From ontologies to folksonomies. A design-driven approach from complex information to bottom-up knowledge

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Abstract

This paper explores the social challenge posed by the complex environments in relation to knowledge management in which contemporary society and all its activities are immersed. The main question addressed is how information design can contribute to the construction of hybrid, bottom-up and collective ontologies-in-progress and dialogue with the complexity of the practices around the construction of digital knowledge.

We argue that it is necessary for information design strategies to deepen its understanding of the semantic web and the new forms of creation of ontologies. This research seeks to broaden the analysis of the role of information design in this moment of change so that design can find a concrete space of agency in such a scenario.

Information design can develop an essential role in developing more suitable prostheses, more versatile instruments and simpler technologies. That is a great responsibility and a great opportunity. A new design approach is required to dialog with the strategies of a web-based culture, as an example of a complex phaenomenon (Lewin, 1992), among which we can find hybrid, bottom-up and collective ontologies, built *in itinere* with the contribution of users that trace definitions, associations and variations, in a kind of defective semantics, founded on co-tagging, mash-up and syndication.

Design has the possibility to establish a rhetorical of project in order to create a dialogue between the social and the technical tissues. This means not only to produce a toolkit to support new scenarios with sustainable models, but also to suggest a vision of a different cultural apparatus, to offer a new way to online interaction, and new points of access to the knowledge.

Keywords

Design and society; cross, trans, inter, multi-disciplinarity; bottom-up knowledge; creativity.

Introduction: approaching knowledge in web culture

According to Lewin (1992) the web culture can be understood as an example of a complex phenomenon. A system is complex when it displays features like non-linearity (there is no direct relationship between cause and effect), emergence and self-organization, among others. They are open, dynamic, non-mechanical systems that are continuously interweaving and interacting with their surroundings. Although they rarely display long-term periods of stability, they are resilient scale-free network systems. A group directed by Albert-Laszlo Barabasi mapped the connectedness of the Web and found out that the structure of the Web connectivity map conformed to what they called “scale-free network” instead of the more popular model of random connectivity. This approach presents also some features present in fractals and other fields.

> Systems as diverse as genetic networks or the World Wide Web are best described as networks with complex topology. A common property of many large networks is that the vertex connectivities follow a scale-free power-law distribution. This feature is found to be a consequence of the two generic mechanisms that networks expand continuously by the addition of new vertices, and new vertices attach preferentially to already well-connected sites. A model based on these two ingredients reproduces the observed stationary scale-free distributions, indicating that the development of large networks is governed by robust self-organizing phenomena that go beyond the particulars of the individual systems (Barabasi, A. and Reka, A., 1999).

The approach of Barabasi is especially noticeable in the way the propagation and constant growth of the World Wide Web have triggered the development of complex systems to control and manage information. The hierarchical features and ethno-classifications that dominated the first phases in the history of online knowledge are being increasingly substituted by non-linear popular taxonomies (folksonomy) that have been emerging without default relationships among elements nor precise points of departure.

By means of these complex taxonomies social actors self-organize themselves to produce definitions, associations and variations, developing a kind of defective semantics founded on practices such as co-tagging, mash-up and syndication. These practices enable social actors to develop different spontaneous and collaborative forms of “bottom-up” classification (Tapscot and Williams, 2007) according to their own conceptual model.

Among multiple perspectives of innovation and development that sprouted in the last years in relation to that flexible and effective codification of online information there are two perspectives that we would like to highlight. These perspectives (correlated but with independent variables) are the semantic web (Berners-Lee, 2002) and the creation of ontologies (Davies, J.; Fensel, D. and Frank van Harmelen, 2003).

Approaching these concepts, the aim of the paper is to explore the social challenge posed by the complex scenarios in relation to knowledge management in which contemporary society and all its activities are immersed. In this direction the research addresses the question of how information design can contribute to the construction of hybrid, bottom-up and collective ontologies-in-progress and dialogue with the complexity of the practices around the construction of digital knowledge.

