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RESHAPING COMMUNICATION DESIGN TOOLS

COMPLEX SYSTEMS STRUCTURAL FEATURES FOR DESIGN TOOLS

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ABSTRACT

During the last thirty years the level of interest in Complexity Science has been constantly increasing. Combining the opportunity offered by the findings of the Complexity Science with the framework of the multi-disciplinary debate on the meaning and use of diagrams, we propose a design methodology to help designers support their interventions in complex environments. The structural features analysis of Complex Systems has been our key point to outline this methodology to offer designers a new mindfulness in the use of design tools. This methodology is based on five phases: analysing, representing, pinpointing, timing and telling. It provides a theoretical framework that incorporates many tools suggesting a different use of them with a special attention to improve the designer's consciousness of the system he is designing in.
When design is addressing complexity, diagrams could become generative tools that can be used to produce metadata relevant to the design process.

Visualization, Complex System, Diagram

1. INTRODUCTION

Complexity theory was developed in the field of theoretical physic in the second half of the XX century. It was built around an interpretative paradigm based on the notion that in a system with a large quantity of agents a high number of interaction process are able to form more complex behaviours and to change the structural condition of the system itself.
A Complex System is made by agents; depending on the scale of analysis, an agent may represent an individual, a project team, a division, or an entire organization.
With roots in several disciplines, modern theories and models of Complex Systems, or more specifically, Complex Adaptive Systems focus on the interplay between a system and its environment and the co-evolution of both. Complex Adaptive Systems models extend traditional systems theory by explicitly representing the dimension of time and its related concepts.

During the last thirty years the level of interest in Complexity Science has been constantly increasing. The convergence of interdisciplinarity and complexity is part of a larger cultural process. Older epistemological classifications and domains of expertise have become more permeable, and widespread crossing of national, political, and cultural boundaries has occurred (Thompson Klein, 2004).

2. COMPLEXITY AND DESIGN

Complexity cannot be experienced if acting within conventional disciplinary boundaries.
Isabelle Stenger defines complexity as an *issue on science* without an epistemological status similar to the scientific notions in a strict sense.
In the last decades, contributes of different disciplines (Jantsch 1980; Holland 1975; Von Bertalanffy 1968; Gray & Rizzo, 1973 just to mention a few) gave shape to emergent contexts where unforeseeable relations and interactions are possible among scientists belonging to different disciplines. Complexity can be perceived right at this crossing point (where technological, scientific, epistemological, philosophical and anthropological questions intersect), thus enlightening the multidimensional nature of any contemporary knowledge. In this sense we may even make the hypothesis that design may join those disciplines of “change” capable to get over the separation between natural sciences, social sciences and the sciences of the artificial,

outlining the profile of a designer whose task is to select results from heterogeneous disciplinary fields, so to reveal analogies and isomorphisms, activating a trans-disciplinary circulation of concepts (Pizzocaro, 2000).

The relevance of flexible approaches that can follow the specific transformation of each situation becomes imperative for design (Boutin & Davis, 1997). The understanding and the reinterpreting of elements of the Complexity Theory and its role in developing new ideas in different disciplines can open promising horizons for designers and design discipline. If we further accept, as Findeli states, the fact that the linear, causal, and instrumental model is no longer adequate to describe the complexity of the design process, we are invited to adopt a new attitude whose theoretical framework is inspired by systems science and complexity theory (Findeli, 2001). Complexity thinking can provide powerful models and procedures to approach the design intervention. We call them *interventions* because they are designed to intervene creating a *disturbance*, thus allowing new patterns to form. This approach is different from a project in which a clear end-result is envisaged from the outset.

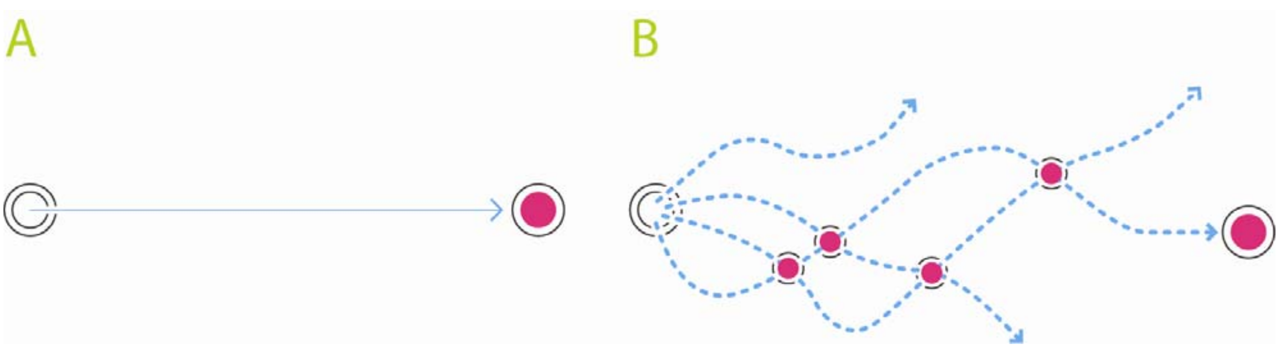

Figure 1: A project is usually considered as a linear process that ends with the choice of a final optimal solution (A). We call *intervention* an exploration of a design space in which the environment investigation continue to provide information and consequently to modify the path to find a *good enough* solution (B).

