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Computer science specialty and Professional Purpose on Unified Search Data option, interaction, Web and software engineer

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Computer Fundamental concepts to study the web as a science

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Plan

Introduction

The result of Google for the observation of World Health Organization 19 February 2009, have been published [8] in the journal Nature. This publication revealed the potential of search engines to estimate in real time the spread of influenza virus. For Google, it opens new opportunities arising from an unanticipated use to their search engines (i.e. Google Search). Today, there is no common formalism for anticipating changes in the Web. It does not evolve in a conventional manner. These are the interactions between publishers of applications, users and institutions that drive the growth.

Chronology

Internet

- ✓ **1961**: Leonard Kleinrock theorizes the packet.
- ✓ **1969**: Birth of Arpanet.
- ✓ **1972**: First e-mail.
- ✓ **1983**: ARPANET switches to TCP / IP.

The Web:

- ✓ **1989** – **1992**: HTML and HTTP URLs to write hypertext documents. [12].
- ✓ **1993**: The University of Illinois presents Mosaic – Graphic Web Browser.
- ✓ **1995** : The Browsers War began.
- ✓ **1998**: Google – Stanford.
- ✓ **2002**: Creation of Friendster, MySpace.
- ✓ **2004**: Launch of Face book.
- ✓ **2005** :conference at the British Computer Society in London [1] that examine the emerging trends on the Web and discuss research that will be needed to exploit opportunities.
- ✓ **2006**: Article "creating Science of the Web" [2] in the journal Science is calling for scientists to "target the web as a primary objective."
- ✓ **2009**: The Google search engine is useful in terms of monitoring World Health Organization. [8].
- ✓ **2011**: Face book and YouTube play a major role in the Arab revolutions.
- ✓ **2012**: The President of the French Republic promises to establish a criminal offense for visiting websites called "terrorists".

Call for the creation of Web Science

Web Science: is an emerging interdisciplinary field that lies at the boundary of Computer Science, Sociology, Psychology, Media, Economics and Law. Its aim is to understand the Web and its impact on the way people think, behave and interact.

The World Wide Web is a network of servers linked together by common protocols, allowing access and exchange of millions of hypertext documents.

It refers to an application that share Resources (documents) across a network and very often confused with the world internet where many other services are associated or backed with the internet like (electronic mail, file transfer, instant messaging, remote access, etc...) where the Web is just one application among many.

The web is a transformational phenomenon from its first day; it has changed the methods of communication, collaboration and teaching [18], it plays a role in changing the world, particularly in science, it became a major phenomenon of the early 21st century and we want to understand it,

"*Understanding the Web is a major challenge as big as any other global cause*."
N. Shadbolt Royal Society, 8 mars 2010

How vast the growth of the Web? What are the principles that govern it? How to model it? What are these phenomena's that emergence creating such science? And what are the key elements and properties of the Web and how are they changing?

The emergence behind creating web science lies behind these important Points

- The impact of the web on the way people think, behave and interact.
- The vast and important progression and developments of the web.
- The social adaption of web 2.0 and the adaption of complex theory system in social theory recently by considering the web 2.0 or social net work structures as complex system.
- The Immanence of the web in the sense they use and rely on resources from their environment.
- The web is the fifth largest economy in the world.

Yes there is a science behind the web we can yield inside and learn many interesting things, yes the web is a complex system, need to be understood and studied like it is important to study the system plantar or the atmosphere and how they works, we need to think of the web as new discipline, we need to know and study the **elements** that make up this system (human, artificial, technological, resources) their uses and technical over view to be able to anticipate future evolution and developments of the web, identify opportunities and protect it from threads and risks to continue its health and existents.

Objective

We want to answer that call with the objective to highlight the fundamental concepts needed to study the Web as a science. This objective is motivated by the conviction that the analysis of Web and its evolution must be a specific science, interdisciplinary in nature, which may involve areas as diverse as sociology, computer science or mathematics.

The issues are part economic, but also human: Analyze online interactions, their impact on the architecture of the Web; fight against cybercrime; against addiction, answer the complex questions of privacy and intellectual property. But also how to control that social values (loyalty, confidentiality, respect for individuals and borders) are observed on the Web? [1]

We will focus on the principles elements that construct the Web; we will seek to show its paradoxes and limitations. In our approach, we distinguish agents (we will refer to the definitions given by J. Ferber [4], their anticipated or unanticipated uses as many bricks that will observe the Web with more discernment and better understanding to its changes.

