Chapter 7

Conclusion & Future Work

This chapter summarizes our research on the Semantic Web applied to Online Examination. Based on our Semantic Web-based Online Examination framework, we recommend some future works.

7.1 Conclusion

The Semantic Web is the future of human knowledge. Some serious computer scientists, although cautious about the promise of the Semantic Web, are ultimately optimistic that it will be everything developers are hoping for — an online source for all of the knowledge humanity has created in science, business and the arts [Koprowski, 2003]. As a result, the Semantic Web is being developed and applied to many domains of interest, especially Online Examination. "The Semantic Web might be a cure for our Online Examination ills," said Rich Baldwin, a spokesperson for software maker Xaffire [Xaffire].

In this research, we focused on the Semantic Web applied to Online Examination. The main objective aims at a smarter Education System. The word "smart" means people can carry out an intelligent, sophisticated and automatic online Education activity with minimum external human intervention and assistance. Fortunately, this "smart" concept could be supported by a meaningful Web infrastructure, the Semantic Web. In our Semantic Web-based Online Examination framework, a Semantic Virtual Machine (SVM) layer is added to the traditional Online Examination architecture. Through this layer, to Web information is given a well defined meaning so that different roles of Online Examination, (such as, Web resources, humans and computers), can work in corporation. The work undertaken in our research can be summarized as follows:

• We first made a deep investigation of the state-of-the-art in Online Examination. After analyzing its process and architecture, we found that the current Online Examination is only designed for humans, which leads to a time-consuming and low-efficient result. In order to solve this problem, conventional Online Examination has to act with a Web infrastructure where to information is given well-defined meaning, better enabling machines to process complex tasks automatically.

• Then, a further and complete study of the Semantic Web technology was made in Chapter 2. According to the concept of Berners-Lee, each layer of the Semantic Web was discussed in detail. As a result, we recognized that the Semantic Web is a good opportunity for Online Examination, which can help to achieve the intelligence and automation of the Online Examination through the machine-process able information.

• Based on research on an Online Examination architecture and Semantic Web technologies, we proposed a conceptual framework for the Semantic Web-based Online Examination solution. In this framework, a Semantic Virtual Machine was constructed and added into the Online Examination architecture, which is responsible for the meaningful Web resource presenting and running.
• Besides, in order to obtain the methodology support, we suggested a developing workflow to implement the designed framework. This workflow includes the steps of semantic annotation, ontology engineering, OWL specification and semantic reasoning.

• According to the workflow, we carried out a deep study of some key technologies related with the workflow steps. This study offered an academic and methodological support for the Semantic Web-based Online Examination.

• In order to confirm the solution and framework proposed, we chose a significant Online Examination domain. Through this tool, users can obtain the smart (intelligent and automatic) product suggestion according to their profile and preference. In short, the contribution of our research focuses on increasing the quality of people online commercial activity. Through our research project, users will get a personalized Online Examination service. However, Online Examination is a wide and complex concept. Thus, to meet such sophisticated environments, our Semantic Web-based Online Examination solution still faces some future work.

7.2 Future work

The Semantic Web vision deserves a renaissance. The ambitions for it were not unrealistic. However, the model that was so successful for the World Wide Web—open and community powered—was not a realistic implementation path. Many of the key success factors behind the World Wide Web are missing from the Semantic Web. The technology is much more complex, the subject matter is far more abstract, and the aspects of scale are far more daunting. The Semantic Web needs a different success model.

We can find alternative success models in other examples of mass market networks. When we look at the rise of existing mass market networks in content, search, and social networking, we see examples of innovators demonstrating small local versions of the networks that prove their utility. Over time, these small networks grow to mass-market proportions. Standardization in technologies and business models comes later as winners emerge.

Similarly, a global Semantic Web will emerge first through small working examples: independent organizations providing microcosms of the Semantic Web. These self-contained services will piggyback on the infrastructure of the Web, using distributed web services, open technologies and data. But before they can be “of the Web”, open and global, these services need to first be “Semantic”.

The Semantic Web is here and the core aspects of the original vision remain. While not all of its champions are operating under the banner of the Semantic Web, they will operate their semantic networks and services on the shoulders of it. Different models with different names, weaving together a global network.

The Semantic Web provides an enticing vision of our online future. This next-generation Web will enable intelligent computer assistants to work autonomously on our behalf: scheduling our appointments, doing our shopping, finding the information we need, and connecting us with like-minded individuals.

