

# Investigating and Modelling the Tangles of Design and Communication

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## ABSTRACT

The role of product design as one of the main asset capable to promote innovation and economical rise is well known and made popular by mass media, and so is its role with respect to the excellence of industrial products including aesthetic qualities and emotional factors. Following tradition Design is mainly based on technical skills and artistic intuition, transferred through atelier-like activities from teacher –wizards to apprentice-wizards learning by examples, and without any guarantee of the results. In fact, what is commonly called Design has been scarcely modelled and the mechanisms of attraction of designed products are still scarcely understood.

The paper presents an original model of Design, and discusses the communication nature of the discipline, exploring the compositional structure of the design artefacts, the role of the perception mechanisms in provoking the construction of meanings and in the arousal of emotions; some possible new conceptual tools are presented, as well as some experiences.

**Keywords:** Design Theory, Design Model, Emotional Design, Perception, Design and Cultures, Design and Neurosciences

## 1. FOREWORDS

The term “design” is today ambiguous. While its meaning in English is quite near to “project”, the term spread out in many languages connoting a specific discipline related to the production of artefacts with strong cultural and aesthetic characteristics. So, we define as *Designers* Munari, Starck, the Eames, and many others, not for their engineering project capability, but for the qualitative characters of their production.

While Design as a discipline has grown with respect to ethnography based user studies, and of project methodology, also based on CAD/CAM applications, on prototyping and virtual prototyping and testing activities, in the studies on materials, in the processes improvement, and so on, very scarce efforts have been dedicated to model

and make more solid the understanding of the aesthetic and cultural properties of the so design products.

Many schools and universities provide Design education: most of them are joined to Art schools, others are within poly-technical schools, but in both cases, Design is considered very far from a scientific discipline, and consequently Design education programs appear as a variable mix of many different courses, some of which have technical goals (e.g. computer graphics), some social (e.g. semiotics or arts history), some “atelieristic” (e.g. some practical experiences in so called “laboratorial” courses, in which the teacher can offer the good example, but is not able to teach, despite the students can learn).

The authors have been teaching in a Design graduation course for several years, and followed a twofold roadmap in research and teaching, setting up a (preliminary) model of what Design is: so, we are here proposing a verifiable model of Design .

In the following we will present the main elements constituting our model, and some experiences both in applying and in teaching Design through it.

## 2. DESIGN IS COMMUNICATION

The word *Design* is ambiguous: it can refer to the discipline and the related education programs; to the project activities; to the domain of knowledge that provide quality to material and non material objects; to the description and specification of an object guiding the production and so on. In the following, with this term we will refer to the intrinsic qualities of designed objects and artefacts providing a distinctive difference with respect to industrial products produced without specific care to form and function qualities.

The main principle of the proposed model for what Design is, is that Design is just Communication (Mai 2010). We can build a specific path from craftsmanship (high costs, personalized products, small volumes of production, apprenticeship as education), to industrial design (transfer of knowledge from persons to processes, high production volumes, low costs, quality standards, process improvements, formalisation and then easy know how

transfer by training, and so on); but after industrial design, when every industry went comparable, any car is compliant to standards related to maintenance, guarantees, consumptions, pollution, costs, performances, and so on, the unique possible differentiation is: what a product is communicating? Which meaning is it transferring?

A very simple example is able to explaining what we have in mind: the vacuum cleaners evolution.

A vacuum cleaner is :

1. a function provider: to catch dirty from your house;
2. a (still archaic-typical) structure: composed of an aspiring body, a dirty collector and one extracting "mouth" (brushes, pipes, collectors, ...);
3. a "communication" capability: as shown in the following picture, we are able to single out, just by the shape, which is an archetype of the vacuum cleaners, which a "lazy" cleaner for humorous people, which the "marine" against dirty, which the "dirty ghost-busters", which the "single neard" cleaner.

