

# The sense of the interface: Applying semiotics to HCI research

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## *Abstract*

*The objective of this article is to reflect on the application of Semiotics to Human-Computer Interaction (HCI) and interface analysis. To accomplish the objective the article presents an example of semiotic analysis of a blog interface but the methodology proposed, conveniently adapted, may be applied to any kind of digital interactive environment. The analysis reconstructs the interface sense production device (including the surface of the page and the link architecture), identifies implied users and exchange scenes of the blog and concludes with some reflections on interface evolution and hybridation. Finally, the article proposes future trends for a Semiotics of HCI.*

*Keywords: semiotics; interfaces; usability; digital Taylorism; interpretation; narrative; link architecture.*

## **1. Introduction: A short history of usability and HCI research**

Scientific interest in the interaction between human beings and computers is rooted in the more general area of human-machine systems, human factor engineering and ergonomics. One of the most important references in *proto-usability research*, Frederick W. Taylor's scientific management studies at the beginning of twentieth century, innovated industrial engineering, specially in time and motion studies (i.e., employing cameras and chronometers to record and measure workers movements). For Taylor

the enormous saving of time and therefore increase in the output which it is possible to effect through eliminating unnecessary motions, and substituting fast for slow and inefficient motions . . . can be fully realized only after one has personally

seen the improvement which results from a thorough motion and time study, made by a competent man. (Taylor 1964: 24)

The early studies of time and motion made by Frank and Lillian Gilbreth (1919), the emergence of radar and aircraft cockpit technology during World War II and theoretical reflections such as Licklider's concept of "symbiosis" (Licklider 2001), may help us keep track of this traditional approach. During the 1960s and 1970s, human factor researchers focused on mapping out information-processing and decision-making skills of standard users. The increased use of personal computers with graphic interfaces in the 1980s created the necessity to improve our knowledge in Human-Computer Interaction (HCI), together with the need for better design methodologies. Nowadays, computers are present in everyday activities and HCI issues are critical for software companies and user performance (Badre 2002). In 1982, the Association for Computing Machinery (ACM) Special Interest Group in Computer Human Interaction organized the first Conference on Human Factors in Computing Systems, which has become the annual CHI Conference. As the graphic user interface evolved, the discipline of HCI advanced and new key concepts, such as "direct manipulation" (Shneiderman 1987) or "user-centered design" (Norman 1988) were developed.

In parallel with this evolution of the HCI field, the industry focused on designing user-compatible interfaces and making software systems increasingly more usable. In the late 1980s usability engineering methods were developed to design and test software systems for ease of use, ease of learning, memorability, lack of errors, and satisfaction (Nielsen 1994; Rubin 1994). In this context ISO 9241 defined usability as "the effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments." Usability, thus, includes the following properties:

- Effectiveness: the accuracy and completeness with which specified users can achieve specified goals in particular environments.
- Efficiency: expanded resources in relation to the accuracy and completeness of goals achieved.
- Satisfaction: the comfort and acceptance of the work system by its users and other people affected by its use.

In the 1990s, the World Wide Web increased the number of non-experts using (or even designing) digital interfaces. However, the first generation of web developers was not aware of any usability issues that, on the other hand, had become a core issue among the software development culture. A new research field and professional market was born: web usability (Nielsen 1999).

## **2. Limitations in traditional web usability evaluation**

It is not a simple task to synthesize in a few words more than twenty-five years of usability research in the context of HCI studies. Most usability research has been conducted by applying quantitative methodologies and using the psychology of perception and cognitive science as the theoretical foundation.

Two of the strengths of quantitative research are reliability and replication. A correct controlled quantitative study may determine with a measurable degree of certainty, what share of a particular web site's visitors used the search engine or highlight their browsing techniques for searching data. A focus group or other qualitative technique would not provide this type of information. If identical studies are conducted in tandem within the same population, the results would be nearly identical. Consequently, changes in a population could be tracked over time by executing the same study at regular intervals. Last but not least, quantitative usability research has also contributed to interface evolution and excellence: the user-centered methodologies and the usability testing of products have undoubtedly increased the quality of digital interactions.<sup>1</sup>

But quantitative research also has some limits. The standardization of techniques in quantitative studies limits testing to certain predetermined hypotheses. Consequently, some potentially interesting spontaneous or tangential responses may be left out. Many elements could affect the results of a quantitative study: misleading questions, incorrect data collection methods, small sample sizes may increase error margins, and so on.

Reputed experts in usability like Jakob Nielsen have admonished the limitations of quantitative methodologies:

When I read reports from other people's research, I usually find that their qualitative study results are more credible and trustworthy than their quantitative results. It's a dangerous mistake to believe that statistical research is somehow more scientific or credible than insight-based observational research. In fact, most statistical research is less credible than qualitative studies. Design research is not like medical science: ethnography is its closest analogy in traditional fields of science . . . Fixating on numbers rather than qualitative insights has driven many usability studies astray." For Nielsen "qualitative studies are less brittle and thus less likely to break under the strain of a few methodological weaknesses. Even if your study isn't perfect in every last detail, you'll still get mostly good results from a qualitative method that relies on understanding users and their observed behavior. (Nielsen 2004)

Quantitative methodologies are very important for usability research, but they're not enough. In the last decade different researchers from Cultural

Studies, Semiotics or Ethnography have claimed that is necessary to enlarge the theoretical basis of HCI studies. Today, HCI is a multidisciplinary field in which different approaches can (and should) be applied. Even pioneers like Don Norman have redirected their research towards new frontiers. How can we study “emotional design” (Norman 2004) issues applying quantitative methodologies? How can we measure “emotion”? How can we quantify dimensions of “having fun” in interaction? How can we explore “funology” (Blythe et al. 2003) issues if we only apply traditional quantitative approaches?

### 2.1. *Digital Taylorism*

Traditional quantitative usability research, when limited to the mentioned scopes, may be redefined as a *Digital Taylorism*: where for instance, chronometers, eye-tracking software, and video cameras are usability researchers’ best friends. Like Taylor’s research, it seems that most of traditional usability research has only been interested in time and motion (interaction) studies. To decrease the number of clicks, to reduce the downloading waiting time, to increase efficiency and effectiveness or to facilitate access to data are key objectives for HCI. But research should not be reduced to only these factors: to understand interaction processes we must apply different theories and enlarge our methodological instruments.

The objective of this first section is not to caricaturize or denigrate traditional HCI studies but to advocate real multidisciplinary research. Quantitative research can tell us a lot about interfaces and interaction processes, specially about the *effectiveness* and *efficiency* with which specified users achieve specified goals in particular environments. But what about the third property of usability, *user satisfaction*? Maybe we could measure satisfaction by means of a user questionnaire but we’ll never understand how and why a satisfaction (or rejection) effect creates. If we only apply quantitative methodologies — measuring for example the number of clicks or users mistakes — many dimensions of interaction processes that contribute to creating a full cognitive and passional experience will remain hidden.

