing in this technology as it is considered that it will gradually replace the current software. *Second Life,* for example*,* has already become popular by providing a virtual world which has all the features of reality and enables teachers to create their first virtual classes. However, virtual classes based on *Second Life* are costly and ephemeral, existing only as long as the courses are in progress, and accessible only to a group of learners, so very far from the free access to information envisaged by the Semantic Web.

According to Fig. 1, Web 3.0 provides a better control of educational resources by the user as it involves more comprehensive knowledge management. With the implementation of open educational resources for non-commercial purposes, a number of tools and information are free to be used and adapted.
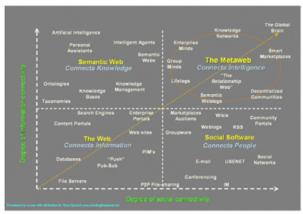

Figure 1. Spivack's Metaweb graph [6]

Open Educational Resources was adopted by UNESCO in 2002 with the hope to mobilize the whole community of educators and develop a "universal educational resource available for the whole of humanity." [7] Since then, several organizations and universities have worked on developing such resources. In Romania, the Ministry Education, Research, Youth and Sports developed a platform designed for the use of secondary school pupils (www.e-school.ro), while InsideMedia began to offer free courses on their website www.academiaonline.ro. Therefore, the way in which courses are designed will also have to change in order to provide on the one hand, free access to some information, and on the other hand, retain some knowledge to be used within the courses organized by universities.

Moreover, Web 3.0 will bring a leap forward in terms of PLEs. The term PLE was first used in 2004 at The Personal Learning Environments Session at JISC/CETIS Conference and represents a personal virtual space where people have the freedom to make decisions regarding the content of their learning according to their needs and interests. Now, the intelligent agents and personal assistants from the Semantic Web will provide the users with valuable information regarding courses and free educational resources. Thus, the information provided to learners will be more reliable and accurate as being filtered by the software.

According to Steve Wheeler [8] the Semantic web also fosters personal educational administration as "The Semantic Web has the potential to challenge this kind of institution-centeredness in the same way that distance learning technologies challenged place-centric education. At some point, institutions will describe courses and degrees semantically, probably just to help their own internal functioning, but with the secondary effect of making many of the components of education at least somewhat comparable across institutions."

Efficient knowledge management ensures better student-centred education, and the possibility to be aware of the educational offers existent on the market. In addition, educators, students and

researchers will have access to more information as the multimedia report will contain data extracted and collated from more sources which are not available at the moment (scanned documents, Excel files, statistics etc.) As information nowadays is difficult to access and manage because of its ephemeral state, one searching for data is facing with a problem. Are the data found valid and the latest in the field? The Internet is bombarded with false, malicious, and incomplete information, with rumours, errors, and misconceptions. Further, the amount of data on the Internet is enormous and difficult to manage which often leads to information overload. The standards introduced by the Semantic Web will maybe shed light on the current information chaos. It will improve collaboration, and research by bridging the differences in various fields of science.

However, maybe one of the most important victories of the Semantic Web and a step forward to globalization will be the translation standards that will be the building blocks of the future Multilingual Web. So far, the Linked Open Data (LOD) has ontologies that are in different languages than English, but it is a long way before a search on the Internet should come with information extracted and translated from different sources. The moment this becomes a reality, education and research will be the main beneficiaries.

III. CHAPTER II: TOWARDS THE COMMON LANGUAGE

When talking about a common language we refer on the one hand, to the one understood by the intelligent agents on the Web, and on the one hand, to the one used by ordinary people who will be the main beneficiaries of these changes and who are monolingual. As more people and institutions are involved in building Web 3.0, the tendency is to design it without building consensus on what the Semantic Web will look like. Therefore, the proposed models have a number of problems:
- No standards built
- No free access to courses
- No viable translation of information

Currently, the models lack interoperability and are not standardized which makes it difficult for users to utilize them as they prefer simple and static software. According to Dou, McDermott and Qi: "These vocabulary differences make life difficult for agents on the Semantic Web. It is much simpler to program two agents to communicate if they use the same vocabulary and the terms have same meaning or interpretation. But in cases where their vocabularies differ, we must resort to *ontology translation* to allow them to communicate." [9]

However, translation-related technologies are far from being interoperable. Until now, some steps have been made in providing people with translated versions of web pages via Google, or by embedding back buttons on the home pages of the web sites. Still, the former offers at best a vague image of the information from another language, and the latter is far more accurate, but difficult to manage and restricted to a reduced number of languages. Text translation is a difficult task even for humans as it involves the interpretation of the combinations of structures, patterns, and cultural contexts that make the translators' view on both target and source language. If experience is also crucial in interpreting a text, the software of the Semantic Web should be able to learn from mistakes and improve, which is not possible for the moment when the problems with software have to be solved also by humans.