Emerging strategies in emergent complexity

Complex systems demand a different attitude that is contrary to the reductionist way that we have been traditionally working within disciplinary borders, by breaking reality into separated parts.

Thus, the emerging strategies in digital reality and the exponential development of the web-based culture, call for a different design approach regarding the spaces of communication, relation and interaction. This implies to listen to different rules in order to create and share information and knowledge that is sensitive to the nature of the system that is complex.

Information design has always tried to deal with this complex field and, as such, should be one of the most flexible and transversal disciplines to respond both to the needs and features of the field,

that is to say, to the need of collaboration, creation and sharing of knowledge and the trends in the complex organization of information in the society of knowledge.

This research argues that it is necessary for information design to develop new kind of strategies to deepen its understanding and its approach to the semantic web and to new forms of ontologies definition. The arguments that support this assertion are various. On one hand, the semantic web offers an environment in which all traceable information (pages, files, images, links…) can be associated to specific metadata able to individualize the context and to construct a network of multi-pertinence for each piece of information. On the other hand, ontologies are the structures able to maintain all entities in perfect hierarchical relation (Nirenburg and Raskin, 2004). Both arguments directly relate to the core of design strategies. On the one hand, information design faces the same complex situations that are experienced by the rest of social sectors. Thus it is challenged to broaden its capacity of translating complex information structures and hierarchies into a bottom-up approach to knowledge. This challenge is mostly addressed specially to the areas of conceptual planning and technical implementation. In so doing, information design could transform actual hierarchical structures present in the very categories and relations used in traditional ontologies into flexible bottom-up forms of data classification able to contaminate the whole system, redistributing itself and remapping its own schemas and questions.

Such bottom-up approach supposes a change from a scenario dominated by ontologies into one in which non-linear folksonomies are central and social actors and society shape and classify knowledge.

Semantics and ontologies: a bottom-up design-driven approach

As a result of this research we seek to broaden the analysis of the role of information design in this moment of change so that design can find a concrete space of agency in such a scenario.

We see two basic roles emerging. The first is a role of mediator between the emerging scenario and society. It implies translating the social trend of bottom-up articulation of knowledge into information frameworks that facilitate it and enable social collaboration to increase strongly.

The way information design can do that is by establishing a project's rhetoric that fosters the dialogue between social and technical tissues. That means not only to be able to produce toolkits to support new scenarios with sustainable models, but also to reveal the possibility of a different cultural apparatus, to offer a new way to develop online interaction and to create new points of access to knowledge.

This research aims at showing that information design can be essential in this early phase of a process that sprouted from a communication necessity but turned into a central question in relation to knowledge. Information design can play an essential role in developing more suitable prostheses, more versatile instruments and simpler technologies to improve the possibilities to sustain and support social processes. This is possible to be done in relation to specific practices that consider people as active users or actors in knowledge processes. Processes such as these should be supported by tools, which are designed to enable people not only to define and share personal contents but also the grids that connect (meta-define) information itself.

A design-driven transit from complex information to bottom-up knowledge must consider the different features of the actual scenario that are: (1) people are feeling like being "immersed" in the information flow and not like being only "in front" of it, (2) societies take active part in the process of construction of knowledge and are not limited to the role of receptors of information; (3) all can be "tagged"; not only messages (contents) but also objects (media) and all elements involved in different processes of information construction can deliver contents.

Considering these points social actors/societies change from the passive role of data receivers into the role of active propellers, promoters of information in the net according to social relational ties.

Before exploring how this change could occur, and how the current paradigm enables this variation, it is pertinent to analyse the dynamics of the semantic web and ontologies that make it possible, then to consider the transition towards a bottom-up logic.

Together these two sources of knowledge management are currently the most advanced systems for analysis, creation and distribution of data, but their own structural ideas are based on a monolithic view of organizational hierarchy. This structure should be challenged to provoke a change based on the fact that there are increasingly more possibilities of social interconnection, high-speed feedback, feedback in relation to actions and choices of users and, specially, bottom up management of data classification performed by communities that select, classify and manipulate information.