Paradoxes

- ***A transformational web based on a protocol insensitive to changes.***

The birth of social structure has transform the web form a hypertext environment to collaborative and interaction environment, such collaboration has produced the web transformational phenomena, the web change every second and the way we think behave and interact change as well, each interaction on the web (e.g. file exchange, post, or any access to static resources) by modifying data or simply logging to an interaction change the web where at the other side the HTTP the principle Protocol Of the web is insensitive to changes .

- ***A web based on stateless protocol with lots of limitation.***

Paradoxically, since the foundations, the notion state is missing HTTP (HTTP stateless) due to the fact that HTTP as a protocol principal of the **World Wild Web** is **Connectionless**.

HTTP Connectionless

HTTP produces the same result for a query with no consideration to earlier requests. The server and client are aware of each other only during a request. Afterwards, each forgets the other. For this reason neither the client nor the browser can retain information between different requests across the web pages. Each interaction between client and server (request and response) is completely independent.

There exists some application layer to overcome this problem like (cookies and session state) we can say that the state is another missing brick of the HTTP.

- ***Stateless HTTP handicaps the evolution of the web and we cannot change it.***

Because HTTP is a stateless protocol, it is difficult to implement Web sites that react intelligently to user input and maintain relations to user action. For example HTTP is unable to retain a memory of the identity of each client that connects to a Web site and therefore treats each request for a Web page as a unique and independent connection. However for applications such as E-commerce which accumulate information as you shop, it is extremely important to know what has happened previously, for example what

you have in your basket. To overcome this problem some other technologies where developed like ActiveX, Java, JavaScript, cookies and session state.

HTTP's statelessness makes it vulnerable to attacks such as so called "man-in-the middle" type attacks. Where a hacker or a person with knowledge can analyze the interaction between the client and server in real-time, like capturing cookies that used for authentication or other information that pass by the forms, this problem has been overcome by the creation of HTTPS [23] in 1994. See L'OWASP The web still vulnerable to 10 major risks: HTTPS can do nothing against the threats of phishing, ARP poisoning, ARP Rogue and against the use of false certificates of MD5 collision, NULL char or social engineering. [27]

- ***The Ignored methods of HTTP***

The Web can be seen as a network whose nodes are HTML pages [19]. A page acts as a hub from the principles of hyperlinks and forms. This network organization based on HTTP protocol comes with four operations GET, PUT, POST and DELETE [20]. Almost the Web has progressed without the use of PUT and DELETE operations that have been rarely exploited [REF?!]. One may wonder how these operations native to the Web core protocol have been ignored. Our intuition comes from the idea that the Web as a communication network is not restricted to a single authority. Under these conditions, confidence could not be a strong element in the development of the Web. Delete operations and writing were quickly assigned to the target resource (CGI script running on the server) while the PUT and DELETE operations are designed to be driven by the source page. [20]

We speak about the confidence factor

We believe that trust is a key factor in the evolution of the Web. We have seen that the lack of trust that has guided the use of HTTP operation protocol. We believe that the trust and support are bricks whose absence might frustrate the Semantic Web.

- ***The main language of the world wild web HTML almost without semantic***

HTML almost with no semantics other than that proposed by the Meta tags [24]. The lack and the delay of semantic in the language principle of the web HTML is a major inconvenience to the semantic web and to the evolution of the World wild web.

Today it is clear that we must work to enrich the content of Web resources and help establish relationships between them. The delay in terms of semantics of HTML until the version 4, 5 is another brick missing from the Web. [17]

Web 2.0

The web is the largest human information construct in history totally dependent on the interaction and activity of billions of linked agents (nodes) human or artificial in the entire world. It looks like a random graph with no fixed shape or structure where a set of nodes and links connected.

Web 2.0 an expression used describe social network structure very often associated with web applications 'sites' that allows its users to interact with each other, share information and change web site content.

Examples of Web 2.0 include web-based communities:

Web services, Search engines, Web applications (culture, law, economy, media, ecology, etc), Social structures, Video Sharing Sites, Wikis, Blogs, and Folksonomies.

Now we will try to examine and go throw some of these elements that construct the web 2.0.