It is a matter of forming a new design approach that acknowledges the features of the system in which it operates. Designers should use their skills to facilitate the emergence of the system; they should no longer focus on finding solutions to specific problems but on the ability to develop tools that can be self-adaptive, continuously modifiable and improvable.

In this framework the traditional design tools such as diagrams, maps and scenarios need to change their nature in order to become effective instruments of visualization also for complex environments as the nature of these kinds of environments query some of the most rooted principles of Design: what does it mean to design for a highly unpredictable bottom up system with non linear interactions?

It has been argued (Friedman, 1999) that acting within Complex Systems involves either substantive challenges to design (increasingly ambiguous boundaries between artefact, structure, and process; increasingly large-scale social, economic, and industrial frames) or contextual challenges (a complex environment in which many projects or products cross the boundaries of different organisations, stakeholder, producer, and user groups). These challenges require a qualitatively different approach to the practice of design.

3. FRAMEWORK

This ongoing research is based on a literature research on diagrams. In it we are exploring the changing dynamics which are reshaping design tools. Combining the framework of the multi-disciplinary debate on the meaning and use of diagrams with the findings of the Complexity Science we propose a design methodology to help designers support their interventions in complex environments, managing the visualization and description of these systems.

In a world that is perceived and understood as complex the design ability of render and describe emerges as an answer to the need of orientation and search.

Design has gone trough a multiplicity of phenomena that has reshaped its meaning and its nature. At the same time, its action field has become more and more different and it has been extending towards new and diverse territories. This has enabled the needs for new project questions and tools (Manzini, 2004).

The skill to envisage is a key instrument of any design strategy, not only in the ability to confine the design intervention context but even more in the detection and description of all the agents involved and of their relationship.

Acting within complexity requires considering two fundamental aspects: on one hand, from a description of reality it is necessary, to overcome the unpredictability of the future, to create narrations of the possible; on the other the impossibility to reach an exhaustive knowledge of the system in which one operate can be by passed by developing a strategic stance that allows to face the system changes and evolution.

The designer key competences can be synthesized in three macro actions *see* - understand frameworks, *show* - visualize the information, and *fore-see* - anticipate critically (Zurlo). In the last decade the topic of show has produced a lot of interest as demonstrates the progressive importance of the information visualization discipline[1].

1. For an overview of the field see:

The ability to visualize complex information does not refer solely to the communication of quantitative information but it also deals with the visual narration of values and qualitative data. The challenge lays in the use of the communication artefacts utilized for the definition of common objectives in a project to create pivots so as to work in a resourceful manner even in a multi-organizational or multi-lateral context.

Diagrams as devices for shared strategies and evaluation of projects impact have an enormous potential to improve decision making process thanks to their ability to involve all the stakeholders, overcoming the possible barriers created by specialized knowledge and language. This definition of diagram includes therefore all those artefacts (maps, scenarios, charts, storyboards, etc.) that have a revealing capacity, a *diagrammatic attitude* finalized to the act of design.

4. DIAGRAMS

The etymology of the word διαγραμμα, DIÀ through and GRÀMMA sign, tells us of an extremely wide range of possibilities.

Diagrams had played an essential role in mathematics since ancient time. It is of significance that in Euclid's Elements diagrams are indispensable for the demonstration of each proposition. It is emblematic that Archimedes was killed while absorbed in the study of diagrams. In much of the 20th century, though, the use of diagrams has been strongly criticized. Nevertheless, in the last decade the situation has significantly changed, not only mathematicians have shown an ever increasing interest in the diagrammatical speculation (Needham, 1997) but it has been the topic of several studies and monographic dissertations.[2]

Architecture seems to have been prefigurative of a new way to use such communication artefacts. Ole Bouman states that architecture thanks to the use of conceptual and diagrammatical drawings is becoming "the art of dynamic situations". In the last few years diagrams have had an ever

BEDERSON B., SHNEIDERMAN B., 2003. *The Craft of Information Visualization: Readings and Reflections.* Palo Alto: Morgan Kaufmann Publishers.
WARE C., 2004. *Information Visualization.* Palo Alto: Morgan Kaufmann Publishers.
TUFTE E., 1997. *Visual Explanations.* Cheshire: Graphics Press.
BOTTA M., 2006. *Design dell'informazione: tassonomie per la progettazione di sistemi grafici auto-nomatici.* Trento: Valentina Trentini Editore.
CARD S., MACKINLAY J., SHNEIDERMAN B., 1999. *Readings in Information Visualization, Using Visualization to Think.* Palo Alto: Morgan Kaufmann Publishers.
CARD S., 2003. *Information visualization.* in Jacko J. A., Sears A., The Human-Computer Interaction Handbook. Hillsdale: Lawrence Erlbaum Associates.

