

# ANALYZING WEB ARTEFACTS BY APPLYING COMPLEX THINKING

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## ABSTRACT

Designing web artefacts is an activity which requires not only to have elements of knowledge in different disciplinary fields, but which also implies to take into account the evolutive dynamics of the socio-technical network within which web artefacts are meant to be integrated. In this paper, we analyze how the principles of complex thinking introduced by Edgar Morin can be used to analyze web artefacts from a cross-disciplinary perspective.

## KEYWORDS

complex thinking, web design, convergence

## 1. INTRODUCTION

Human beings evolve at the same time as they make the artefacts they create evolve and the socio-technical network to which they belong becomes more and more complex as new connection means appear and as there are new possibilities of linking the elements of this network together. When creating an artefact, a designer needs to be able to imagine how different components can potentially become connected to one another so as to form a coherent entity; he has to make a succession of choices according to parameters which have interdependency relationships. Not considering some of those parameters means taking the risk of producing unwanted side-effects and the problem with web interfaces is that it is actually difficult to get a “whole picture” of the scheme of interactions to consider. Because the dimensions according to which they can be analyzed require elements of knowledge in distinct disciplines which are delimited in their scope, the relations which exist between those dimensions tend to be disregarded. If web design is an activity at the convergence of multiple disciplinary fields, web artefacts also need to be apprehended from a cross-disciplinary perspective. In this article, we present the concept of “complex thinking” as defined by the sociologist and philosopher Edgar Morin and we analyze how the principles he presents in his approach can be used to analyze the multi-dimensional nature of web artefacts and the socio-technical dynamics to which they participate.

## 2. WEB ARTEFACTS: A FRAGMENTED VISION

An artefact is an entity which results from a transformation process initiated by an individual or a group of people. The designer's role is to ensure that the finale form of an artefact expresses correctly the functions which have been attributed to it and that its components are articulated in such a way that its use facilitates

the realization of a task. During this transformational process, the designer has to make a series of decision and in order to do so, he needs to have elements of knowledge in distinct disciplines. He needs to be able to analyze the entity he wants to create according to multiple perspectives: as a technical object which has material properties, as a medium which can be attributed several functions, as a new creation which modifies our environment and our usages, etc.

From the macro level to the micro level, from technical aspects to social aspects, web artefacts (that is, digital resources designed to be published on the web) offer multiple facets of analysis but the problem is that those facets are often described within the limits of different disciplinary fields (engineering, social sciences, communication studies, etc.) and it is thus difficult to have a global vision of the relational scheme according to which those facets are articulated together. Design thinking should be the glue that enables to assemble them, but the actual motto within the web design community is to focus on user experience : by putting emphasis on the target, we have come to neglect the very object to which design activity applies. Taking into account the way end-users will interact with the artefact is of primary importance, but understanding the potential properties of this artefact should not be of a minor concern, all the more so as web technologies evolve at a quick pace, which also means that the functionalities which can be implemented and the forms of representation which can be used at the interface level also change quickly.

As stated by Hendler et al. (2008), we need to “better understand the complex, cross-disciplinary dynamics” driving the development of the web, we need an interdisciplinary approach to understanding it, and the Web Science Research Initiative has been launched to reach this goal.

But bringing different viewpoints together is not an easy task, nor it is to find how the different approaches can fit with one another. We believe that applying complex thinking may prove to be a useful method to apprehend the multi-dimensions of web artefacts.

### 3. COMPLEX THINKING: CONCEPTS AND PRINCIPLES

Complex thinking has been introduced by the philosopher and sociologist Edgar Morin (1990, 2008). He considers something to be complex when there are multiple heterogeneous components which interact and interfere with one another, and when they weave together an emergent whole (from the latin *complexus*, “what is entwined together”). Morin suggests to view complex entities as “unitas multiplex”, to consider the unity in the multiple and the multiple in the unity in order to avoid falling into one of these two traps: the first trap is to crush differences by focusing only on the whole, the second one is to overshadow unifying dimensions by focusing only differences. Instead of apprehending things in a dual manner, as being either one or the other, we have to consider them as regards one another, we have to find the link which enables to consider both viewpoints.

