The Semiotic Web: Don't forget the user amongst all the semantics

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ABSTRACT

The original exchange of information that was enabled by the development of the World Wide Web has been greatly enriched as the web systems have developed. The Semantic Web enhances the reliability and efficiency of automated information re-use. The central tenant of this paper is that the semantics that imbue the "Semantic Web" are not sufficient to ensure that users understand the information presented on the World Wide Web but that a wider understanding of the importance of the user's context will prompt the development of the Semiotic Web and in this way human beings will regain first class status/membership of/on the World Wide Web

Categories and Subject Descriptors

Evolution of the World Wide Web, e-Research, Semantics, Semiotics, Human Computer Interface.

General Terms

Documentation, Design, Human Factors, Standardization,

Keywords

Semiotic Web, Semantic Web, Human Computer Interface, Context, e-Science, e-Research

1. INTRODUCTION

The way in which the consideration of users and their context should influence the design of the human computer interface to the Web and Web based applications, requires a wider study than just semantics and needs to consider the meaning of the 'signs' used and implied in the Human-Computer and Computer-Computer communication and interaction. As semiotics is the study of the meaning of signs, the proposition presented in this paper is that the "Semiotic Web" will lead to improved usability of the World Wide Web in its full global and multi-disciplinary context.

One of the experiences of the UK e-Science programme [1] has been that the designers of the e-Science (or more generally the e-Research endeavor) middleware and applications, including the Semantic Web software, forget the needs and desires of the ultimate users at their peril. The consideration is more than the necessary requirements capture to ensure that the software delivers the desired functionality, but to ensure that it delivers this functionality in a usable manner [2]. One way in which the e-Science functionality can be delivered, and functions automated, is to make extensive use of semantic annotation. This delivers a methodology for much more accurate computer-to-computer communication, in a frequently human readable (ASCII coded XML) but incomprehensible manner.

While the semantics may seem to be sufficient for computer-computer communication, if the context of the item of data is properly captured, the human-computer interface (HCI) needs to be much more subtle and consider the context of the user as well as the data [3]. However, with the global scope of the World Wide Web the users will come from different cultures, of different ages and with different experiences and thus frequently make radically different assumptions about the meaning of the texts, signs and symbols presented to them when accessing a web page. This contextual discussion forms the basis of the discipline of Semiotics, "It is... possible to conceive of a science which studies the role of signs as part of social life" (Saussure). In this sense users from different disciplines even embedded in the same culture make very different assumptions about the nature and meaning of research work; a problem that many of the large e-Science collaborations have experienced.

While semiotics is the study of 'signs' in a very general sense, including names, the study of specific type of signs, that of icons, is one of the more obvious areas of interest in the application to the World Wide Web. Semiotics raises its head in a related context (that of the human computer interface to many new applications) as the increased use of icons and associated graphic devices, e.g. pen movements on a tablet, hand gestures, etc. to improve the usability of web software, make greater and greater assumptions about what the user implicitly understands and associates with these signs and with this there is a greater risk of cultural and community assumptions being made without being explicitly understood. Scientific researchers interacting with computer scientists frequently experience a version of this and specialized working practices are helpful in alleviating misunderstandings [4].

2. E-Science & The Web

The UK e-Science Programme gave a huge impetus to the development of collaborative, grid and web based research, and software to support and extend this research. The initial emphasis was on "Grid", large scale computing, with large amounts of data. A unique evolution, driven in part by the CombeChem Project [5,6] with in the UK was the demonstration of how important the data centric view became as the different projects began to focus on applications. Large scale computing power was difficult but feeding sensible data to the systems built was even more difficult. Assembling this data from diverse sources, maintaining context and provenance was almost insuperable – but not insoluble; the concepts of the Semantic Web, broadened to the Grid world, have been the basis of many solutions, such as that adopted by CombeChem.

Given this willingness to re-interpret the Grid imperative, it is in retrospect surprising that so little emphasis was given to Usability, and the Human-Computer Interface. The problems associated with automated re-use of web content, driving the semantic web agenda, had displaced the humans from the central role in driving research collaborations. Bringing the user back to the fore led to many aspects of the e-Science technology being reconsidered.

On reflection what we were trying to achieve was a synthesis between "User Centric" and "Data Centric" approaches. The needs to describe data (and processes) in great detail if they were to be successfully represented in the digital world, led to significant review of the processes and the meaning of the data as understood by the human users. In the e-Bank project these considerations significantly influenced the descriptions of data that were needed for curation of crystallographic data in a way that provided provenance that would work even in the absence of peer review [7].