2 See also: Shin, 1994; Allwein-Barwise, 1996; Jamnik, 2001; Greaves 2002;

increasing role in the most advanced architectonic production becoming a distinctive trait of the neo-vanguards (Corbellini, 2004).

Ben Van Berkel and Caroline Bos defined diagrams as a sort of mediator: “We see it as an external element, in between the object and the subject that we use to introduce other themes and organizations into a project with the aim of escaping from pre-existing typologies”. They use diagrams for what they call the proportioning of information – representing visually, and where possible in real time, variable phenomena for a specific location. “The aim is to have a generative, proliferating, unfolding effect on the project – not only during its development in the studio, but also afterward, in its public use”.

As a confirmation of such an approach Hyungmin Pai in his The portfolio and the Diagram[3], referring to the American context, detects a progressive obsoleteness of the visual representation systems centred on the drawing of the object itself in favour of more efficient graphic instruments able to correlate concisely the aesthetic aspects with other functional, symbolic, conceptual, temporal aspects, ultimately with all those elements that would result unpredictable but that constitute the greater part of the contemporary design scenario.

In this research diagrams have been considered as operating devices able to reveal weak links among the elements of the system and to show the driving forces that can facilitate (or hinder) a design intervention. This idea finds a correspondence in the Gilles Deleuze philosophical interpretation on diagrams[4]. As an *abstract machine* a diagram goes beyond its own substance and representation to become an effective conceptual device. It is at the same time a tool for comprehension and design able to create significant relations between reality and its interpretation. This happens “because the relations between forces, or power relations, are merely virtual, potential, unstable, vanishing and molecular, and define only possibilities of interaction, so long as they do not enter into a macroscopic whole capable of giving form to their fluid matter and their diffuse function” (Deleuze, 1981).

A diagram is “the map of relations between forces, a map of destiny, or intensity, which proceeds by primarily non-localizable relations and at every moment passes through every point, or rather in

3 The Portfolio and the Diagram is about the changing ways architects see, read, and use the words and images of architectural publications. The discourse of the diagram provided a new range of possibility in the architect’s relation to words, images, and buildings. More than the diagram itself, more than the province of narrow-minded functionalists, the discourse of the diagram is a complex formation of texts, concepts, and modes of representation.

4 Among Deleuze various works on diagrams see:
DELEUZE G., 1968. *Différence et répétition.* Paris: Presses Universitaries de France.
DELEUZE G., GUARRATI F., 1980. C*apitalisme et schizophrénie, tome 2, Mille plateaux.* Paris: Editions de Minuit.
DELEUZE G., 1981. *Francis Bacon. Logique de la sensation.* Paris: La Différence.
DELEUZE G., 1981. *Focault.* Paris: Editions de Minuit.
DELEUZE G., 1988. *Le Pli. Liebniz et le baroque.* Paris: Editions de Minuit.
See also:
De LANDA M., 1998. *Deleuze, Diagrams and genesis of form.* Ben van Berkel van B., Bos C. (eds), Any Magazine, N.23, Diagram Work

every relation from one point to another". Indeed diagrams effectiveness lays in the ability to act as go-between with explicative functions of the different correlated quantities, as a sort of graphic shortcut for the representation of complex phenomena.

But to the evocative ability of this shortcut, deriving from the free correspondence between concepts and representations – "makes no distinction between content and expression, a discursive formation and a no-discursive formation" – it is added the fact that diagrams can be real and proper tools for design processes. "It is a machine that is almost blind and mute, even though it makes others see and speak" (Deleuze, 1981).

Diagrams support multiple interpretations. Diagrams are not schemas, types, formal paradigms, or other regular devices, but simply place-holders, open instructions for action, or contingent descriptions of possible formal configurations. They work as abstract machines and do not resemble what they produce (Allen, 1998). As Giovanni Anceschi states: "Representing does not only mean to make a more or less accurate replica of the visible, representing does also mean showing the invisible. Showing the invisible, in turn, does not only signify to merely illustrate the real existence, but it does means to imagine visual models of the possible, probable, and hypothetical" (Anceschi, 1981). The potential application for design is now clear: the creation of a visual and diagrammatic language that facilitates the representation of the observed systems and the pinpointing of the emergent criticalities. Diagrams from this viewpoint could help designer to think clearly on complex problems, playing up the system elements and their relations.