Semantics is a discipline that, according to various criteria and different approaches, demarcates the parameters of a language, and the conceptual and paradigmatic behaviours of a system. It sketches the formal aspects, but also anticipates the inconsistencies, the displacement field and the extensions of a specific reference domain. In relation to complex scenarios, it reduces the factors to be analyzed by breaking them down and looks for links that constitute the fabric of formal learning. In relation to the world of the Web, and taking into consideration its dimension, it should be noted that the successful implementation of a semantic analysis (and often semiotics) derives, in part, from the fact that the latter practice is concentrated in specific environments[1].

Semantics allows for the understanding of systems and their translation into formal codes that abstracts the fundamental character of their relations, developments and the nature of their behaviour. Serving as a tool it helps spot the merits and logic of a method and also the possible epistemological and systemic misuses of application.

Let's consider the case of semantic web applied to systems like Amazon or e-commerce websites, where each question about a product returns as suggestions relating other similar products that may be of interest to the customer to purchase[2]. There are also cases of search engines that are based on the semantic filtering of information (i.e. Mooter, in Figure 1).

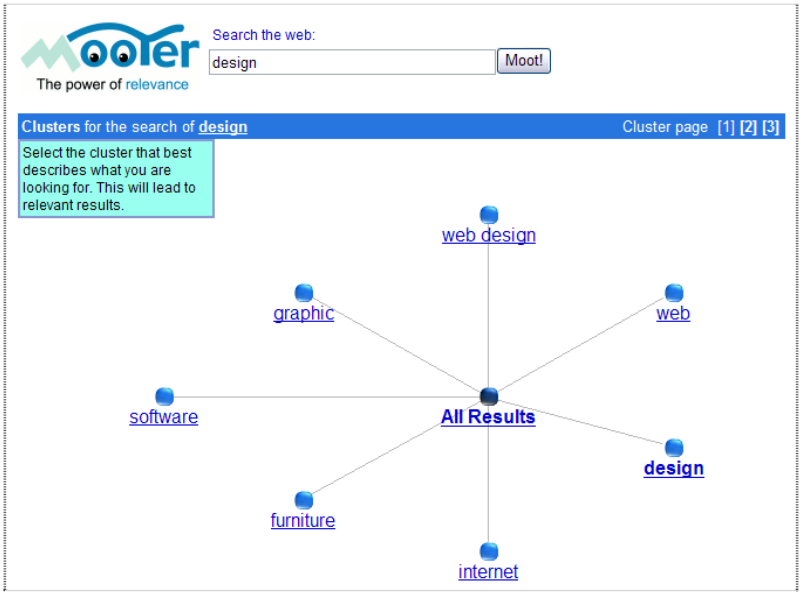

Figure 1. Homepage of Mooter Search Engine, a Website based on an engine for semantic search and content rating.

Thus, when semantics is given the task of outlining the complex linguistic expressions that define the typical or significant features specific to a particular area, it will also mark the content in relation

[1] Cfr. Davies, J., Fensel, D., Van Harmelen, F., *Towards the Semantic Web*, Chichester, John Wiley & Sons, 2003, *passim*.

[2] Do not consider here a similar comparison made by other users and compared with a hypothetical product, but how those products are labelled due to semantic similarities, and how they can be classified and made available to every database query by simply "playing" the characteristics of similarities, themes, quantities, etc.

to which these features are linked, so that they can be associated to “labels” (tags[3]), that are as close as possible to the reality they represent.

The semantic Web, based on the electrical classification of information, thus becomes an environment where information and traceability (pages, files, images, links, etc.) might be associated with metadata[4] that specify the context and build a network of objects that belong to distinct areas.