## 3. The contribution of semiotics to HCI

Qualitative research should not be limited to “understanding users” and “observing their behavior.” Qualitative research, for example, should also focus on interface sense production system and interpretation processes. This stance could be defined a semiotic approach to HCI. Semi-

otics is not just the *science of signs* but a theory of *sense production and interpretation*. It operates with theoretical models of sense production and interpretation strategies. In other words, semiotics studies objects (texts, discourses) to arrive at processes (sense production and interpretation). If we consider HCI as a semiotic process, research should focus on the interface — considered as a sense production device — and should analyze the ambiguous game between signification and interpretation played by designers and users. For semioticians this process is not a linear transmission of information (interface → user) but a cooperative one (designers ↔ interface ↔ user): both designers and users, mediated by the interface, participate in this contractual game of sense production. From this perspective, semiotics proposes qualitative research that complements traditional quantitative research (Scolari 2007).

Semioticians have enriched HCI research in many different ways; for example, by proposing a framework for understanding and designing computing systems as sign systems. From this perspective programming is considered as a process of sign-creation and the user's working situation can be seen in an interpretation context (Andersen 1992, 2001). Semiotic research has also been helpful for understanding children's signification processes better in order to design elements on the web (Baranauskas and Melo 2003), and has improved assessments of expressive power in geographic information systems (Baranauskas et al. 2000). It has also contributed to the design of computing systems by placing them in a much broader theoretical and philosophical context (Andersen 1990). Semiotics has provided a characterization of end user programming as an essentially linguistic design activity (de Souza 1993, 2005a, 2005b; de Souza, Barbosa, and Silva 2001; de Souza, Barbosa, and Prates 2001). This last approach, known as *Semiotic Engineering* and well known in the HCI community, considers interactive systems as devices that propose an exchange between designers and users.

We'd like to indicate some limits of this approach before continuing. Even though semiotic engineering was developed in the 1990s, it is still anchored in Eco's theory of codes and sign production as introduced in the *Trattato di semiotica generale* (1975). From this perspective Semiotic Engineering is still fixed in a linear conception of human-computer exchanges:

HCI is a specific type of twofold computer-mediated metacommunication in which computer system designers send system users a one-shot message: The message tells the users how to communicate with it in order to accomplish a certain range of effects. It is a one-shot message because, from a design point of view, it conveys a complete and immutable content encoded in and made available by the system's interface. (de Souza 2005a: 84)

It would be enough to move the bibliography four years into the future to gain another perspective of HCI. Since *Lector in fabula* (1979), Eco has developed an interpretation theory based on a set of epistemological movements: from *code* to *encyclopedia*, from *sign* to *text*, and from *decoding* to *interpretation*. These movements are not just semantic interchanges: going from codes to encyclopedias means going from a “flat” notion of sign — understood as a simple substitution of terms, like in a dictionary — to a new idea of sign based on the inferences and dialectics of semiosis. The distance from *code* to *encyclopedia* breaks the message-sending lineal tradition that can be found in traditional linguistic, information or broadcasting theories.

Thanks to Eco’s contributions, Semiotics abandoned concepts like *message*, *effects*, and *encoding* more than twenty-five years ago. In other words: Semiotic Engineering speaks an old semiotic language that does not include, for example, *user cooperation* (Eco’s main concept when he analyzes interpretation processes) in constructing the meaning of the interface or the *conflict* between designers’ and users’ strategies. Even though it takes Peirce’s theories into account — for example the concept of *unlimited semiotics* — Semiotic Engineering does not fully develop the consequences of Eco’s paradigm mutation. For instance a semiotic of HCI should include concepts like the *implicit user* (or *model user*, a category based on Eco’s *model reader*) or *interface-user cooperation* (based on Eco’s *text-reader cooperation*) in its theoretical dictionary (Eco 1979; Scolari 2001, 2004; Diamanti 2003; Galofaro 2003; Cosenza 2004).

To conclude this section we introduce a reflection on the relationship between Semiotics and the HCI community. For software engineers trained in quantitative methodologies and the usability research tradition, the semiotic approach may sound strange or unnecessary. Unfortunately, most semiotic theoretical production is embedded in specific scientific jargon. Nevertheless, most video game developers and interface designers have already been applying semiotic principles over the last thirty years without being aware of it ... When developers and designers create a virtual environment or a software interface, and generate within it certain functions or characters with particular properties, they are introducing the users to an interactive experience based on semiotic principles. Semiosis is everywhere and humans apply semiotic skills all the time.

If semioticians like Umberto Eco have incorporated the contributions of cognitive science and the psychology of perception into their theories, the same could be asked of these fields. HCI research could broaden its limits by incorporating a semiotic point of view in its scientific reflection.

### 3.1. *Improving traditional HCI research*

How can semiotics continue to improve HCI and usability research? For example analyzing interfaces as if they were sense production devices. When we read a newspaper, we construct the meaning not only interpreting the written text or the photographs: the position of news on the page (and inside the newspaper), the dimensions of fonts or the existence of borders (boxes) around the text also contribute to the interpretation of the information. For example, news in the upper area of the page is more important than the news in the lower area of the page; news with photographs is more important than news without photographs; and news on the first page is more important than news in the last pages of the newspaper. The newspaper interface is a meaning production device.

These differences and oppositions (such as upper/lower = more important/less important) are the basic elements of the complex grammar of printed newspaper interfaces. The same may be said about digital interfaces: in interactive environments sense is also basically constructed by means of oppositions and differences. Like newspapers, cinema or television, multimedia interactive environments integrate different semiotic systems. If audiovisual language includes sound, moving images and sometimes written text, an analysis of a web interface should at least include the study of:

- The interface “surface” (colors, forms, composition, dimensions, etc.) and contents (written text, audio, video, etc.);
- The hypertextual architecture of the web site (content organization, links, etc.);
- The “interaction grammar” (Scolari 2004) proposed by the interface;
- The narrative dimension of interaction;
- The sense production/interpretative processes that involve users and designers.

In any case, the first step of a semiotic analysis is to study the text: as we have already seen, semiotic research moves from objects (interfaces, contents, architectures) to processes (interaction, sense production, and interpretation).

Semiotics also has powerful tools for creating classifications founded on a formal basis (that is, established in oppositions and differences). Why not apply this capability to interfaces or user’s interactive experience classifications? Classifying of elements and processes is the second step — after defining the basic concepts — when constructing any theory. Recent experiences in classifying video games (Maietti 2004), info-visualization devices (Scolari and March 2004) or users’ experiences in video games

(Eugeni and Bittanti 2004) or in web navigation (Santaella 2004) are good examples of possible future developments in this field.

Let's take a brief look at semiotic processes before continuing. From a semiotic perspective interpretation processes are *inscribed within the text* (in our case, within the interface). Any text includes a communication program, a *reading proposal* or *contract* that the reader must accept and activate during the interpretation process (Eco 1984; Bettetini 1984; Verón 1985; Casetti 2002). By the same logic, interfaces include an *interaction proposal* that the user must accept in order to perform actions in an interactive environment (Scolari 2001, 2004).