This concept of diagram as generative machine implies the overcoming of the isomorphic link between the representation and the final production. Consequently the specific tools of design should be, to a certain extent, modified and/or integrated so that their descriptive and prescriptive specificity acquires a generative and creative potential. The use of diagrams should be the result of an effective design act, the diagrams processing is to all effects a design activity. This design approach is not only an intervention that uses different communication artefacts (flow chart, format, scenarios, maps, texts…), a diagrammatic design is not necessarily the one that use diagrams, but is the one that behave as a diagram.

Complexity - it is largely assumed - refers to both the nature of the phenomena to be studied and to our ability to make sense of it. Acting within complexity is a process that implies to cope with *wicked problems*, where the goals are uncertain and the solutions are many and sometime at odd. Design is the discipline that have to do with *ill-defined problems* (Cross, 1982, 1995) emerging as a discipline with a strong hermeneutic connotation that can be strategic and sense-making (Zurlo, 2004). This is possible thanks to its communicative ability but also for its inborn critical skill of projection towards a possible universe but within a recognisable and workable frame (Anceschi, 1996). Exploit to best these design abilities could diminish the difficulties of designing in complexity. These difficulties have been defined by Dosi (Dosi & al., 1996) *as Knowledge-gap* and *Problem-solving-gap*. Accordingly to Pizzocaro (2004) analysis it could be assumed that the designer "is placed in an intervention dimension where both a cognitive and execution uncertainty is present".

5. METHODOLOGY

The methodology developed in this paper aims to give a contribution to the reduction of these uncertainties developing designers' ability:

- to acquire information in a Complex System
- to turn information into knowledge
- to manage a design intervention in Complex Systems

Complexity calls for strategy: "the art of using information arisen in action, to assimilate them, to promptly formulate specific action schemes and to be receptive to gather the maximum of certainty to face what is uncertain" (Morin, 1985).

This methodology is based on five phases: analysing, representing, pinpointing, timing and telling. It combines an analytic as well as a synthetic approach. The structural features analysis of Complex Systems (highlighted in bold in the text) has been our key point to outline this methodology to offer designers a new mindfulness in the use of design tools.

TO ACQUIRE INFORMATION IN A COMPLEX SYSTEM

1. ANALYSING: PARTS

to analyse all elements
to set a process of framing
to set a process of coarse graining

TO TURN INFORMATION INTO KNOWLEDGE

2. REPRESENTING: RELATIONS

to communicate visual descriptions of the system

3. PINPOINTING: CLUSTERS

to rearrange information

TO MANAGE A DESIGN INTERVENTION IN COMPLEX SYSTEMS

4. TIMING: HORIZONS

to define how far the time horizon will be
to create a monitoring regime

5. TELLING: SCENARIOS

to imagine futures
to build up coarse-grained stories

Figure 2: Summary of the methodology phases

5.1 ANALYSING: PARTS

Complex Systems consist of a large number of elements. To act within a Complex System it is necessary to make a first analytical process. Although an analytical process it is not sufficient to fully understand a Complex System (Capra, 1996) in any case it consents to identify the system elements and their feature.

This quantitative phase in which designers recognise the agents and the stakeholders involved in the observed system, requires:

- to analyse all elements, tracing a structure of the system under examination.

In 1660 Pascal says: “I hold it equally impossible to know the parts without knowing the whole and to know the whole without knowing the parts in detail”. This signifies the abandonment of a linear exploration and the adoption of a circular investigation that try to understand the phenomena going from the parts to the whole and vice versa. This analytical phase moves from the elements to the whole, giving information about the parts in detail, it support the designer to decide his distance from the system and the level of detail and precision he want to work in.

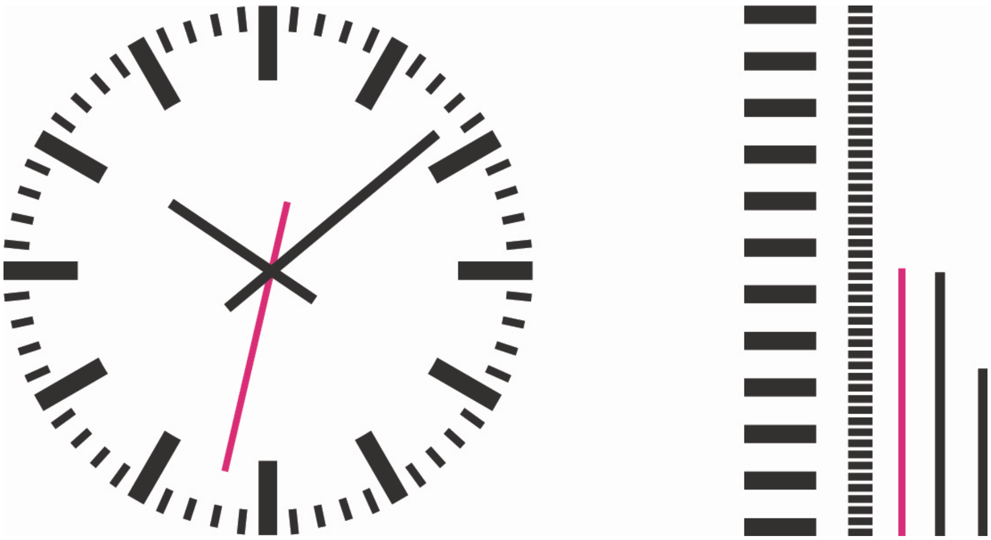

Figure 3: Sometimes the analytical phase of investigation produces useless information about the system.