That process requires a structure able to store and maintain all entities, identified and appropriately “labelled”, in perfectly hierarchical relationships. This structure should also provide an exhaustive and rigorous conceptual framework with which to manage relationships, rules, dependencies, symmetries and the specific different domain for which the structure was established.

The configuration logic and substance of a specific domain is called ontology. Although it is a term borrowed from Philosophy[5], in relation to the Web its meaning is no longer focused on the essence and significance of things, but on a particular form of description and classification, which opens and lays out the patterns by means of which things can be incorporated and information reconfigured.

Both ontologies and Semantic Web constitute a unique framework, considered as a complex organism in which information, and the logic that governs information retrieval and archiving, are inseparably united and inter-connected. There are different types of ontologies, all oriented to cover specific needs including some which are constitutive (or higher), disconnected of any application domain, and extended to describe entities in general[6].

What emerges from the consideration of these constructs is the dimension within which they are created, the frame of reference for information management and the very nature of how ontologies have an “embedded” hierarchical scheme developed specifically for self-inclusion. An example of this is the *W3C Semantic Web Layer Cake*, which is not only one of the most popular patterns on the Semantic Web, but also one of the most criticized for having a highly complex and rigorous structure (Figure 2).

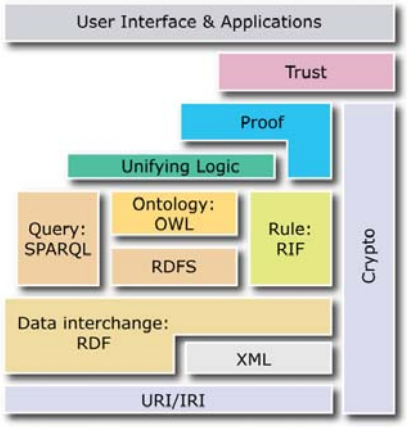

Figure 2. This figure represents the W3C Semantic Web Layer Cake, a very effective scheme based on a rigorous structure for ontologies.

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[3] A "tag" is literally a particular label that can be attributed to any item to qualify and create a description outlining the characteristics that distinguish it.

[4] Metadata is literally information about information (*meta*-data, as well as data) used to describe its characteristics. Labels (tags) allow you to identify, locate, filter and get more specific details about a particular item of any type (words, content clusters, files, documents, etc.).

[5] In Philosophy the term ontology (lit. "speech about being") is the study about being as such; for the Web, the term has a branch that involves the construction of an exhaustive and rigorous conceptual framework within a specific domain: a definition that describes with precision the "essence" of a system using the classification and measurement of its key constructs.

[6] Among the most common ontologies is sufficient to recall Cyc, a proprietary system developed as early as 1985 that consists of a constitutive ontology and several specialized domain ontologies; WordNet, a database designed as a semantic network based on the principles of psycholinguistics; SUMO (Suggested Upper Merged Ontology), a project of ontology deployment, which tends to reserve certain words and their meaning for all systems based on the same standard (P1600.1), in the same way that a general ontology (in the philosophical sense) defines "what exists", implying that a hierarchy can be accepted rather than a basic choice.

On the one hand, firstly, the construction of these hierarchical systems ensured the beginning of knowledge formalization in the Web. On the other, different forms of information management appeared: popular taxonomies (folksonomies[7]) allow the development of spontaneous and collaborative forms of "bottom-up" knowledge classification reflecting the conceptual model of users. This is a model free of predefined relationships between elements or specific pre-organized structures.

Redesigning the scenario: towards hybrid ontologies

Considering the idea of the Semantic Web as unattainable, some experts celebrated its death when bottom-up systems of social classification started growing. In fact, the detractors of Web 2.0 are used to consider exhausted the concept of the Semantic Web: the perspective previously outlined shows that the "semantic" approach might be somehow incompatible with the kind of content building process that was considered the original centre of the project.

However, the criticism in relation to the Web 2.0 is not the end of the semantic dimension of information in the network. If fact, it represents the beginning of a challenge related to the re-articulation of the bonds that had been attributed to a "pre-instructed" system of ontologies in order to construct flexible hierarchies, within the limits of specific domains of knowledge.