Unfortunately, the Semantic Web is also a vision that, to some, seems very distant. It has been over a decade since it was popularized in a May 2001 article in Scientific American. Semantic Web researchers and engineers have been toiling even longer on the monumental technical and sociological challenges inherent in creating a global Semantic Web.

The good news is that we are seeing evidence today of its accelerating emergence. Although still far from its grand vision, there are available today small “local” versions of semantic
webs and software agents. Consumers can begin using these intelligent assistants today; producers can begin incorporating this next-generation Web into their current business models and applications.

Paradoxically, the path to a global solution may evolve not only through the cooperation of a Semantic Web community, but through the selective forces of competition. As proprietary semantic networks vie for mass market dominance, winning technical and business models will emerge through a tapestry of data providers and services.

Tools are emerging to help people more effectively use Linked Data. Freebase from Google is an example of a proprietary graph-based database that is leveraging Linked Data. Freebase contains millions of facts about a variety of topics: people, geography, entertainment, etc. This data has been contributed by the Freebase community of users, as well as gathered from Linked Data and unstructured sources on the Web. It is much like Wikipedia in its content, but much different in its form.

In these local examples of semantic webs we have several of the key aspects of the original Semantic Web vision. Software agents and services are collaborating over a distributed web of semantic data. Proprietary technologies are addressing gaps in the open infrastructure to make workable semantic applications a present reality for consumers.

Of course, this snapshot of small local semantic webs needs to be placed in the context of the rate of change. How quickly are we moving towards a fully realized and global Semantic Web?

It's difficult to point to objective measures of growth across such a distributed environment. But consider the following markers:

We are seeing an accelerating increase in the amount of Linked Data, reminiscent of the initial growth in the document Web during the mid-nineties.

Major Internet companies such as Google and Facebook are making their semantic data assets a focal point of their product development and marketing initiatives.

Virtual assistants such as Siri and Google Now have catalyzed a cottage industry of start-ups, representing a diverse range of automated services.

We are witnessing an accelerated emergence of new semantic technologies and services. A confluence of trends in the business and technology landscape is creating a virtuous cycle of innovation.

Like the World Wide Web, the Semantic Web is decentralized -- no one organization or agency has control over all of its rules and content. However, some people and organizations have taken leadership roles in the development of Semantic Web guidelines and protocols. These include the World Wide Web Consortium (W3C), its director Tim Berners-Lee and its member organizations. The W3C is not a research organization, so universities, other organizations and the public also play an active role in Semantic Web development.

Some areas of the World Wide Web have already incorporated Semantic Web components. These include RSS feeds, which use RDF, which proposes to create machine-readable personal web pages.

But much of the Semantic Web's function and practicality are still in development, and there are some pretty big obstacles to overcome. Decentralization gives developers the freedom to create precisely the tags and ontologies that they need. But, it also means that different developers might use different tags to describe the same thing, which could make machine comparisons difficult. Critics also question the "identity problem" -- does a URI represent a Web page, or does it represent the concept or object the page describes. For example, is "http://www.starwars.com" meant to represent the "Star Wars" films, or just the Web page?

Some developers disagree on whether the Semantic Web should rely more heavily on rules or on ontologies. Critics also say that the project is enormously impractical. First, people don't actually think in terms of the graphs that RDF uses. Second, it seems unlikely that businesses
and existing sites will actually devote the time and resources it would take to add all the necessary metadata. In the future, off-the-shelf software might include options for adding metadata when creating new documents, but that tool still might not make the project feasible on a larger scale.

For lots more information on the World Wide Web and the Semantic Web, check out the links on the next page. Since the framework we proposed is only a prototype, so there are lots of works needed to be investigated in the future.

First is the issue of the Services Description. As a result, the relevant Web resource and Online Examination procedure are more difficult to describe. Then our future work is related with considering a more efficient and appropriate way to present sophisticated commercial activities, such as, pre-defining certain top level Web service ontologies and their relationships.

Next, for the Services Processor, our application adopts the PSM (Problem Solving Method) for the semantic reasoning, which is a domain-oriented method. Then, every new application domain should design a new PSM. So the future work is considered a domain-independent service process method. Fortunately, the current research of the Semantic Web services (Web services advertisement, discovery, deployment and composition) will bring some perspectives.

Besides, referring to Online Examination itself, an important topic is the security issue. In our Semantic Web-based Online Examination, users are asked to offer their personal profile information. Sometimes these information are confidential. Thus another unavoidable future work is to find a way, enabling users to access the semantic Online Examination with confidence and privacy.

Finally, we hope that this study can bring an inspiration of the Semantic Web-based Online Examination research and the relevant application design.