#### 4. Applying semiotics to HCI

After this brief theoretical introduction we can proceed to analyze a web interface. The methodology that will be applied in this analysis integrates the classical visual semiotic approach (i.e., Greimas 1989; Joly 1993, 1994; Eugeni 1999; Schapiro 2002), a recently developed semiotics of objects (i.e., Deni 2002; Landowski and Marrone 2002; Semprini 1999) and the already mentioned semiotics of HCI (see Section 2). In this case, and just to show the possibilities and limitations of the semiotic approach, a blog interface will be analyzed.

Interpreting graphic interfaces is neither an immediate nor indistinct process. It is a dynamic process in which three components operate:

- The perceptive material on the interface surface;
- The designer's and user's knowledge frame and previously acquired capabilities;
- The user's perceptive and interpretative operations.

The three elements interrelate during the interpretation process: the designer inscribes in the interface a series of instructions and information for the user (cognitive scientists defined these instructions as “affordances”; Gibson 1979). To interpret the interface the user applies frames based on these instructions, and these new cognitive experiences are integrated into the already existing frames, therefore determining future interpretations (Scolari 2001, 2004). In other words, the interpretation process is cyclic, constructive and develops according to a series of steps (Eugeni 1999). We can distinguish four steps in interpretative activity:

- Recognition of a surface composed of lines, shapes, colors, textures, positions, etc.
- Recognition of a scene made up of different elements.



Table 1. *Analysis levels*

Level	Analysis
Plastic	Analysis of a surface composed of lines, shapes, colors, textures, positions, etc.
Figurative	Analysis of a scene made up of different components.
Communicative	Analysis of the receiver's position in relation to the interface.
Meta-communicative	Analysis of the receiver's position in relation to the entire situation.

- Recognition of the receiver's position in relation to the interface.
- Recognition of the receiver's position in relation to the entire situation.

This process therefore determines four research levels (see Table 1):

- Plastic level: research into the interface surface
- Figurative level: research into the representative scene made up of objects, areas and mutations
- Communicative level: research into the spatial location and narrative in relation to the scene
- Meta-communicative level: research into the receiver's position as a spectator of the scene

At the plastic level researchers analyze the basic elements of the interface (shapes, colors, positions of elements, spatial oppositions, contrasts, etc.) and identify basic sense production structures. The figurative level analyzes the represented elements (icons, photographs, video, etc.) and any kind of mutations (animations, states, paths, actions, etc.) on the screen.

But interfaces do not only present a content and a set of instructions for interaction: they also offer information about users possible movements and represent the relationships of the communicational exchange. At the communicative level the researcher analyzes these virtual strategies within the text/interface (*enunciator* or *implied designer* versus *enunciatee* or *implied user*) (Eco 1979; Greimas and Courtés 1983; Scolari 2001, 2004; Diamanti 2003; Galofaro 2003; Cosenza 2004). Finally, the meta-communicative level refers to special interpretative situations — such as cinema within cinema — in which the researcher analyzes the relationship of users with the entire communication situation. We can identify this level in paintings that include mirrors and complex visual games, such as Diego Velázquez's *Las Meninas* (1656) or the *Portrait of Giovanni Arnolfini and his wife* painted by Jan van Eyck (1434). The meta-communicative level may also be present in certain computer-mediated communication situations that reproduce the user's or the interlocutor's face on the screen.

In this article, we focus mainly on the first and third levels. Figurative (second) level analysis depends on blog contents (photographs, video, audio, etc.). The meta-communicative (fourth) level is only present in particular interfaces, for example a bidirectional videoconference system. In the following sections we'll analyze the plastic level of the interface, the hypertextual architecture and the communicative level of a blog created with Blogger, one of the most popular blog creation systems (Figure 1).<sup>2</sup>

#### 4.1. *Plastic level*

We can identify three areas in the interface, each of them which corresponds to an exchange scene.<sup>3</sup> An area at the top of the page introduces the blog (head), another area is mostly dedicated to posts and commentaries (content) and the third area may include the author's profile, links, search device and additional information such as the latest posts, categories, archive, blogroll,<sup>4</sup> etc. (extra content). The browser's interface and the possibility of visualizing the operative system interface behind the browser are not included in this analysis. The distribution of elements on the page is based on an orthogonal structure and derives from a web page standard format recuperated from traditional graphic and print design. This basic structure can be found in many blogs and is a distinctive trait of this genre of web site (Figure 2).

Each area, as we have already indicated, corresponds to an exchange scene:

- Head: the top part of the page presents the blog in large characters (title) and sometimes includes an image or logotype. In this blog, this area is separated by a double line from the rest of the interface. We can define this space as an *author-users exchange scene*. In some cases the title includes a brief phrase that represents the “philosophy” of the blog. In Blogger, interfaces with the system automatically generates a blue bar that includes a search engine, a link to Blogger home page, a link to a random selected blog, etc., above the head area. This standard area, dedicated to the *institution-user exchange*, is practically integrated into the browser interface and creates a transition effect between the browser and the blog interface.
- Content: the central body of the blog, mostly composed of posts and comments, also includes an *author-users exchange scene*. This area — constituted by headlines, brief texts, audio files, photographs or videos — recuperates many compositional principles of traditional