Figure 4: Sometime the analytical phase of investigation could provide useful information about the system. In this case we can, for example, acquire information about the length of the tube lines or find a tube stop reading the index.

Complex Systems are usually open systems and they interact with their environment. This means it is often difficult to define the border of a system. In a design intervention boundaries are needed to narrow the number of information in order to make the system manageable and describable. Boundary setting is the first important step in designing interventions for a Complex System. Instead of being a characteristic of the system itself, the scope of the system is usually determined by the purpose of the description, and is thus often influenced by the position of the observer[5] (Cilliers, 1998). The act of setting up boundaries is fundamental for Complexity-base designers.[6]

The designer is asked:

- to set a process of framing defining the observer distance from the system and the scale of its description. Complex Systems lack explicit boundaries that are settle on to confine the system for a particular purpose.

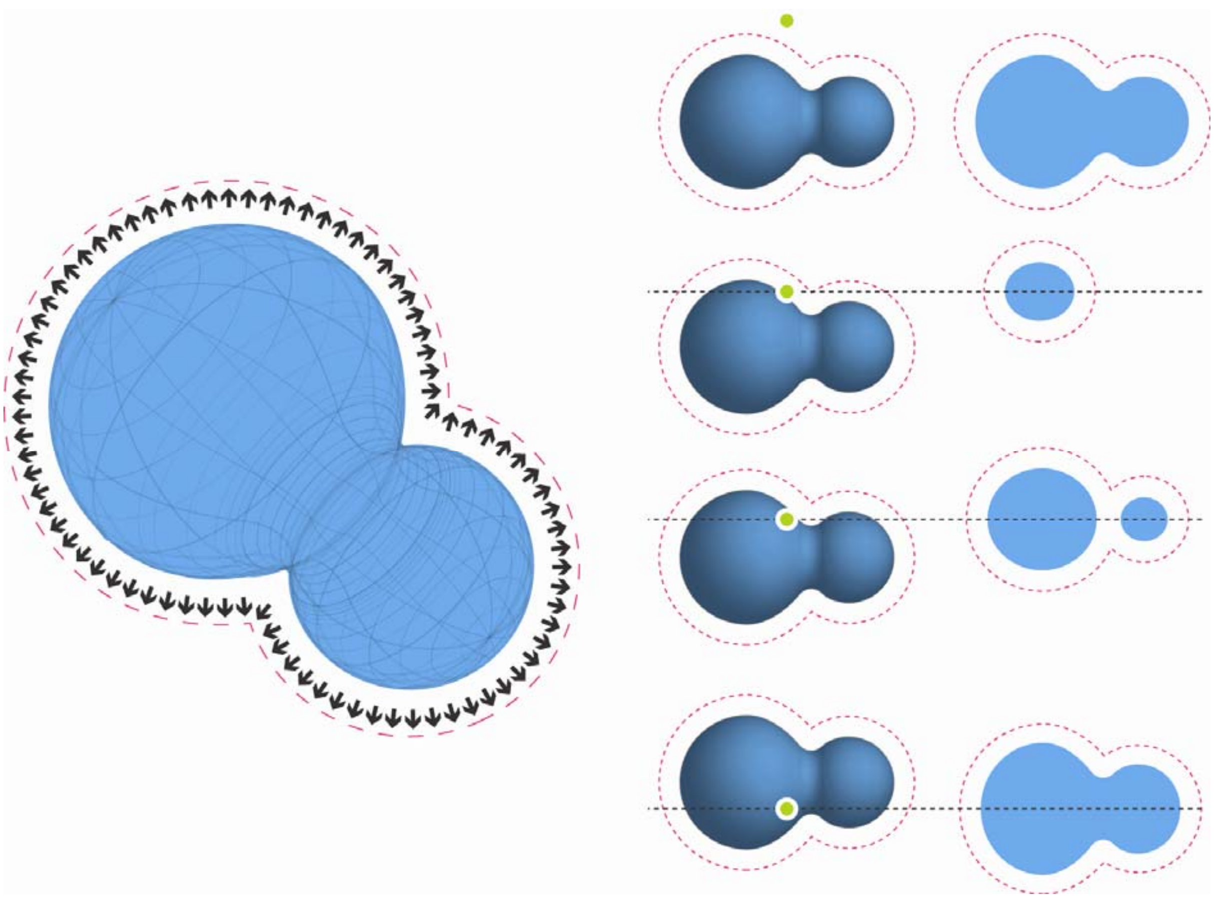

Figure 5: Setting the boundaries of a system (i.e. the blue blob in the figure) and the scale of its description could radically change the information we gathered from the observation. This choice should be done according to the purpose of the investigation.