The change of perspective rests precisely on the imperfect nature of these bonds, which are based on a fluidity that hierarchical systems cannot sustain. This fluidity constantly shapes, defines and translates knowledge processes and practices that occur in social systems of information sharing and has the power to reconfigure the network itself.

Even previous to the assumption of a "collective intelligence"[8], this kind of tag-enabled knowledge management is based on subjective value criteria that reveal the connective[9] shape of people's thinking. That process builds an ontological open form in continuous alteration and semantically flawed.

Information connections, together with the kind of connections typical in social networks, offer a view of how knowledge systems are being organized in the Web: which tools, challenges, drivers and with which forms of technology we are dealing to achieve specific results in empirical applications.

Nova Spivack[10] showed how the current landscape in the Web is not characterized by the decline of the Semantic Web or of an information regimen proper of the system. Spivack says that the Semantic Web is a project to be followed inspired by the position of a society that is aligned with the Web 2.0 but freed from the Semantic Web. It implies a project that points towards a scene in which the systems of semantic search, semantic database, etc., form part of the social web. This is a moment in which we are redefining participation, information and classification tools, and passing from the monolithic and hierarchic system of Web 1.0 to include social networks, media sharing, mash-up, weblog, wiki and all that is redefining the role of the user in the very nucleus of information.

Another element that underlines the role of ontologies in the prospective of "folksonomies" is the actual information management system: designing a process to manage data growth with bottom-up classification methods that reconfigure data without any hierarchies of flow is a natural point of disarticulation between "quantity" and "quality" of information that individuals and groups have to

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[7] The term folksonomy is derived from the words folk (people) and taxonomy and indicates both a collaborative, popular (bottom-up) mode to classify information using keywords (tags), that emerges from the movement of groups that cooperate spontaneously to organize distributed information in the web. It is also a form of ethno-classification or demo-classification (classification people-driven).

[8] Levy, P. 1994, *L'intelligence collective. Pour une antropologie du cyberspace*, Paris: La Découverte.pp. 205-221.

[9] De Kerckhove, D. 1997, *Connected intelligence*, Toronto: Somerville House Publishing, pp. 73-90.

[10] Nova Spivack is is considered one of the leading voices on the next-generation of search, social media, and the Web. Spivack has founded numerous ventures including Twine.com, EarthWeb (now called Dice.com), and Live Matrix (in stealth). He worked with technology ventures like Kurzweil, Individual Inc., and Thinking Machines in the late 1980's and early 1990's. He speaks widely on the future and has co-authored several books on Internet strategy, collective intelligence, and technology.

manage. This means that with the advent of a truly semantic, ontology-based and bottom-up web, able to process information using a folksonomy-driven approach for classification, we will no longer need to use large amounts of data to obtain better information. Rather we will exploit the most suitable data (qualitatively more weighed, marked and labelled) to obtain a result more aligned to what we want.

Let's consider one of the largest existing search engines, Google. No doubt that if you submit a non-precise search without clear filters, it is difficult to get results without being overwhelmed by dozens of pages, among which it is impossible to navigate clearly for lack of a "policy" guide. They are generated and arranged in precise sequences supported by a structure of referrals. Following a realistic process of development, in this situation it is very difficult to bring what we want to focus.

In the near future, the construction of knowledge in the network -either from the viewpoint of conceptual design or the point of view of technical implementation- should take into consideration the arrangements, structures and social dynamics present in the Web. Having more strategies and recombinant grids to share knowledge empower the way people can contribute and beneficiate of knowledge itself.

This implies to align the current hierarchical structure and the bottom-up processes of data classification, making possible the same categories and relations that are present in traditional ontological systems. This means coming to postulate and implement "hybrid" ontologies based on arbitrary starting structures, according to the domain in which they serve, and incorporating users.