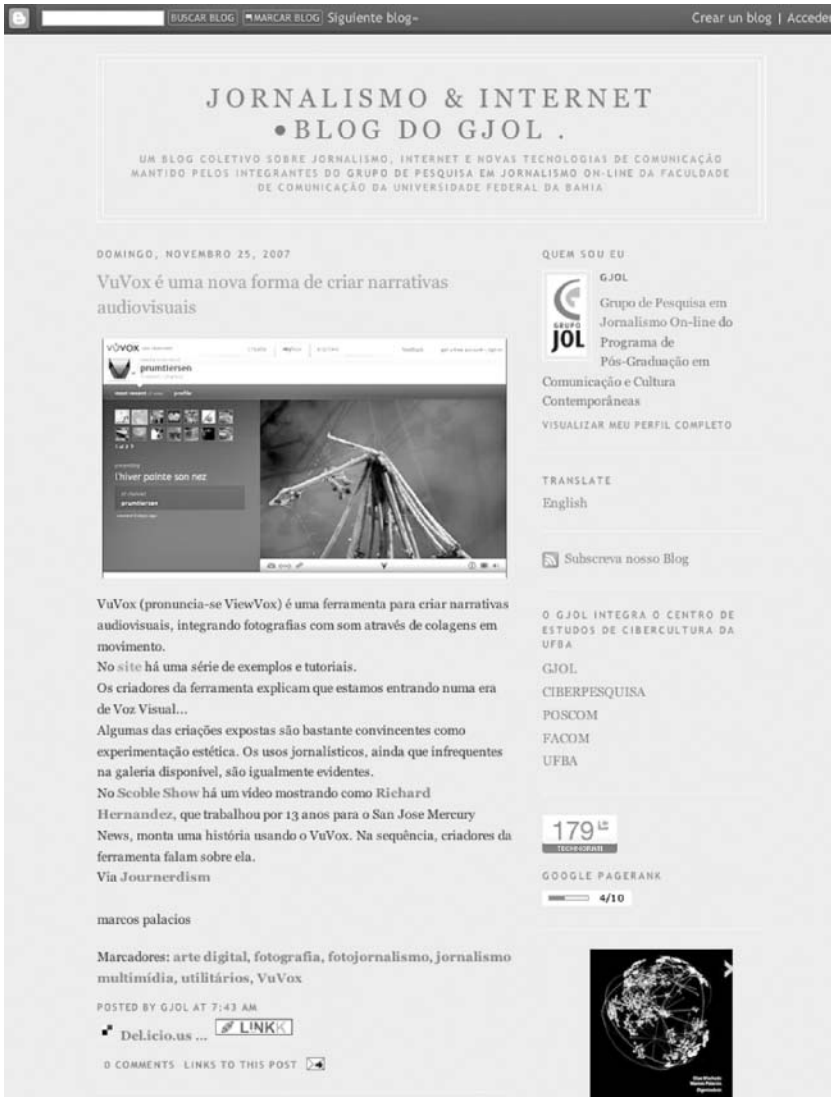


Figure 1. Blog interface

graphic and typographic layout. It also includes a series of links and information which is automatically generated by the system (time the post was posted, link to comments, tags, linkbacks, etc.). This space is the real added value of blogs, the place which exploits the dialogue

Head	
Title	
Presentation	
Content	Extra content
Post date	
Title	Profile Author
Image – Post Text	Translator
Author	
Tags - Hour – Del.icio.us - Comments - Links	RSS
- - - - -	Subscription
Post date	
Title	Links
Image – Post Text	
Author	Technorati
Tags - Hour – Del.icio.us - Comments - Links	position
- - - - -	Google
Post date	
Title	Additional
Image – Post Text	information
Author	
Tags - Hour – Del.icio.us - Comments - Links	Blogrolling
- - - - -	

Figure 2. *Blog interface structure*

that characterizes these environments. A linkback is a method for web authors to obtain notifications when other authors link to one of their documents.<sup>5</sup> As an alternative, the author may decide to present a brief version of the post and a “Read more” link: in this case the post expands and fills the surface of the browser window.

If the user clicks on the “Add comment” or “Comments” link, a new window with an interactive device for creating comments opens. This area may be considered as a *system-user exchange scene*. In just one click the reading interface becomes a writing interface. Finally, if the post is good enough to mobilize the readers, comments constitute a *user-users exchange scene*.

- Extra content: this area (in the right or left column of the blog) is a heterogeneous space that includes links, ads, mini-banners, search devices, last comments and post lists, tag clouds, copyright information, etc. Most of these links and devices may be included within an *author-users* or *system-user exchange scene*.
- Author’s area: blogs also include an author’s particular space for post writing and web administration. This interface is independent of the template selected by the author. In this area the author writes the post, uploads images, indicates categories (tagging), etc. Like the content creation window, this area looks like a mini-word processor or a software environment. It can be considered as a *system-author exchange scene*.

From the perspective of interface hybridation, blog orthogonal format originates from the first personal web pages created in the early 1990s, which followed the traditional layout of press design: a system based on columns and designed to be read, at least in Western cultures, from top to bottom and from left to right. This scheme is completely integrated into Western readers’ perceptual framework. The same layout can be found in newspapers and magazines, and today it can be identified in many online interfaces (web pages, wikis, blogs, etc.). However, as we’ll see in the following section, contamination between interfaces is more complex.

4.1.1. *Basic oppositions.* The graphic layout in blogs contributes to the sense production process, for example by creating content visual hierarchies. Blogs, like any other media, compete for reader attention. In this case the enunciator is a personal author (or, occasionally, a group or an institution) that communicates with more than just written texts (posts): the blog layout is also a powerful communication device.

The final objective of a design, conceived in close relationship to a journalistic model, is to allow a reader to identify and feel comfortable with navigating through a paper, comfortable with its order, clarity and legibility. And to precisely express the publication’s personality and brand. This is how the editorial functions of a design are accomplished. (Cases i Associats 2006: 4)

These reflections on newspaper design can be applied to blog design. In this case the brand is not institutional like in a newspaper but personal: the figure of the author is very strong in a subjective writing culture like that of blogs.

The blog interface articulates a signification system that is founded on oppositions and differences. Blogs organize their contents chronologically, generating the following opposition:

<i>Higher</i>	/	<i>Lower</i>
Newer posts	/	Older posts

The latest posts are always in the top part of the content area. From a semiotic perspective this organization of contents may be defined a *semi-symbolic system* (Greimas 1989; Floch 1990): an opposition in the expression level (higher/lower) corresponds to an opposition in the content level (newer/older). This opposition comes from online newspapers (Scolari 2004), but is different from traditional printed newspapers, where the opposition is:

<i>Higher</i>	/	<i>Lower</i>
More important	/	Less important

The same opposition (higher/lower) may generate different meanings (newer/older posts, more/less important) in different semiotic systems.

Like in printed publications, typography also proposes a signification system in blogs. Small changes in font color, dimension or style introduce differences that create meaning. For example:

<i>Large fonts</i>	/	<i>Normal fonts</i>	/	<i>Small fonts</i>
Title	/	Post	/	Comments
<i>Black font</i>	/	<i>Colored font</i>		
Normal text	/	Interactive text (link)		

The font coding system may change for each blog (in one environment links may be colored words, in another one underlined words, etc.). From a semiotic perspective the most important issue about the typographic signification system is not to respect the traditional HTML style for links (blue underlined words) but to maintain a logical consistency of the code. If links are red words, this color should not be used for titles or for evidencing concepts. The author of the blog must respect these codes and maintain the same relationships within the interface to avoid misunderstandings (and the consequent user frustration).

Like printed newspapers blogs invite users to read a title (first reading). Then, if the content seems interesting, the user will continue reading the

post written in a normal font (successive reading). Finally, the links to paratextual contents (Genette 2001) integrated by comments, linkbacks, etc., are usually indicated by small fonts after the post. Therefore, the differences and oppositions between large/normal/small fonts may be reduced to one basic opposition:

<i>Larger font</i>	/	<i>Smaller font</i>
First reading	/	Successive readings

Like in printed newspapers blog interfaces propose a *reading path* to the users by manipulating the position of texts and the dimensions of the fonts.

Font color and dimension are also employed for constructing meaning in info-visualization systems like tag clouds. These devices, which are very common in blogs and online newspapers, propose a semantic hierarchical map of contents. The system automatically creates a graphic representation of the more common tags in a predetermined environment. To generate the hierarchies the tag clouds propose a signification system based mostly on font dimension and colors (Figure 3). Very often these systems can be personalized by the author.

Before concluding this section I would like to make one more observation about the comments. The content area of blogs (scene of the *author-users* and *user-users exchanges*) introduces a device, the footnote, which has a long tradition in Western written culture (Grafton 2000). These “postnotes” that include comments, information about the post (date, time), tags, etc. transform a classical textual solution into an impressive community-making device. If traditional footnotes were written by the author (or the translator), blog comments are dialogical spaces for open discussions between authors and readers.