5 This concept is related to the definition of Effective Complexity by Murray Gell-Mann (1994). Complexity is connected to the regularity of a system measured not on an observed phenomenon but through a subjective interpretation of the observer.

6 Among the various approaches to boundary-setting see:
ULRICH W., 1983. *Critical Heuristics of Social Planning: A New Approach to Practical Philosophy.* Bern: Haupt+.
ULRICH W., 1996. A *Primer to Critical Systems Heuristics for Action Researchers.* Hull: Centre for Systems Studies, University of Hull.

- to set a process of coarse graining. A description is coarse-grained when some of the fine details has been smoothed over or averaged out. Coarse-graining is reached by making approximations, by ignoring details on finer scales. As the Nobel Prize Murray Gell-Mann has suggested, harnessing complex issues requires the taking of coarse-grained images. Our natural tendency is to take fine-grained pictures so we can see each detail. Understanding complexity requires coarse-grained images at a resolution that shows the overall pattern of the system and the pattern of the elements in it (Gell-Mann, 1994).

Figure 6: A fine grained image contains a high number of information; in a complex system this means it will be unmanageable. A process of coarse graining should set the right level of details in order to maintain a recognisable image of the system.

Because the act of setting boundaries is a practice affected by biases, interests and vision, is very important to clarify how the process was performed and to be constantly aware of it.

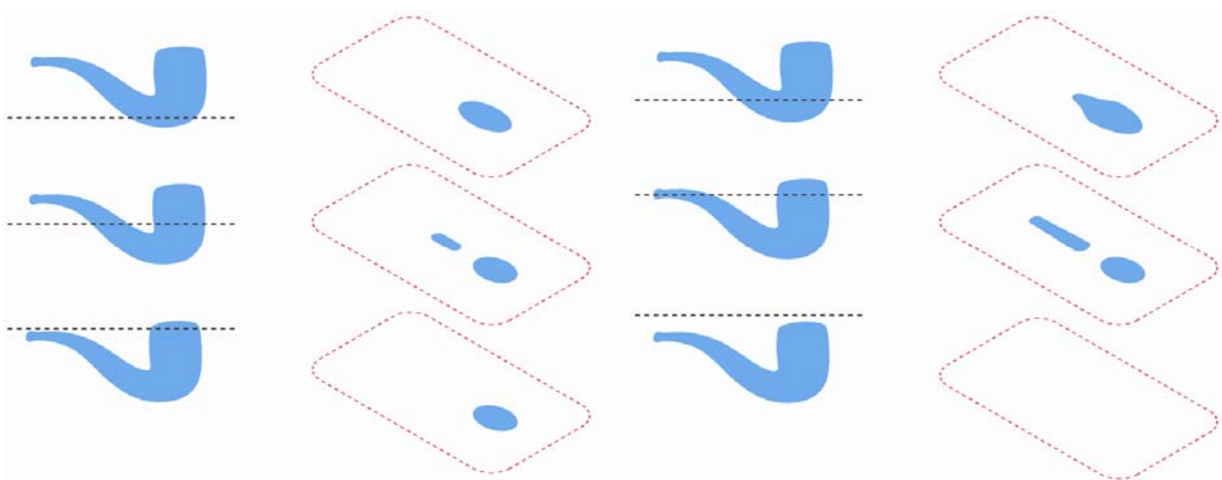

Figure 7: The point of view from which we observe a system change our perception of it.. In this example by David Peat, a simple object as a pipe is represented from a three-dimensional and a two-dimensional perspective.

When acting in a multilateral design process should be considered very important to set the frame and the grain so as to reduce misunderstanding when sharing information.

5.2 REPRESENTING: RELATIONS

The field of Complex Systems is interested in relationships. The elements interact and this interaction is dynamic. The interaction does not have to be physical it can also be thought as a transference of information. Even though they are very different in their appearance, these systems are extremely similar in how they elaborate information. This common characteristic may be considered one of the best starting points to understand how they work. While studying any Complex System one should follow what happens to information: one observes that information reaches the system as a data flow. In such a flow the designer notes the regularities and sorts them out from random and arbitrary features, condensing them into schemes and models that could be used as guidelines for design interventions.
This information can be communicated to other people in the form of

- visual description of the system.