The process of collaborative tagging as a turning point: towards hybrid ontologies

The construction of software systems has always required the adoption of specific programming languages consisting in re-defined or pre-arranged codes. The Web galaxy is no exception to that when considered as a complex environment based on different kinds of software that operates by means of its own codes. However, unlike a programming language, in order to participate in the construction of information in the actual Web galaxy it is not essential neither to build specific processes and to manage and elaborate different languages, nor to have particular technical skills and competencies. There are open-platforms, social software, aggregators, user-generated systems, etc., which allow communities to self-organize in relation to information simply by (re)arranging the structure of pages to be displayed on screens and the relationship between (self-generated) contents.

The uniqueness of this organization, introduced firstly related to a basic language like HTML and then, in the late nineties, radically changed by the social approach to the Web, is to use "labels", known as tags. Tags describe each component on a page, giving it a formal role, functionality or value. From these initial steps related to the dawn of the World Wide Web, many steps forward emerged. In addition to evolution of codes there has been a gradual evolution of classification systems and labelling means, until a change of perspective was brought by the introduction of a new coding language like XML.

The concept of tags, a simple but effective system, not only allowed a profound evolution in programme languages for the Web, but are also emerging as social tools for defining bottom-up information.

In fact, due to its potential, tagging is challenging the traditional channels and methods of construction of knowledge in the network, by making "liquid architectures" of which has always been based on the hierarchy and the predetermination of their own apparatus of incorporation. In fact, these hierarchies are weaker because, by the tagging of one or more elements, people can potentially classify any content. It is possible to create layers between elements and then, meta-layers, and meta-meta-layers, and so on, until the tagging completely re-ontologize the system.

This process suggests another special feature of the labels, namely their strong ability to adapt to contexts of application. In fact, in the Web, with the evolution of the connective participation of users, a tag has a significance that goes beyond simple keywords and page-code structures: labels are directly exploited by users to sort and classify their contents and those of others, without fol-

lowing any hierarchical or scientific rule, but simply by referring to their needs and to an idiographic modus operandi.

Folksonomy, as a method of classifying, refers to communities but is completely personal and customizable. It expresses a form of digital identity of individuals, who, as members of a group (broad or narrow), contribute to shape it according to self-organizing rules, which emerge spontaneously during the connective process of the tagging itself.

Regarding that, David Weinberger[11] offers s a very eloquent example. Weinenberg underlines that if we are in a supermarket, the possible relations between a product and another may be multiple and different for everyone but, because of the fundamental bond of physicality, the products may be placed on one, or a maximum two similar shelves. On the Web, using a tag, and thanks to digital contents, each object can relate to a multitude of others, according to an order that is customizable and scalable.

This characteristic clearly shows how each individual is free to manage and organize information, creating relationships between them and the external sphere of possible links of information. It is interesting to note that categories and hierarchies loose strength and consensus in a social apparatus that tends to overcome them. This self-organizing bottom-up approach to knowledge destabilises the grids of information architectures and substitutes them with liquid forms of relation and different layers of meta-information which are able to create their own order through disorder and emergency.

In fact, different people classify resources in different ways and make different use of them. In addition, similar concepts can be represented with different labels, in many languages and with different kinds of approach.

This property clearly shows that there are languages that can evolve and be structured by the simple phenomenon of tagging, allowing each individual to spontaneously define anything by means of his/her (but shared) language model. The moment this happens all denoted meaning may collapse or evolve, changing the dimension of meaning and significant according to a dynamic logic based on bottom-up understanding, tolerance and trends. In fact, it is enough if a group considers that a new label, or a particular tag is reliable for a specific term to be adopted as common language in the Web.

These considerations suggest that bottom-up classifications are usually successful only when a large number of users tag the same information. The “mass” (*folk*) decides about the most representative and credible keyword and about content in a spontaneous democratic and transparent way, according to a natural and direct principle of self-elimination or collective dismissal.