#### 4.2. *Figurative level*

A figurative analysis of interface must include the study of the discrete elements that make up the blog and the interpretative processes that they generate. The figurative level “introduces in scene subjects, objects, space and time articulations that are recognized or reconstructed by the user” (Eugeni 1999: 49). Contemporary digital interfaces are *syncretic texts* (Greimas and Courtes 1983; Cosenza 2004) that integrate different languages and media. Blogs are a good example of semiotic syncretism: they include written (i.e., titles, posts, comments), iconic (i.e., photographs, graphics), audio (i.e., podcasting files) and audiovisual (i.e., video, animations) components.

blogs **interface** hypertext text  
interaction **semiotics** network  
**metaphor** nelson norman  
blogsphere online **link**  
greimas **eco** interpretation discourse  
**saussure** nielsen  
google textuality architecture **HCI** book  
oppositions videogame **icons**  
usability blogrolling **internet**

Figure 3. *Tag clouds*

How can semiotics enrich the analysis of these elements? A brief theoretical note is necessary before continuing. Umberto Eco (1975) considers that semiotics can be divided in two approaches: the Theoretical and the Applied approach. The first one, which is more philosophical, abstract and generalist, constitutes the central core of complex theoretical thinking with strong relationships with psychology, cognitive science, linguistics, philosophy of language, anthropology, and sociology. The second approach involves applying the categories and concepts produced by the first approach to different phenomena. Over the last forty years semiotics has generated a series of applied semiotics such as semiotics of cinema, semiotics of theatre, semiotics of comics, semiotics of photography, etc., which can be applied in interface analysis. It could be said that any element present in a blog interface has an Applied Semiotic waiting for it.

But a multimedia interface is more than the sum of particular media and languages. Semiotic theory has still to develop categories for analyz-



ing these combinations of elements in a single web page. Researchers have formulated several theoretical categories for analyzing the relationships between written text and image (Barthes 1977) or sound and image like in cinema language (Metz 1991), but Semiotics has not yet produced an integral theoretical framework for digital syncretic text analysis.

In a few words: once the discrete elements that compose the figurative level are identified the researcher must apply the corresponding semiotics, always remembering that this is simply separating a complex unit into basic units for the sake of analysis. The researcher must remember that *for the user the sense effect of the interface is integral and unique*. The same situation may be found in other well known syncretic texts like films: for the spectator the final sense effect of a scene does not appear “divided” between sound effects, dialogues, camera movements, photography, etc., it emerges from the combination of all these languages and rhetorical devices.

#### 4.3. *Architecture*

Theoretically, analyzing a web content architecture may also be included in the plastic level: instead of studying “surface” oppositions and differences the researcher could examine “space” oppositions and differences. The concept of *plastic* should not only be interpreted as an analysis of iconic units: by definition, *plastic* is related to three-dimensional forms or spaces and is characterized by an emphasis on formal structure. In an online environment, the formal structure not only involves the surface of the interface but also includes the content architecture of the web site. However, in this article and only for didactical purposes we prefer to separate the surface (interface) from the content structure (hypertext).

Semiotics is a useful theoretical device for creating taxonomies. Is it possible to create a taxonomy of blog links? How can a researcher classify the links included in the content area? Two large categories of links can be identified in a blog:

- Internal links: links directed inside the blog.
- External links: links directed outside the blog (to other blogs or the rest of the web).

Internal links connect the post to the comments or to other posts in the same blog. They may be created by the author (post to post) or automatically by the system (post to comments). Like traditional footnotes internal links amplify the content creating a galaxy of paratexts around the original text. The author’s links (post to post or post to external

web) look to the past, to their associations with previous texts during the writing process.

External links send the reader to other blogs or web pages. In the specific case of linkbacks (automatically created by the system to keep track of who is linking to, or referring to a post) this hypertextual link is a revolutionary device that modifies writing logic. The author of the post knows who has cited the post (linked) and in which context. These links (blog to blog) look to the future, they are born after the reading process and represent reader associations.

This basic opposition may be useful for developing a classification of blogs (and web sites) based on structural criteria. The internal/external structure of links is basic for defining the communicational philosophy of a web site. Blogs (or webs) that contain more external links may be considered *centrifugal* (or *exogen*), while blogs (or webs) with a majority of internal links may be define as *centripetal* (or *endogen*).

<i>External links</i>	/	<i>Internal links</i>
Centrifugal (exogen) structure	/	Centripetal (endogen) structure

The World Wide Web is a hypertext and, by definition, an open system composed of millions of links and texts. In this sense search engines like Google or Yahoo! may be considered the great centrifugation devices of the web: users that have arrived to these interfaces are rapidly expelled to the frontiers of cyberspace. Most blogs follow this model: they include links to other blogs or web pages. However, it is not difficult to find centripetal blogs (or web sites) designed with an endogen conception. In this case the link architecture tries to avoid visitors running away to other web sites and aims to consolidate loyalty to a brand. Many blogs created inside online newspapers — for example the blogs of well-known journalists (Palacios 2006) — have been designed following this criteria. Fortunately, this trend is changing and many online publications are opening their links to external web sites. The original intention of these publications was to “catch” the readers and keep them inside their territory. As everybody knows, it is almost impossible to do this in a hypertextual structure. Another characteristic of the blogosphere<sup>6</sup> is the existence of *aggregators*: web devices that filtrate and organize previously syndicated contents to facilitate recuperating the information. These blogs of blogs or *metablogs* are useful for filtrating content in an information-overloaded environment.

As we can see, the blogosphere is not a chaotic space but an open and always changing link architecture. In the first level we find the basic link between the post and the comment, in the second level the links between blogs (created by the author or the linkbacks automatically created by the system) and in the third level the metablogs that aggregate and filter

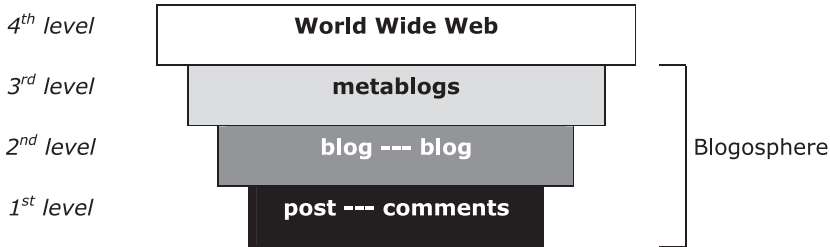


Figure 4. *Link architecture*

the blog's contents. These three levels make up the blogosphere. Finally, the World Wide Web may be considered the fourth level of links. Obviously, these four levels are not separated or autonomous: they are crossed by transversal links that connect, for example, a comment (first level) with an external web page (fourth level) (Figure 4).

#### 4.4. *Communicative level*

The interface, like any text, proposes a communication project. From a semiotic perspective the interface may be considered the battlefield of two strategies: the designer's strategy and the user's strategy. To analyze this dynamic process the researcher should identify the designer's "footprints," marks, and instructions (affordances) inside the interface. This virtual figure or simulacrum of the designer inside the interface is called the *enunciator* or *implied (model) designer*. Furthermore, the interface "is talking to" a specific user or category of users; this simulacrum of the user(s) is known as the *enunciatee* or *implied (model) user*. This presence of virtual figures and exchanges is one of the bases of semiotic approach (Eco 1979; Greimas and Courtes 1983; Bettetini 1984; Casetti 2002; Scolari 2001, 2004).