3. The Semantic Web or a Semiotic Web

3.1 Web vs Grid Debate

At the start of the CombeChem project the Chemists were not surprisingly, middleware neutral, perhaps despite having used Globus software in a preliminary project [8]. Globus vs. Web Services, seemed to be the issue back in 2001. To some extent this was resolved in a user centred manner, which would set the trend for HCI considerations for much of the rest of the project. It became apparent to the Chemists that Web Services were what ran our Bank ATMs. We trusted (well mostly) the bank to provide the money and deduct only the correct amount from our accounts. We felt that it would be possible to convince our colleagues that a system secure enough for them to trust their own financial operations, would be good enough to access and manipulate chemical information, even if the item that was the centre piece for their highly lucrative spin-out proposal! So we adopted "Web Services". Clearly as the plot moved on there was an evolution that brought "the Web" and "the Grid" closer together, both having their semantic children which the projects adopted. However this discussion was all within the scope of computer-computer information exchange and the ultimate human application users were rather remote form this discussion.

3.2 The Web 2.0 Generation

The influence of the 'User Generated Content', focus of Web 2.0 applications, has influenced the continuation of the CombeChem project. The initial work produced a Semantic Electronic Laboratory Notebook, in order to capture with full context, in a digital form, chemical information as it was being created in the laboratory. Such rich data was then available to feed to Semantic Chemical Web (Grid). While this reflected well the need to capture process (i.e. a synthetic chemistry reaction), satisfy safety needs, and facilitate recall of process data, it did not perhaps reflect the realities of "thought and discussion" of the chemical problems. What was needed here was the record of the research conversation now frequently being undertaken between several individuals with diverse skills, as well as providing access to one's previous thoughts and good intentions.

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3.3 Sufficient Semantics?

Semantics is not enough (sufficient) and a full understanding of context requires a broader view, especially when transfer of information between different cultures (be they societal or disciplinary) is involved. In many ways the transfer of information between different disciplines can involve communication across a cultural gap every bit as big, or bigger, than those experienced between different societies.

3.4 Simple Icon Example

In semiotics it is necessary to be clear about the icons, and the way in which the icon represents the object, and indeed whether it is the object or the concept of that object that is being represented [9,10]. Careful consideration can help to reduce the ambiguities. To take a simple example the 'Back' button, or as it is often represented as an arrow pointing to he left, on the browser provide interesting (and well known) possibility of confusion. Does "back" mean the previously accessed web page (the browser back, or the in our terms the previous page from the user's perspective) or the preceding page in the sequence defined by the web site author (the provider's or designer's view).

A similar issue may arise in PowerPoint presentations especially when used on a tablet PC. The floating menu that appears, usually, on the bottom left of the screen also has a back arrow. At least it has arrows that point left (back) and right (forward). However in a PowerPoint file written in a language whose natural direction is reading right to left the menu appears on the bottom right of the screen. Seeing this, I was uncertain which of the left/right arrows would take me 'back' the previous slide. I have not yet been able to check the situation for a language that is written vertically, when I presume there can be a confusion between left/right and up/down depending on the assumptions of the author and reader.

3.5 Human Computer Interfaces

The nature of the human-computer interface is also critical in the usability of the software. We are no longer restricted to text based input, nor even mouse response to icons and pictures. The touch sensitive screens capable of multiple simultaneous inputs (e.g. the Apple iPhone and ITouch iPod, the Microsoft Surface, etc.) and the Nintendo WII are examples of more sophisticated modes of interactions. The WII demonstrates that a more powerful interaction concept can sell better than higher quality graphics and the interface opens up the area of gesture computing by reducing the costs to those of consumer electronics. The interface is the key, and key to the interface is the understanding of how users will perceive the information, be it text or icons presented to them. The new interfaces allow new ideas not just in the HCI but also in the actual applications. The semantics needed to describe the context that will enable the Computer-to-Computer exchanges have to be captured from the human interaction, and that exposes things like the 'Web Interface' to the complexities of the social context and thus the necessity of a semiotic analysis.

4. Internet vs Intranet

One possible way to investigate and check the importance of semiotics, and the implied cultural assumptions, would be to compare the structure and use of the symbols between web sites on the Internet with those on an Intranet. The later have by their nature, a much more restricted target audience, with a common outlook, at least in so far as the users all belong to the intranet's organization. A comparison is underway between the University of Southampton's external web presence (www.soton.ac.uk which has recently been rebranded) and its intranet (sussed.soton.ac.uk).

5. Conclusions

There is a need to take a combined view of the program / service and the user interface, the latter cannot be just an add-on covering of the former. To achieve this more uniform approach to the programme and the interface(s) we need to recognize that the signs & symbols that make up the language of communication between the computer and the human or another computer convey to the human much more information than the mere words and their dictionary definition. The overall impression that these signs and symbols create may be highly culturally dependent. An understanding of these potential difficulties and their resolution falls not within the Semantic Web but the wider discourse that will be enabled by the Semiotic Web. The consideration of users in all their different types may even benefit from looking at the recent reconsideration from a semiotic perspective of "What is a consumer?" in market research [12]. The Semiotic Web will enable us to place the human experience back, or more properly human experiences, back at the centre of the World Wide Web. The alternative is that the users will be adrift in misunderstandings occasioned by the sea of semantics – 'Semantics, Semantics everywhere nor any drop to …..

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