In order to understand the dynamics of complex entities, we also need to analyze how they are connected to their environment, and to follow their mutual evolution. The notion of open system, as defined by van Bertalanffy (1976), is here fundamental. An open system is evolutive: it tends towards homeostasis but it is characterized by a dynamic state. It evolves as it interacts with its environment which in turns evolves with the system. The relationships they have condition the evolution of both; they participate to the formation and the organization of the one and the other.

According to Morin, if we have difficulty in examining those relationships, it is because we have been taught to apply simplifying thinking. Simplifying thinking is directed by the principles of reductionism and disjunctions: we tend to fragment reality into separate blocks and to analyze those blocks in an isolated manner; we make mutilating abstractions which prevent us from apprehending the relational scheme within which organized entities evolve.

Morin offers to substitute the paradigm of disjunction/reductionism to that of distinction/conjunction and he introduces three main principles which can help apply complex thinking :

- *the hologrammatic principle*, which highlights that the parts are to be considered in function of the whole and the whole in front of its parts. Not only the parts form the whole, but the whole can also be incorporated in the parts. Each individual, for instance, integrates the culture, the language, the collective code of the community she/he is a part of.
- *the principle of organisational recursion*, which goes beyond the principle of feedback as defined in the cybernetic approach : the process of self-regulation is not here completely pre-determined but it

can be adjusted by a process of self-production, so as to maintain a dynamic state of organisational balance. It can be represented via a generative spiral in which the products and the effects themselves produce and causes new products and effects.

- *the dialogical principle*, according to which what can be opposed can also be linked and two antagonist or competing notions can be united without them losing their duality : they are both essential for understanding a same reality for "the opposite of a correct statement is a false statement. But the opposite of a profound truth may well be another profound truth." (Niels Bohr)

## 4. APPLYING THE PRINCIPLES OF COMPLEX THINKING

Complex thinking is an approach which aims at improving our understanding of multi-dimensional entities. But are the principles set forth in this approach really relevant when it comes to web artefacts and what can we learn from putting them into practice ?

### 4.1 The dialogical principle : application v/s information space ?

According to Garrett (2007), the "basic duality" according to which web artefacts have been considered, as either applications or hypertext information spaces, is at the core of misunderstandings among the web design community and he underlines that in most cases, web artefacts can not be neatly categorized into one of these two groups. They are hybrid entities, "incorporating qualities from each world." They are information spaces (Noël, 2007): if we take for instance a tourism web site, it provides some information about an area, but it also gives the means to access and manipulate this information, it offers both some content and some possibilities of interactions.

What the analysis of web artefacts teaches us is not something new, but something we tend to forget. When we read a newspaper, we tend to view the linguistic signs as the only content to be interpreted and to consider the paper support mainly as an inscription support. But it is also an interaction support: we don't expect it to give us the means to easily copy and paste an interesting article, as it is the case on the web, but we do expect to be able to turn its pages. And we not only interpret the linguistic signs on the paper, we also interpret the very form of this newspaper and how it can be used.

What distinguishes digital artefacts from other information media is that the possibilities of interaction are not pre-determined : they can themselves be programmed. And what distinguishes digital artefacts from other tools is that it is not the very shape of the instrument which has to be designed so as to express the way end-users can use it: the possibilities of interactions have to be represented at the interface level via explicit signifiers (Saussure, 1965; Norman, 2007). Those signifiers are not just used to refer to a signified, they also have to be thought as manipulable objects, they are meant to inform end-users about a topic *and* about the possibilities they have to interact with the system.