If we analyze a blog from this perspective, we can identify three implied users: the author, the reader, and the commentator. The interface creates different exchange scenes (such as *system-author*, *user-users*, *author-users*, etc.) to define these implied users. In other words, the blog "is talking to" three different users:

- Author: the *author* is the blogmaster and will have full access to all the functions of the system (post writing, link creation, image and video uploading, comment management, tagging, etc.). The subjective philosophy of blogging, remembering that blogs were born as per-

sonal web pages, makes the author the central figure of this communicative environment.

- Reader: at the other extreme we find the *reader*, a traditional web user who just reads posts and comments without making contributions.
- Commentator: the *commentator* is the new thing of blogs, an active-reader that participates in the discussion, makes contributions and creates links.

The blog interface includes specific exchange scenes for all of these virtual figures. This multiplication of implied users may also be found in software (for example a word processor that can be personalized or simplified by the users) and videogames. For example in *The Sims* the user may be just a *spectator* (watching the characters' interactions without interfering), a *player* (changing the variables of the game characters) or a *creator* of new characters or stories from snapshots. Three implied users for just one interface (Eugeni and Bittanti 2004).

A final reflection on interface contaminations or *remediations* (Bolter and Grusin 2000) before concluding this analysis. Interfaces constitute a semiotic system and it's relatively easy to identify contamination and hybridation between interactive devices (Scolari 2004). As we have seen, blogs incorporate elements from the *mise en page* of printed publications (for example columns, titles, etc.), combine them with textual organization forms that come from online newspapers (for example the vertical axis as a semi-symbolical chronological system) and include original info-visualization devices like *tag clouds*. Blogs also include text writing environment that reproduce a word processor interface. In this context, semiotics could help the researcher not only to describe a sense production system — the blog interface — but also to reconstruct the hybridation between digital and traditional interfaces (Figure 5).

## 5. New paths for a semiotic of HCI

From a semiotic perspective institutional webs and online newspapers have *interfaces for knowing* while video games, software or virtual reality environments have *interfaces for doing*. The conversion of the web into a collaborative platform, that is, the evolution from web 1.0 to web 2.0 (O'Reilly 2005) is producing a convergence of both typologies of interfaces. As we have just seen, a blog interface like the Wikipedia or YouTube integrates *spaces for knowing* and *spaces for doing*. Even in this case, semiotics proposes a series of concepts and instruments that could be applied to immersive multimedia and collaborative experiences. In this

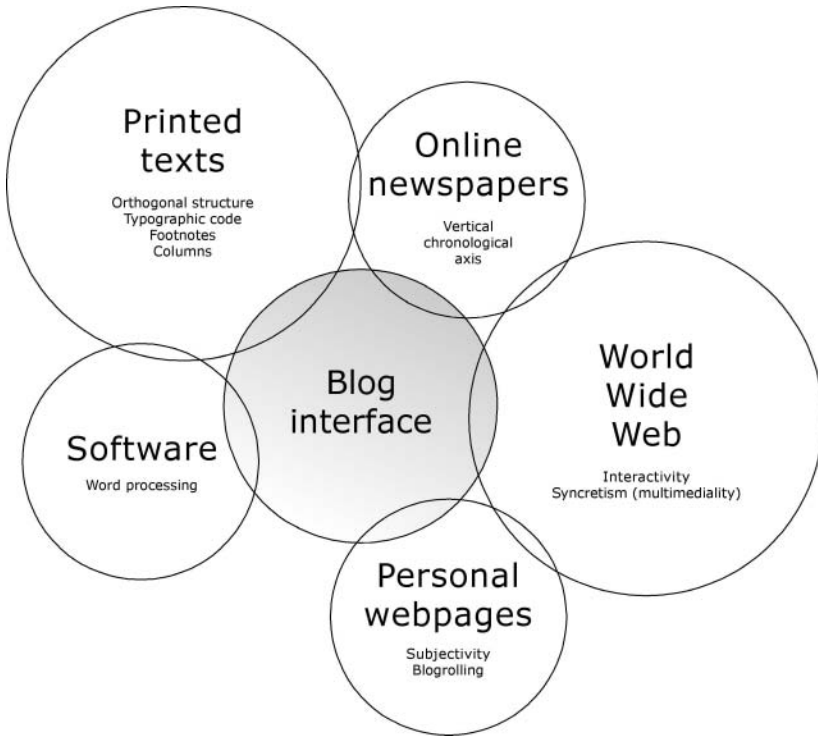


Figure 5. *Blog interface contamination*

sense, blogs are powerful collaborative environments; however, the web has developed more intensive and richer user experiences than writing comments or linking posts, such as online videogames or virtual communities like *Second Life* (<http://www.secondlife.com>). These experiences need more sophisticated theoretical models and categories to be understood.

### 5.1. *Narrative and interaction: Making sense by doing*

How do semioticians describe a traditional narrative, for example a folktale? The structure of this kind of narrative is a basic one: a subject (a hero, usually the Prince) has to reach an object (for example he has to rescue the Princess). Before getting to the Princess the hero will be tested, interrogated, suffer attacks, and so on ... which paves the way for his encounter with a helper that will offer him a “magic tool.” The Prince

will find helpers and opponents in every phase of his long journey to his object. This path is a succession of states and transformations. Finally, the subject will defeat the opponent and save the Princess (Propp 1968).

This basic model has been successfully re-elaborated by Greimas (1987) and the semiotic School of Paris so that it can be applied to any kind of narrative or situation. The narrative model has been applied to different narratives (literature, cinema, theatre, etc.) and social experiences (passenger's paths in the underground, consumer movements in supermarkets or libraries, etc.). In this second case, a semiotic approach can help researchers better explain and understand how and why people *create sense by doing*. From our perspective, this theoretical approach could enrich and bring new challenges to HCI and usability research.

Why not study users paths or interactive activities from a narrative point of view? Why not analyze an online newspaper navigation process from a narrative perspective? Let's analyze an online interaction process: a user (subject) is looking for the latest sports news (object) in the World Wide Web. The user will find helpers (search engines, easy to use interactive devices, help on line systems, chromatic and typographic codes, icons, etc.) and opponents (slow download of contents, badly designed interfaces, unconventional interactive devices, etc.) in every phase of the journey to the object. This path is a succession of states and transformations (from search engine to newspaper home page, section page, title, brief information, complete information, thumbnails, big photographs, videos, etc.). Finally, the reader will reach the object (in this case, the news). The semiotic approach could be helpful for identifying unconventional elements or badly designed sequences and, if necessary, transforming them into "helpers" to improve the interactive experience. Some researchers may find applying a narrative approach to any human-computer interaction extravagant. But ... what is HCI but a process where a subject must reach an object (to modify an image, to write a text, to send a message, to defeat an enemy, to find data in the network) by manipulating different devices? As we can see, the user is the hero of this narrative and a well designed interface is the magic tool. Bad designed interfaces can be considered the opponent of this folktale.