Thanks to these assumptions, folksonomies are transformed into a fast, distributed and scalable form of information classification, in which the process of indexing not only enables users to produce new forms of aggregation but also questions the validity of any hierarchical ontology. This approach also introduces a change in the method of finding information, -deconstructed and reassembled into descriptive metadata- that goes beyond the original value of a unique and arbitrary classification model. This is changing not only in terms of meaning and significant, but also in relation to the mechanisms of access: social tagging exploits a mechanism of “browsing” that is based on the identification of content through keywords, rather than by index scan, which is established in the “finding” procedure, common to many systems for mapping, tracking and retrieving data network.

The same is valid in relation to information and interaction processes that enable discovery, and possible further classification of information. These processes bring a change in the game of communication which not only alters the message contents but also the paradigm relating to management and meaning, impacting all actors involved.

This change has introduced new forms of visualization and interface, promoting the development of innovative graphical models such as tag-cloud, a visual presentation of labels, which uses a recursion of terms that is measured by the size of a tag-source for determining the level of importance.

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[11] Weinberger, D. 2007, *Everything is miscellaneous*, New York: Time Books, *passim*.

Another effect of this change has been the phenomenon of serendipity, or the ability to discover something unexpected in the process of looking for something else. This peculiarity shows that tagging is becoming an increasingly essential component of the Web. In fact, the dissemination of folksonomies in various social networks inevitably leads to a different variation of tags in relation to proxemics[12], or distance of interaction.

This means, for example, that the search for a video in a system like Youtube, when we use one or more keywords, may often not give the desired result but is more likely to simultaneously provide a certain number of clips. This process suggests that the very tags trigger greater cross-fertilization and completeness levels in data search, through the variables of relevance, redundancy and recurrence.

In this scenario, contents are enjoyed in a scalable multiple level manner, thanks to the dynamism of bottom-up processes, which are curiously aligned to complex adaptive systems. That means that the structure and connections in the Web display a behaviour that is similar to complex systems. The analysis of folksonomies-in-process can determine and describe this behaviour and processes of change.

Tagging, as noted, has successfully been adapted to the realm of the network and the digital world, and it is important to stress the weight it occupies in everyday life. This process, firstly related to the Web, is now being extended to any process of reality: RFID systems label everyday world, making it possible to identify, through radio frequencies, the objects equipped with RFID-tags. In this way, objects can be recognized and tracked according to position changes. Right now, although RFID-tags are not widely employed they have a great potentiality to be used in marketing and integration. In fact, they represent both the best channel for user profiles and the most effective one for communication between objects (or systems software).

Therefore, it is inevitable to note that labels, whatever the form, are playing a major, if not a decisive role, in the development and creation of new software, hardware, and in new processes in information and knowledge construction.

Conclusion. Design open rules for information: tag mash-up for an “imperfect semantic”

The multiple challenges posed by the successes and failures of the Semantic Web trigger a need to take a new step towards a different approach in relation to online information and its “liquid” shape: it is necessary to facilitate and, in some cases, to provoke a paradigm shift in relation to the hierarchical structure of the system, leading users to a new dimension in the social construction of knowledge.

Based on an user-centered definition of innovation, it is clear that the Semantic Web project -as it is outlined in the manifesto of its inventor Tim Berners-Lee-, brought a gradual change in the concept of knowledge management, especially when it comes to make available and distributed online information.

The development of this new social form of use of the Web seems to result from the permeation of the network’s capillary level, fostered by the distribution of open-source code, the employment of systems that allow for the sharing of any type of resource and a social attitude to create and manage relations by means of online tools. These factors led users to be able to regain possession of a heritage that is theirs by right.

This was not the case in relation to the question of content, but rather in relation to what kind of media and platforms are made available in the phenomenon of social software: everything starts from a need to communicate, not from the subject of knowledge, and then people exploit the most suitable prosthesis, the most versatile tools and the most available technologies to define which tools can be used in the process of knowledge sharing.