It is not so much a matter of representing positions fixed in time and space but rather to translate in a visual language the strengths and the tensions among the agents of a system. Diagrams are the typical instruments used by designers to describe reality.
Frequently diagram is considered a graphic tool that allows managing a high number of data. Collecting and assembling a large quantity of information is not sufficient to efficiently communicate in complex contexts. Here the emphasis should be put on relations; attention should be given on the concept of interactions, on the links among the elements which determine mutual influences in a dynamic cohesion.
When design is addressing complexity, diagrams could become generative tools that can be used to generate metadata relevant to the design process. Diagrams and maps are media between what is known about a system and what the system is; they could display not only quantitative data but also ideas, concepts, frames, schemes, viewpoints, perspectives and values of the system observer.
The graphic and communication design of maps does not only concern the information accessibility and usability issues but constitutes an interpretation guide for the author

communication purpose; the graphic sign, the mapping technique, pictograms typology and layout, the degree of approximation of the representation are important hints for its reading and interpretation. (Quaggiotto, 2006)

The observer and the system are in a relationship. As a more general definition (Bar-yam, 1997) we could take that an observer is a system, which through interactions retains a representation of another system (the observed system) within it (Pizzocaro, 2004).
The creation of a layout is a partial and never exhaustive description of the environment. It is a narration in which inevitably a choice of what will be represented is made: it is a political stance. Each representation of reality and therefore each diagram, from maps to mood-board, from story-board to scenarios, are intentionally structured and thus arbitrary, *anexact*[7] and incomplete. These features show the political nature of these narrations and the principle of responsibility designers should be aware of.

5.3 PINPOINTING: CLUSTERS

Complex Systems consist of individual agents clustered together to form a larger scale phenomena. The high order complexity resides not in any of the individual agents, but in the rich pattern of interaction between them. An element may belong to more then one cluster. Clusters should not be interpreted in a special sense, or seen as fixed, hermetically sealed entities. They can grow or shrink, be subdivided or absorbed. Clusters are dynamic and interact with other clusters, both directly as well as through the individual members they share with each others (Cilliers, 1998).

- To rearrange information by clustering and observing the density of the elements.

In the process of rearranging information could be useful to look for driving forces converging and merging elements into meaningful clusters and relating the clusters to each other. Forming and studying these clusters helps to detect the driving forces of the system. Kees van der Heijden defines a driving force as a variable which has a relatively high level of explanatory power in relation to the data displayed in the cluster (van der Heijden, 1996).
This is an action that redefines the distribution of the elements and the morphological aspect of the diagrams designed in phase 5.2. By observing this rearranged diagram the system criticality

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7 In order to designate something exactly, anexact expressions are utterly unavoidable. Not at all because it is a necessary step, or because one can only advance by approximations: anexactitude is no way an approximation; on the contrary, it is the exact passage of that which is under way (Deleuze & Gauattari, 1976)

could be spotted, highlighting where the designer intervention is required. This is an action of pinpointing able to suggest new directions for the design intervention. The pointing of regularity and irregularity develop into a pattern recognition process that is able to connect clusters in order to reach a meaningful image of the system.

5.4 TIMING: HORIZONS

Complex Systems have a history. Not only do they evolve through time, but their past is co-responsible for their present behaviour. Any analysis of Complex System that ignores the dimension of time is incomplete, or at most a synchronic snapshot of a diachronic process (Cilliers, 1998).

The designer is asked:

- to define how far the time horizon of the project will be.

He shouldn't abstract from the idea of the directed *arrow of time* (Prigogine, 1981); to declare the project term is a key point for the design intervention. Due to the evolutionary nature of Complex Systems every attempt to depict it should be labelled "Data is partial and maybe out of date" as Valdris Krebs (Donath & al., 2006) says. This is a big problem in the mapping of any social data where by fixing something into an image, we give it solidity that it does not merit (Donath & al., 2006). In a Complex System is very different to design for short term or for long term. That is because **interactions are non-linear**. A non-linear change is a change that is not based on a simple proportional relationship between cause and effect. Therefore, such changes are often abrupt, unexpected, and difficult to predict. A small change in the value of a driver could produce a disproportionate change in the outcome.

SHORT TERM

Because their behaviour with respect to a given variable is extremely difficult to predict, when modelling non-linear systems in short term action it is common to approximate them as linear.

In a short period the most probable configuration of a system, will be quite similar to the previous one (Kelly, 1994). The designer has good chance to predict the immediate future behaviour of the system looking at the interactions among the elements or clusters of elements. In a Complex System any elements influences and is influenced by quite a few ones. **The interactions usually**

have a fairly short range; this means that the information is primarily received by the immediate neighbours.

LONG TERM

Non-linear relationships between causes and effects hinder the capacity to foresee how the system will evolve in the long term. Complex Systems react in unpredictable ways to external perturbations: a big pressure can be reabsorbed by the system without any evident result while a small one can produce sensible changes. If considering a design intervention as an external factor, designers should take into account this non linear causality.
In order to improve the ability to adapt their system description - maps and diagrams - to uncertain and unforeseeable circumstances the designer is asked:

- to create a monitoring regime for a periodical examination of the project environment.