In certain type of interactive experience, for example in videogames, the narrative dimension of the interaction process is evident. In the case of software, the user manipulates virtual objects (texts, images, sounds, etc.) and modifies them until reaching the object. Like any narrative, this process is a succession of states and transformations. At the end of the path the user/hero has reached the object by increasing his interactive experience and competencies. The same structure could be found when

users look for information on the Internet or send messages with a mobile device. In all of these cases we are dealing with, as Greimas postulated, “subjects running behind objects.”

## 5.2. *Emotions, passions, and interactions*

Like a good romance or film, well-designed interactive environments have a great capacity in co-opting the user and generating similar passions. The interaction processes can contribute to generating of affective states and, as with text, create passions in the user. “User satisfaction” — one of the three properties of usability as defined by ISO 9241 — is also a passional state: as the result of a sequence of emotional states generated by HCI processes. Let’s also remember that “emotional design” (Norman 2004) and “funology” (Blythe et al. 2003) are considered one of the challenges of contemporary HCI. In other words, researchers should go beyond a merely cognitive approach (users are more than “thinking machines”) and enlarge their vision of interaction processes. Users are human beings, they can feel satisfied or frustrated, excited or irritated with their interactions.

Almost twenty years ago Greimas and Fontanille (1993) developed the first steps in a semiotic of passion. Their objective was to explore the possibility of constructing a discursive syntax based on the different states of a temporal process which could represent temporality. In this context they provided a semiotic interpretation of traditional theories of passion and applied structural rules to passions like anger and revenge. For example *anger* is presented as a succession of states:

*Fiduciary waiting > Frustration > Displeasure > Aggression*

Greimas and Fontanille considered anger as a syncope of revenge and a necessary process of re-balancing pleasure and pain.

Why do visitors flee from a web site when its elements are downloaded very slowly? What happens when a reader leaves an online newspaper after unsuccessfully looking for certain information? In this case we can develop the sequence:

*Waiting > Frustration > Displeasure > Action (to leave the web site)*

Why do users enjoy video games? Because they experience different emotional states during interaction (fear, rage, anxiety, happiness, etc.). The current research field known as “funology” (Blythe et al. 2003) could be

enriched by introducing of emotional issues. Semiotics can help researchers reconstruct these processes and further understand why users feel certain emotions while interacting with digital devices (not only video games).

Like a movie director, interactive designers may facilitate or complicate, accelerate or delay the rhythm of the interaction by manipulating the semiotic system, for example extending/reducing the number of clicks to increase/decrease the tension. This is a rhetoric device employed often by game designers to create passional states (Colombo and Eugeni 1996: 200). The language of video games is still mostly based on cinema and software rhetoric so it should be considered as a semiotic system “under construction.” Over the next years we’ll see the appearance of new rhetoric devices in this field. Semiotic research may follow this creation process and interact with it.

## 6. Conclusions

For the last twenty-five years usability has been one of the most important issues in the HCI research agenda. Most of this research has been conducted by applying quantitative methodologies. In this article we have indicated the strengths and limitations of this approach by redefining it as *Digital Taylorism*.

Quantitative research is necessary but it is not sufficient for understanding HCI processes or for providing all the answers to the questions that usability and digital interactions pose. Currently HCI is considered a multi-disciplinary field in which different theoretical approaches and methodologies can (and should) be applied. In this article we proposed exploring the possibility of applying continental Semiotics, mostly based on the research of Italian and French scholars, to HCI research, in this case to a blog interface. The same theoretical categories and methodology may be adapted and applied to software, video game or web interfaces.

A unified semiotic methodology or school does not exist: there are different ways of analyzing an interface or an interaction process from a semiotic perspective. Herein we have indicated a series of possible research paths. Semiotics could help HCI studies by reconstructing the interface meaning structures, in the generation of improved taxonomies and in the description of interface contamination and hybridation. Semiotic research could also be helpful for explaining passional states from a narrative perspective.

In a few words: applying a combination of semiotic and narrative methodologies could complement traditional research, bringing to light new aspects of interface usability and HCI processes.



## Notes

1. An interesting reflection on achieving quantitative maturity in usability can be found in Sauro (2006).
2. “Jornalismo and Internet – Blog do GJOL” (<http://gjol.blogspot.com>) is a well-known Brazilian blog about online journalism and new technologies. The blog has been created by the Online Journalism Research Group (GJOL – Grupo de Pesquisa em Jornalismo On-line) of the Faculdade de Comunicação – Universidade Federal da Bahia. The blog has been designed with a standard Blogger template.
3. In this section we follow the semiotic model proposed by Fraticelli (2004) and Vittadini (2004) in their study of chat interfaces.
4. A blogroll is a collection of links to other weblogs.
5. The linkback “enables authors to keep track of who is linking to, or referring to their articles. The three methods (Refback, Trackback, and Pingback) differ in how they accomplish this task” (see <http://en.wikipedia.org/wiki/Linkback>). Accessed 27 March 2009.
6. “Blogsphere is the collective term encompassing all blogs as a community or social network. Many weblogs are densely interconnected; bloggers read others’ blogs, link to them, reference them in their own writing, and post comments on each others’ blogs. Because of this, the interconnected blogs have grown their own culture” (see <http://en.wikipedia.org/wiki/Blogsphere>). Accessed 27 March 2009.

## References

- Andersen Peter B. 1990. *A theory of computer semiotics: Semiotic approaches to construction and assessment of computer systems*. Cambridge: Cambridge University Press.
- Andersen Peter B. 1992. Computer semiotics. *Scandinavian Journal of Information Systems* 4. 3–30.
- Andersen Peter B. 2001. What semiotics can and cannot do for HCI. *Knowledge-Based System* 14(8). 419–424.
- Badre, Albert. 2002. *Shaping web usability: Interaction design in context*. Boston: Addison-Wesley.
- Baranauskas, Maria C. & Amanda M. Melo. 2003. Design with children: A semiotic approach. In *Proceedings of the Latin American conference on Human-Computer Interaction*, 69–78. New York: ACM Press.
- Baranauskas, Maria C., Alysson B. Prado & Cláudia M. Medeiros. 2000. Cartography and geographic information systems as semiotic systems: A comparative analysis. In *Proceedings of the eighth ACM international symposium on advances in geographic information systems*, 161–166. New York: ACM Press.
- Barthes, Roland. 1977. Rhetoric of the image. In *Image/music/text*, 32–51. New York: Hill and Wang.
- Bettetini, Gianfranco. 1994. *La conversazione audiovisiva*. Milan: Bompiani.
- Blythe, Mark, Kees Overbeeke, Andrew Monk & Peter Wright. 2003. *Funology: From usability to enjoyment*. Boston: Kluwer Academic.
- Bolter, Jay D. & Richard Grusin. 2000. *Remediation: Understanding new media*. Boston: MIT Press.
- Cases i Associats. 2006. *Diseño de la noticia/Designing news*. Barcelona: Cases i Associats.
- Casetti, Francesco. 2002. *Communicative negotiation in cinema and television*. Milan: Vita e Pensiero.