Web 2.0 Weakness technologic

- ***Stateless web Services, limited in semantic description and dynamism*** **[5]**

Web services are standardized and interoperable software components (pieces of code and/or data structures) that perform some function like change of information's (messages) and that use Internet protocols and technologies. They are describable, discoverable and executable according to SOA standards. Web services rely on 3 XML based slandered languages to allow the communication between applications.

- ✓ WSDL (Web Services Description Language), to describe software component like the function that might be invoked.
- ✓ SOAP (Simple Object Access Protocol) to describe methods for accessing these components that is message exchanges.
  SOAP is based on the HTTP protocol (one of the main Web protocols)
- ✓ Universal Description, Discovery and Integration (UDDI) to publish a service and to identify/discover a service provider in a service registry.

Web services suffers many inconvenient problems like Remote Procedure Call (RPC), object-oriented behavior, client/server orientation, no user adaptation, no memory (stateless), no lifetime management, no conversation handling (simple request/answer interaction), synchronous communication.

The major drawback of Web services is semantics [5]: WSDL allows definition of a service interface and service implementation but only at a syntactic level. There is no way to transfer transaction semantics across a SOAP call.

SOAP is based on the HTTP protocol, where HTTP is stateless protocol (unable to retain a memory and maintain relations to user action, unable to manage a long lived interaction such as a conversation), Therefore SOAP is also a stateless protocol and each SOAP message is unrelated to any other message

UDDI registries do not support semantic descriptions/ searching of/on functionality. Searches can only be based on keywords only.

- ***Search engines based Keywords limited in semantic and do not adopt the evolution technologic and progression of the web like the utilization of other approaches (taxonomies, thesauruses and ontology's)***

Search engines are very important fetchers of the web2.0, despite the large use of search engines many questions can be asked about satisfaction performance and unnecessary related information, comprehension and the search by keywords.

The weaknesses of search by Keywords and the cruel lake of semantic

Search engines based on keywords rather than semantic explained Nova Spivack in 2008. [11] However many other sophisticated search concepts can be used like taxonomies, thesauruses and ontology's.

A user searching for information on Google about the "army of Napoleon" will rapidly encounter the limits of search by keywords; the term "army of Napoleon" may be seen as the instance of the super class "army" who is specialized "Napoleon".

In addition, the search keyword is not based on a thematic lexicon and sorely lacking in expertise on the target area which would benefit from specialized (principle of the directory). The project SygAnnot [Annexe 2] and its extension RDF [Appendix 4] has shown that it is possible through the techniques of NLP to label the text of a document markup lexical and thematic. This markup is used to structure research by establishing a hierarchy between the terms by reference to a thematic ontology

Another example: today a search on keywords "HTTP DELETE", Google returns about 1,580,000,000 results. If the search was thematic and hierarchical, it is sufficient to specify THEME="Web Science" to easily find publications on scientific topics.

Other shortcomings

- The question of satisfaction
- Search engines based HTML any code not written on this format cannot be parsed, or interpreted, thus cannot be found or ignored.
- Many related unnecessary results

Failures

- Many search engines does not support frames

➢ *Most application web adopt the client Server model*

Web applications often adopt the client/server approach, in client/server mode; most of the information resides on one side (server) and most of the intelligence on the other (client).

The Web is still limited to embody high level, peer-to-peer mode architectures where both the client and the server acts as server and share resources and these resources are available to every computer in the network implies client and server are equal.

➢ *Folksonomies with Limited search capabilities when compared to taxonomies, thesauruses and ontology's with no common structure and suffer from the problem of multiple syntactic variations*

A folksonomy is a system of classifying, creating and managing tags to annotate and categorize resources such as photos, web pages, documents, etc. The importance of folksonomy that it offers an easy method to organize information based on tagging and offer new search approaches passed on tags like semantic search.

Les inconvenient of folksonomy
Limited search capabilities when compared to taxonomies, thesauruses and ontology's.

Tags without structure
Due to the fact that users create tags and assign them freely to resources it produces the inexistence of any structure among these tags.

The problem Multiple syntactic variations of a same tag

- Misspellings (*semanticweb /semnticwev /zemantcweb*).
- Singular or plural (*semanticweb / semanticwebs*).
- Separators (*semantic-web /semanticweb*).
- Combination of them (*semanticweb /semanticweb*, *semantic-webs*)
- Synonyms (multiple tags for the same concept)
- Homonyms (the same tags used with different meanings).