### 4.2 The hologrammatic principle: being part of the web while incorporating it

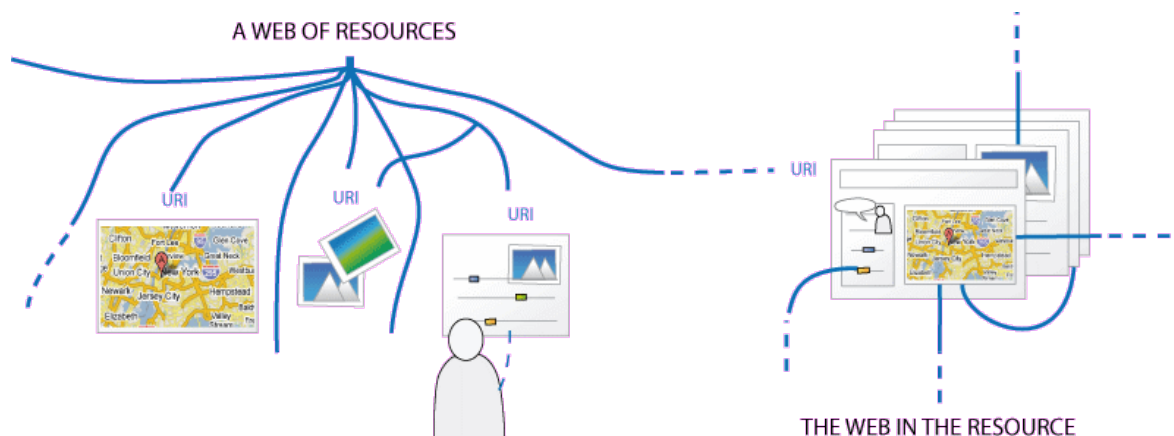
A web resource is an entity accessible on the World Wide Web and identified by a URI (Uniform Resource Identifier) : it can be a photo, a video, a text, an information system, or even an abstract concept. Like Russian dolls, web resources can contain other web resources. In fact, web sites and applications are often constituted of multiple other resources, which can themselves be accessed in an independent manner. They are as much part of the network as the network is part of them (Fig. 1).

Understanding the hologrammatic nature of web artefacts is essential for web designers. You don't put a site on the web just like you put a photo album on a shelf. In the case of a photo album, its content is independent from the content of the other books which also stand on this shelf. But web artefacts are not hypermedia systems which just happen to be accessible on the web: they are part of it, and the data they contain can be provided via other online applications or be re-used by other people.

Web sites can then be considered as the meso level of construction between the micro and the macro scale from which the web can be apprehended. At a micro level, the web is made up of identified media units which can be integrated into multiple web pages and web sites are the organized entities within which those pages are articulated. At a macro level, web sites become themselves the components of a larger system and they can be analyzed according to the properties they have acquired as a medium by being located on a distributed network. This network changes the way information can be provided or propagated (Weaver et al.

2008; Segaran, 2007), or the way people can interact with one another or perform a task collectively (Surowiecki, 2005) and web sites have to be designed so as to provide ways of incorporating end-users' activities.

Figure 1. The hologrammatic web



## 4.2 Organizational recursion and web dynamics

The web is a network in constant evolution, not only as regards the content to which it gives access, but also as regards the forms of connections it gives rise to. Designing a web artefact requires to take into account two types of dynamics: a social one and a technical one. The technological layer determines the way information can be represented, formulated and spread. It defines the potential ways according to which the social membrane can be woven, but end-users are the ones who actually shape the form of the network, as they establish new links with one another and interact with the resources they find.

Because the web is a convergence point, it changes at an unprecedented speed: the network distribution amplifies the way technological advances can be passed on and reverberated, but people also tend to adopt those technologies easily because a particular attention is put on how those technologies should be made accessible to them. If the web 2.0 has been characterized as the “web of people”, it is because it has also been characterized by applications which have been designed so as to facilitate the way people can join this social web. They have been developed with an envisioned “social” construct (Hendler et. Al, 2008): web designers not only have to think about how an individual can interact with a system, they also have to think about how groups of people can communicate together or perform a task collectively via an artefact which is itself connected to a group of applications.

## 5. CONCLUSION

An interdisciplinary approach is needed in order to understand web artefacts and the impact they have in our society. If designing web artefacts is an activity at the convergence of multiple fields, analyzing the properties of these artefacts may also help us make connections between disciplines which have evolved separately. In this paper, we have started exploring how complex thinking principles could be applied to analyze web sites and applications. We have seen that they could be considered as inform-action spaces, which are hologrammatic in nature (they are part of a network but they also integrate part of this network), and which have limits that are constantly pushed further under the drive of socio-technical dynamics.

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