The consequences, or the beginnings, of this phenomenon constitute the currently scenery:

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[12] The term proxemics was created by Edward T. Hall to describe a set of measurable distances between people as they interact (Hall, E.T., *The hidden dimension*, Garden City, N.Y., Doubleday, 1966).

- People are feeling “immersed” in the information flow and not just “in front” of it;
- Users became active parts in the process of knowledge construction, apart from being receptors and distributers (users became actors);
- Not only contents but also all entities and things are involved in the information process (i.e. objects, environments, etc.);
- Unique conceptual hierarchies and classifications can no longer be enough to describe a reality that is constantly changing.

By analysing the implications of that scale phenomena we see that users became not only a patron but also an active propeller in the information network, updating the first forms of co-authoring in the age of hypertext.

This oversized semantic shapes a new way of knowledge building that can no longer rest only on language dimension, semiosis, structural constraints or revived special structural data ties, but should also take into consideration the trends and drivers that have led to specific results, or to evaluate certain goals.

In this moment of indefinite proliferation of groups, which aggregate and separate according to complex and non measurable phases, links built between statements, terms, concepts and data clusters are born and die when the collective attention is focused on them and reconfigure their scope, contents and their very labels. Unstable information links result from these “bottom-up labels” that reflect how online communities accept and determine values. This produces proliferation of metadata and the redefinition of contents according to their cognitive matrix.

The result of all these processes is a form of semantics declined according to the impulses, attractions and polarities that happen between users that reconfigure the very network, since no hierarchical structure can control a process that falls within its same patterns of demarcation and classification.

An imperfect unstructured semantic emerges. It is a kind of semantic that is longer based on models of heuristics and linguistic processes, but on a mash-up of tags and syndication, that characterizes the dynamics of a projective and unpredictable mass collective action based on communities of users on the network.

It is necessary for information design to understand both, the processes present in the semantic web -as an environment in which all traceable information (pages, files, images, links…) can be associated to specific metadata able to individualize context and to construct a network of multipertinence for each piece of information- and the new forms of creation of ontologies, understood as structures able to maintain all entities in hierarchical relation (Nirenburg and Raskin, 2004).

Both dimensions directly relate to the core of design strategies. On the one hand, because information design faces the same complex situations that are experienced by the rest of social sectors and thus is challenged to broaden its capacity of translating complex information structures and hierarchies into a bottom-up approach to knowledge. This challenge is mostly addressed specially to the areas of conceptual planning and technical implementation. In so doing information design could transform actual hierarchical structures, present in the very categories and relations used in traditional ontologies, into flexible bottom-up forms of data classification able to contaminate the whole system, redistributing itself and remapping its own schemas and questions.

In synthesis, such bottom-up approach supposes a change from a paradigm dominated by ontologies into one in which non-lineal folksonomies are central and social actors and society shape and classify knowledge. In this scenario information design can find a concrete space of agency, in special, assuming the role of mediator between that emerging social media and society. This implies translating the social trends into information frameworks to improve social collaboration.

That can be achieved by (1) establishing a project’s rhetoric that fosters the dialogue between social and technical tissues. This requires to develop research that is focused on the articulation of social-technological dimensions; (2) developing more suitable prostheses, more versatile instruments and simpler technologies; (3) being aware of the responsibility that is in the hand of information design to define and discriminate what can start any grid of the shareable knowledge; (4) learning to listen and to be supportive of social processes.

That is a moment of great responsibility and extraordinary opportunity to perform the transit between different conceptions of social information and knowledge. Information design should con-

sider at least these three different dimensions of the actual scenario: (1) how people feel in relation to knowledge (immersed)"; (2) how knowledge is constructed (bottom-up), and (3) what can be included in the process of electronic knowledge (contents, objects, environments, products, etc.).

This challenge can help society to find new ways to create information online: it can redefine systems in order to serve society to create social deals and offer a totally bottom-up knowledge toolkit to empower people.

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