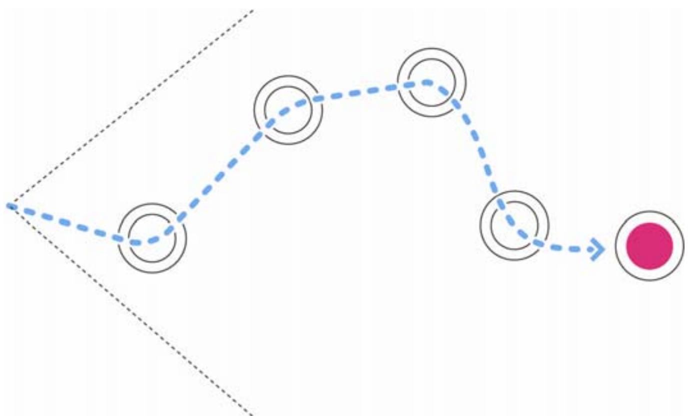

Figure 9: Because a complex system is continuously evolving to set several pause to the design intervention for monitoring the environment could be very important for the consistency of the solutions.

Monitoring to detect the patterns that emerge enables corrections in the description to be made by acquiring new data. A programme of monitoring reinforces the idea that interventions in a Complex System can never be set and forgotten and increases the mindfulness of designers - a key requirement in handling complex and unpredictable environments (Weick & Sutcliffe, 2001).

5.5 TELLING: SCENARIOS

As Jonas says: time is no longer a linear parameter, *the fourth dimension*, but the source of uncertainty. The future can be conceived as a projective space, determined not only by natural trajectories, but by plans, wishes, hopes, fears, decisions, etc. In other words: it is a space of imagination (Jonas, 2005). Because systems have memories and imagination, the designer could consider the future as a source of creativity:

- to imagine futures.

When the number of the system elements and relationships increase, when the rate of change of the context rises, to make a model of the reality in which designer operates becomes more and more difficult. As the future developments of a system are only imaginative their transformation into stories and narrations helps coping with complexity (Schwartz, 1991).
Particular attention has to be put in the narrative grain of stories. To study all the fine grained stories of a particular system means try to foresee the future evolution of any single element and it would be quite impossible. To imagine possible future and to assess their probability Complexity science suggests

- to build up coarse-grained stories (Gell-Mann, 1994).

A coarse-grained story is the set of all alternative fine-grained stories that converge on a specific behaviour of the observed and diverge on all the possible behaviours of what is not observed.
Scenarios are typical tools for telling stories. Born within the Future studies and Strategic planning field, *design orienting scenarios* can be defined as a set of visions finalized to capture the energies of all those involved in a design process, to generate a shared vision and desirable to converge their action in a univocal direction (Manzini & Jégou, 2004; Maschi, 2002).
Scenarios are not prediction of future. They are diagrams for exploration and mapping that help to imagine different futures observing the present situation. Scenarios don't predict the future so much as they illuminate it, preparing us for the unexpected. Scenarios are multiple approaches to the future, stories of the inevitable and necessary recombined with the unpredictable and matters of choice. The best scenarios aren't necessarily those that come true; they're the ones that subvert expectations, providing deep insights into the changes happening. The better scenarios are the more they penetrate to the deepest possible understanding of the present (Mc Corduck & Ramsey, 1996).

6. CONCLUSION

In the methodology described in this paper we do not replace traditional design tools as diagrams rather - with a special attention to improve the designer awareness - we suggest their different use providing a theoretical framework.

To sum up: this methodology with its different use of diagrams requires those who have to cope with complex issues to develop the ability to think in a complex rather than complicated way, to value equally connections and elements, to consider the system unpredictability as a source of creativity and innovation, in other words to learn from complexity.

The next step of this ongoing research would be to test this methodology. We have identified two University Courses (*Density*[8] and *Atlas*[9]) in the Second Year of the Master Degree in Communication Design, Faculty of Design – Politecnico di Milano as a field of study for this empirical work.

The aim of the course Density is to verify the power of communication artefacts in helping decision making processes and their ability to facilitate dialogue within participatory design actions. In the course Atlas the territory and the urban space become a platform for practical experimentations on the interaction of Complex Systems using multimedia artefacts.

It has not escaped our notice that the testing phase should extend also to non academic contexts.

We suggest as future works in-depth studies of each methodology phase.

8 URL:<densitydesign.org>;
URL:<http://www.design.polimi.it/guida/2006/index.php/corso/c/411567/programma>
We are much indebted and we have been stimulated by the unpublished empirical work and ideas developed in the Density Course where since three years some of the concept outlined in this paper have been used and applied.

9 URL:<http://www.design.polimi.it/guida/2006/index.php/corso/c/411562/programma>

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