The reduction of syntactic tags variation helps to improve the quality of folsonomies and to improve the search approaches based on tags can be considered as another important brick to be taken into consideration.

Usages of Web 2.0

According CEFRIO in Quebec, the main family of expressions used in Web 2.0 is (organizations, share and collaborate, chat, search and collect, broadcast and watch).

Also according CEFRIO, the use of Web 2.0 administration tools bring the following

improvements: better a relationship to the user interaction and more efficient functionality and collaboration. [26]

Intangible benefits	**Tangible benefits**
Reducing the number of emails	Better knowledge management
Reduced costs of travel Employee	Worker Satisfaction
Reduced telephone costs	Greater capacity for innovation
Reduced IT budgets Competitiveness	enhanced
Marketing strategies more effective	Improved customer relations
Faster product development	economic monitoring
Customer loyalty	Better integration and communication
Best individual performance	Strengthening brand
Professional development individuals	Employee retention

Table: the benefits of the use of web 2.0 for organization according to CEFRIO

The transformation of Web 2.0 is mainly induced by human exchanges individual or community. The first bricks that emerge from the social web are mainly useful to the organization of such collaboration.

Tim O'Reilly introduced the term Web 2.0 as the basis for exchange between users as a (collective intelligence) and showed the transformation that has taken place between Web 1.0 and Web 2.0 by the following table. [25]

Web 1.0	**Web 2.0**
Double-click	Google Ad Sense
Ofoto	Flicker
Akamai	Bit Torrent
mp3.com	Napster
Britannica Online	Wikipedia
personal websites	Blogging
evite	upcoming.org and EVDB
domain name speculation	search engine optimization
page views	cost per click
screen scraping	web services
publishing	participation
content management systems	wikis
directories (taxonomy)	tagging ("folksonomy")
stickiness	syndication

Table: illustration of the transition to web 2.0 by Tim O'reilly and John Battelle.
We see that applications rely more on sharing, collaboration and interaction between users

The collaboration on Web 2.0

The collaboration on the web in terms (organizations, share and collaborate, chat, search and collect, broadcast and watch) has produced the web transformational phenomena that the web is changing and these changes has an impact on the way we think, behave and interact.

Now a day's these social agents like face book and YouTube and others can change political power, remove governments, creates problem, and affects many small things on our daily life.

Other Paradoxes

- ***The Web is Immanence system***

  An approach related to complex theory systems adopted recently in social theory to explain the relation and behavior of complex systems such as social organizations.

  The general idea behind the notion of immanence is that the cause of the development of an object occurs inside this object. [2] The web is immanence in the sense that it relies and depends on information from its environment, the power is not in face book, or YouTube but in the environment of face book and YouTube, in the users of face book and YouTube, face book is nothing without users.

- *The web economic impact*

  The mere size of the internet web economy has outstripped all visions and expectations. According to "Boston Consulting", the web economy has grown to about $2.1 Trillion in 2010 and is expected to double by 2016 creating millions of jobs. If the Internet web economy was a country it would have been the fifth largest economy in the world.

  From internet shopping to online messaging, the web reduced the cost of delivery for the marketers and producers and a better value to the consumers.

  This has been the core reasons behind the rise of behemoth Google as a search engine and Amazon as an Internet market place, we call ecommerce. The web has helped keep inflation in check while the economies around the world are growing. People and businesses around the world can now communicate and conduct business at lower costs by purchasing products at wholesale and communicating cost effectively using internet telephony like Skpe and other web mediums.

- ***Social web we should have HTTP Annotate (Add Meta data to resources)***

For an efficient semantic value, the servers should allow direct annotation resource. URI would then designate a given and all links that characterize it. It is the vision "HTTP annotate".

Vision SMA for the future web

The actual information system of the net is static where all delivered information to human or artificial entities is readymade information products (e.g. pages, images documents functions, application, results, etc) the generation of smart services and the participation to an interactive and collaborative society can be considered as another paradox , That's why we introduce the **Multi agent system (MAS), Dynamic Service Generation (DSG) and the use of a grid based Service-Oriented Architecture (SOA)** where the **grid** is an approach in **distributed computing** that provide a mechanism to deal with state full and dynamic services[5].