- Colombo, Fausto & Eugeni, Ruggero. 1996. *Il testo visibile. Teoria, storia e modelli di analisi*. Milan: La Nuova Italia Scientifica.
- Cosenza, Giovanna. 2004. *Semiotica dei nuovi media*. Bari & Rome: Laterza.
- Deni, Michela. 2002. *Oggetti in azione. Semiotica degli oggetti: dalla teoria all'analisi*. Milan: FrancoAngeli.
- De Souza, Clarisse S. 1993. The semiotic engineering of user interface languages. *International Journal of Man-Machine Studies* 39. 753–773.
- De Souza, Clarisse S. 2005a. *The semiotic engineering of Human-Computer Interaction*. Boston: MIT Press.
- De Souza, Clarisse S. 2005b. Semiotic engineering: Bringing designers and users together at interaction time. *Interacting with Computers* 17(3). 317–341.
- De Souza, Clarisse S., Simone D. Barbosa & Sérgio R. P. Silva. 2001. Semiotic engineering principles for evaluating end-user programming environments. *Interacting with Computers* 13. 467–495.
- De Souza, Clarisse S., Simone D. Barbosa & Raquel Prates. 2001. A semiotic engineering approach to HCI. In *Extended abstracts of the ACM CHI 2001 conference*, 55–56. New York: ACM Press.
- Diamanti, Simone. 2003. L'interfaccia come ambiente. *Versus* 94–96. 83–97.
- Eco, U. 1975. *Trattato di semiotica generale*. Milan: Bompiani.
- Eco, U. 1979. *Lector in fabula*. Milan: Bompiani.
- Eco, U. 1984. *Semiotica e filosofia del linguaggio*. Turin: Einaudi.
- Eugeni, Ruggero. 1999. *Analisi semiotica dell'immagine. Pittura, illustrazione, fotografia*. Milan: ISU Università Cattolica.
- Eugeni, Ruggero & Matteo Bittanti. 2004. Sim-biosis. Di-simulando the Sims. *DeSignis* 5. 85–96.
- Floch, Jean M. 1990. *Sémiotique, marketing et communication: Sous les signes, les stratégies*. Paris: Presses Universitaires de France.
- Fratelli, Damian. 2004. Nuevos chats en la red. *DeSignis* 5. 107–116.
- Galofaro, Francesco. 2003. Giocare in un mondo simulato: osservazioni sulla regia interattiva. *Versus* 94–96. 113–134.
- Genette, Gerard. 2001. *Paratexts: Thresholds of interpretation*. Cambridge: Cambridge University Press.
- Gibson, James J. 1979. *The ecological approach to visual perception*. Boston: Houghton Mifflin.
- Gilbreth, Frank & Lilian Gilbreth. 1919. *Applied motion study*. London: George Routledge and Sons.
- Grafton, Anthony. 2000. *The footnote: A curious history*. Cambridge, MA: Harvard University Press.
- Greimas, Algirdas. 1987. *On meaning: Selected writings in semiotic theory*. Minneapolis: University of Minnesota Press.
- Greimas, Algirdas. 1989. Figurative semiotics and the semiotics of the plastic arts. *New Literary History* 20(3). 627–649.
- Greimas, Algirdas & Joseph Courtes. 1983. *Semiotics and language: An analytical dictionary*. Indiana: Indiana University Press.
- Greimas, Algirdas & Jacques Fontanille. 1993. *The semiotics of passions: From states of affairs to states of feelings*. Indiana: Indiana University Press.
- Joly, Martine. 1993. *Introduction à l'Analyse de l'Image*. Paris: Nathan Université.
- Joly, Martine. 1994. *L'Image et les signes*. Paris: Nathan Université.
- Landowski, Eric & Gianfranco Marrone (eds.). 2002. *La società degli oggetti*. Rome: Meltemi.

- Licklider, Joseph C. R. 2001. Man-computer symbiosis. In Randall Packer & Ken Jordan (eds.), *Multimedia: From Wagner to virtual reality*, 47–63. New York: Norton.
- Maietti, Massimo. 2004. *Semiotica dei videogiochi*. Milan: Unicopli.
- Metz, Christian. 1991. *Film language: A semiotics of the cinema*. Chicago: University of Chicago Press.
- Nielsen, Jakob. 1994. *Usability inspection methods*. New York: Wiley.
- Nielsen, Jakob. 1999. *Designing web usability: The practice of simplicity*. Indianapolis: New Riders.
- Nielsen, Jakob. 2004. Risks of quantitative studies. <http://www.useit.com/alertbox/20040301.html> (accessed 27 March 2009).
- Norman, Donald. 1988. *The psychology of everyday things*. New York: Basic.
- Norman, Donald. 2004. *Emotional design*. New York: Basic.
- O'Reilly, Tim. 2005. What is web 2.0: Design patterns and business models for the next generation of software. <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html> (accessed 27 March 2009).
- Palacios, Marcos. 2006. Blogs y Prensa de masa en Brasil: Convivencias o connivencias? Paper presented at La parola guida de @domani Conference, Turin, Italy.
- Propp, Vladimir. 1968. *Morphology of the folktale*. Austin: University of Texas Press.
- Rubin, Jeffrey. 1994. *Handbook of usability testing*. New York: John Wiley.
- Santaella, Lucia. 2004. *Navegar no ciberespaço. O perfil cognitivo do leitor imersivo*. Sao Paulo: Paulus.
- Sauro, Jeff (ed.). 2004. Waits & measures — quantifying usability. *Interaction. New Visions in HCI* 33(6). 20–43.
- Schapiro, Meyer. 2002. *Per una semiotica del linguaggio visivo*. Roma: Meltemi.
- Scolari, Carlos. 2001. Towards a semio-cognitive theory of HCI. In *Extended abstracts of the ACM CHI 2001 conference*, 85–86. New York: ACM Press.
- Scolari, Carlos. 2004. *Hacer clic. Hacia una sociosemiótica de las interacciones digitales*. Barcelona: Gedisa.
- Scolari, Carlos. 2007. Limitations in “Digital Taylorism”: Applying semiotics to HCI Research. Paper presented at the fifty-seventh annual conference of the International Communication Association, San Francisco, 24–28 May 2007.
- Scolari, Carlos & Jaume March. 2004. Hacia una taxonomía de los regímenes de infovisualización. In *Proceedings of the V AIPO Congress*, 142–152. Lleida: AIPO.
- Semprini, Andrea (ed.). 1999. *Il senso delle cose*. Milan: FrancoAngeli.
- Shneiderman, Ben. 1987. *Designing the user interface*. Reading: Addison-Wesley.
- Taylor, Frederick. 1964. *Scientific management*. New York: Harper & Row.
- Verón, Eliseo. 1985. “L’analyse du contrat de lecture”: Une nouvelle méthode pour Les études de positionnement des supports presse.” In *Les médias, expériences, recherches actuelles, applications*, 203–230. Paris: Institut de Recherches et d’Etudes Publicitaires.
- Vittadini, Nicoletta. 2004. Mediar el diálogo. Interfaces y comunicación mediada por computadoras. *DeSignis* 5. 107–116.

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