In addition, the cost of translation and expertise in the field impedes the implementation of the Multilingual Web, doubled by the fact that language is a living organism which leads in years to obsolete translations if the software is not able to evolve. This also has an impact on the quality of information itself if the language used is updated. According to Elena Montiel-Ponsoda: "when localizing ontologies representing culturally-influenced domains, in which the granularity level of some concepts may differ from culture to culture, we may come across mismatches that need to be solved to provide adequate translations." [10]

The Semantic Web should also provide access to a large number of open resources so that people will improve their knowledge in different fields. However, the number of free courses is

currently limited, and the creation of an Open University, as envisages by UNESCO, is still in the offing. At best, some organizations provide both free and paid courses on their web sites.

Furthermore, according to a survey organized by Elearning Magazine [11] people are not used to certain features of Web 3.0 (such as virtual worlds) and use them less for education than other features of Web 2.0 (such as Social networking, blogs, wikis, forums and shared workspaces). If currently, the Personal Learning Environment is a collection of tools, devices like computers, laptops, tablets, mobile phones, and services like social media, blogs, wikis etc., the PLE of the future will include devices and services which are not very popular today or are waiting to be invented. The generation of Web 2.0 may be reluctant to accept the Semantic Web, but as the changes will be most probably gradual, people will soon find themselves trapped in the middle of a web revolution.

Still, people tend to be reluctant to use certain technologies, for various reasons:

- They are concerned with security problems,
- They do not like changes,
- They are not innovative,
- They do not need the technology,
- They cannot afford the devices,
- They are not familiar with the technology,
- They do not like the idea of virtual assistants because they are afraid of being intoxicated with irrelevant information,
- They do not feel at home in virtual reality,
- They feel they cannot have any control over the process,
- They do not trust the information provided,
- They prefer to interact with people, not virtual agents,
- They prefer to make their own decisions etc.

QUESTION: Which of the following Web 2.0 solutions do you use for learning purposes? (Check all that apply.)

Solution	% responding positively
Social networks (Facebook, LinkedIn, etc.)	72
Wikis, blogs, forums	71
Podcasts, video podcasts	62
Shared video media (YouTube, Flickr, etc.)	58
Shared workspaces (SharePoint, Social Text, etc.)	57
User-generated content (learning portals, intranets)	55
Instant messaging	52
Microblogs (Twitter, Yammer, etc.)	42
RSS feeds	41
Web services	34
Social answer sites (eHow, Answers.com, etc.)	33
Peer-to-peer networking	25
Mash-ups (Google Maps, etc.)	23
Social bookmarketing (Digg Reddit, etc.)	16
Virtual worlds (Second life, 3D Worlds, etc.)	12
Location-based applications (Foursquare, Loopt, etc.)	7
Augmented reality (Layer, etc.)	3

Source: Elearning! magazine survey, 2011

Figure 2. Solutions for Web 2.0

Webmasters are flexible, innovative, are interested in internationalization, and are not localized. This results in changes to the software, and in the end, in the advancement in Information and Communication Technology, and the implementation of the Semantic Web, smart mobile technology etc. In contrast, some users will always resist and dread change for various reasons: age, background, lack of financial means etc.

Moreover, institution will have to change their perspective on education and learning. With the implementation of the OpenUniversity, some courses will become obsolete and will have to be redesigned. The information provided will have to exceed the one that will be available on the Internet. Therefore, courses will become more specialized and contain more practical issues that cannot be covered by the free courses. This may also lead to overprotecting certain information in order to preserve the *status quo* in some universities. Another impact on course design may be the level of interactivity and technology involved in both teaching and learning as teaching methods should not lag behind the technology on the Internet. This will put pressure on the course developers and teachers together. Furthermore, in EBL (Web-based Learning) space, "the process of knowledge development is based on the creation and regeneration of contents. But an important feature of WBL is the interaction between students and teacher. An intense interaction within a group is based on

providing educational contents for students' individual needs in a suitable way and whenever they need it." [12]

However, regardless of the shortcomings of current standards, the Semantic Web is part of the normal development of the Web, and even if, some people do not feel comfortable with the elements that foresee its implementation, the new generations will have outgrown this. In time, the standards and the protocols will achieve the desired level of interoperability, and the advancements in Information and Communication Technology will solve most of the current problems and mismatches.

IV. CONCLUSIONS

The implementation of Web 3.0 and its benefits for education will soon become reality. If fostering socialization, exchange of information and cooperation, social software and computer-mediated communication used for learning were features of Web 2.0, the Semantic Web will introduce the personal assistants, intelligent agents, 3D gaming, virtual worlds, open educational resources and better knowledge management. With the help of intelligent agents and personal assistants, people will be able to organize their own learning, set their own goal and make decisions regarding the content of learning. The Semantic Web will undoubtedly benefit learners even if the face of education generally will have to change to suit the advances in Information and Communication Technology. In the end, the models and standards will become interoperable, the software will provide accurate translations, and the multimedia report will contain the wealth of information users are looking for. The intelligent agents and the personal assistants will be people's partners in education, and then and only then, the Semantic Web will have become reality.

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