An intelligent web and More Dynamic Services

DSG is the process of obtaining services constructed on the fly through agent's conversation.

In **DSG**, service providers /consumers are both *agents* (human or artificial) members of a *community*, and they can have *conversations*. Thus DSG involve two types of entities ***human Agent*** *(**HA**)* and ***Artificial Agent*** *(**AA**) (*computer, machine, agent, software system).

The **DSG** provides a solution and mechanism to the web to become real collaboration environments by allowing all kind of agents to communicate and generate services with one another,

The **DSG** Agent communication inputs and output flow of messages may be represented by **streams** as lazy evaluation to express the natural delayed aspect of interactions.

Example of intelligent dynamic generated services:

- You leave your home in the morning and an Internet service warns you to get your umbrella because it's raining in Paris, the city where you are going to!
- You are at home and an Internet service warns you that a TV show might interest you tonight.

More streams

An alternative approach to state modeling, streams are smart data structure to model state full systems and their evolution in terms of sequences that represent the time histories of the systems being modeled like the time at which the elements of the sequence are evaluated, when the list is constructed or processed.

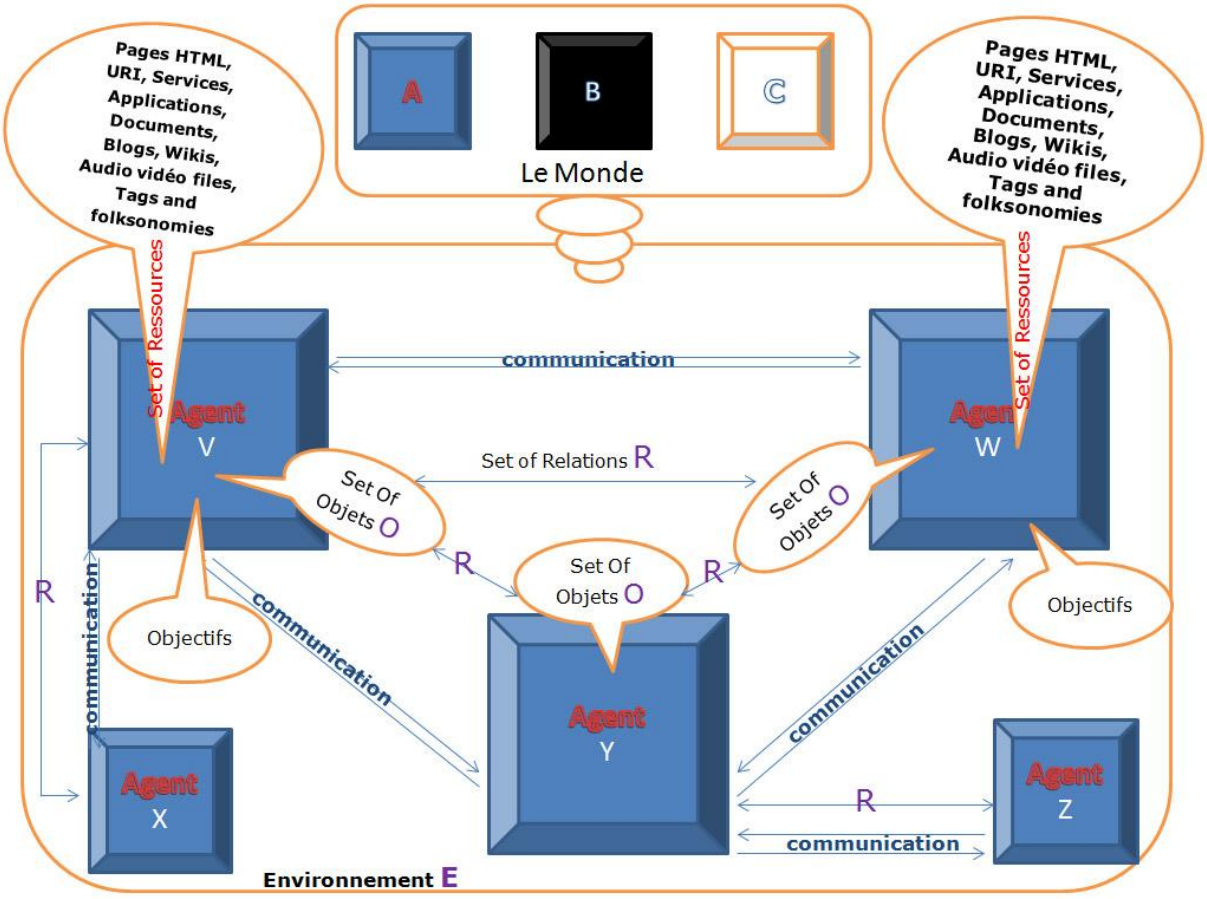
Lazy evaluation

Means that all the arguments of a function are evaluated when the function is applied I.e. an agent may delay the production of the next message until it interprets its interlocutor's reaction to its previous message. Delaying evaluation of function arguments until the last possible moment is called lazy evaluation. Lazy evaluation often support the implementation of streams

A qualitative description of agents

Today, the description of agent is carried out by various means such as Meta tags of HTML (W3C HTML Meta elements), the metadata, the service description (WSDL).

Note that there is no means to give a qualitative description of the agents. What is its level of reliability in terms of safety (Face book would be more orange than green light ...), robustness (can be considered an indication of failure rates), its level of utility, its nature (directory, Web services, messaging, human etc...).



The human agent Z (a user) communicates via a software agent Y (a browser) that is connected to a virtual agent (a service under Agora, a website, an application) and accesses to different objects (resources dedicated within the meaning Agora).

For Y and Z, we can consider a graduation that would give them confidence indices, interest, or other value to evaluate their qualities. It would be dynamically calculated based on attributes of the agent (FQDN, URL, HTTP headers content) referencing, the potential employee certificate (X509 EV, validity, authentication) and taking account of

relevant information to adjust value such as logs, statistics runtime and semantic relationships that concern (tags).

A colored navigation

These indices of trust are taken from the history and returned to the browser (e.g. to a plug-in) and can be used to adjust the color of the browser (address bar or border), for example «red indices of alert» to «green indices of trust». This colored navigation will improve the trust factor during navigation and it opens the possibility to evaluation software, as a kind of Page Rank for the trust and would rise to the discrimination but this would then tend to show that the lines on the social web are similar to those found in reality.
The central idea is to give agents a value that would evaluate their qualities. For the interaction between human agents, the interesting qualities are reliability, privacy (or familiarity), popularity, courtesy.
The difficulty in evaluating these indices of trust is related to the nature of quality that needs to be evaluated..
Assuming that Z is a community manager, for example an e-teacher who runs a community for his teaching (a VO according Agora), CEFRIO [26] gives the following indicators classified by families of uses:
Share and collaborate: number of friends, fans, followers, community managed, number and relevance of contributions, number and relevance feedback, level of feeling #, # commitment rate.
Find and collect: number and relevance of search results
Broadcast: number of releases, number and relevance of internal comments, number of proposed training, by number of member training, member satisfaction, and number and relevance feedback
Watch: The number and relevance of contributions, number and relevance of comments, number and relevance of ideas collected, level of feeling, commitment rate.
For objects of the Web, we can cite among other attributes describing size, type of encoding, network address.
It remains to imagine what entities are likely to evaluate this index and what rights.

Channel the confidence and support

we believe that the trust and support are bricks whose absence might frustrate the Semantic Web. We must channel these feelings on the web.

Emotional web

To give more meaning to the Web, we can consider convey the emotion expressed by the user via an association between the semantic relationships and browser. Today, a user on a social network clicks on "I Like" creates a semantic link (relation) between the data and the user. But the state of the resource remains the same. The table [URI, number of people who likes] remains the property of Face book. The link "I like" is registered on Face book account or the property of Face Book, while at the other side client nothing happened even though we are speaking about a semantic relations. For the semantics to be extended to the entire web would require servers that are URIs available agents is able to account for semantic links (tags). We call this vision "HTTP ILIKE". For an efficient semantic value, the servers should allow direct annotation resource. URI would then designate a given and all links that characterize it. It is the vision "HTTP annotate".

Conclusion

In terms of technology, the actual Web is made of limits, paradoxes and contradictions. Because the Web is transformational, the web change every second and the way we think behave and interact change as well it needs a dedicated science to be able to anticipate future evolution and developments of the web identify opportunities and protects it from threads and risks to continue its health and existents.

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Annexes

[annexe 1] Analyse des logs de Mailman http://informe.free.fr/confonsciweb/analyseLogsMailman.html
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