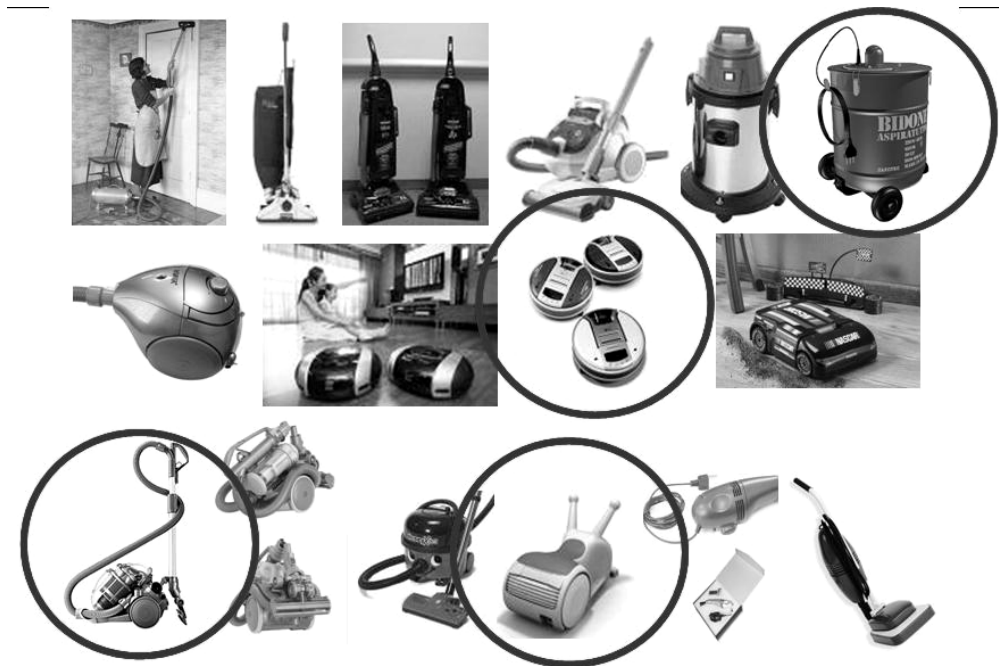


Fig. 1 – Vacuum cleaners communicating different concepts: the first is the archetypical product, while the ones highlighted express force and robustness (Bidone Aspiratutto), hi-tech and young upper class (Rumba), sophisticated futuristic technology (Dyson) and playful laziness (buster Vacuum Cleaner for Kids).

Design intended as the capability of adding quality and appeal capability to material objects is the result of a design activity by a designer. So, Design is Communication, in the sense that the new added meanings are the qualifying and differentiating characteristics.

### 3. DESIGN: FUNCTION, SHAPE, MEANING.

The meaning of a design artefact is conveyed through our sensorial channels: the sight is clearly sufficient, in the above mentioned examples, but we all know how much important are (for example in new cars), sounds or smells, as well as touch feelings.

Some of the meanings are immediately conveyed through senses, while others reflect a more complex context. For instance, the "marine" vacuum cleaner Bidone Aspiratutto winks to many stereotypical element (the army green, the stencil for letters, the rough essential shape) understandable only through specific cultural knowledge.

So, we can try to define Design as the triplet *Function, Shape, Meaning* [5].

- **Function:** corresponds to the goal of the artefact; it must "work" properly, with efficiency and effectiveness; in general, beside a primary function (to aspire, for a vacuum cleaner), other secondary functions can be present (e.g. the power regulation, or a wing compacting powder in some vacuum cleaner), usually coherent with the primary one. Within the domain of the function we should consider other aspects such as maintenance and maintenance costs, duration expectancy, disposability, and so on.
- **Shape:** corresponds to the primary sensorial properties, such as geometric form, colours, curves vs. edges, and so on; we have to extend such a term to other senses, such as touch (smooth, coarse, ...); hearing (dry or soft sounds, pleasurable or disturbing noises); smell and, when applicable, taste; the shape is able to convey many suggestions: some emotional (e.g. rounded curves

induce mild sensations, with hard edges induce dramatic sensations), some cognitive (e.g. affordance).

- **Meaning:** corresponds to mental notion that we attribute to an artefact; many kind of meaning can be provided through the primary perception of the shapes (e.g. big head and pawns and rounded shapes unavoidably suggest “puppyness”); others require more complex reference nets, such as the “marine” vacuum cleaner, or what we perceive as an hi-tech product, or a vintage one.

So, a designer should identify the proper functions for an artefact, and provide it with the proper shapes in order to convey the required meaning.

#### 4. DESIGN: HOW IT WORKS.

The provided model suggests at least two different level of *meaning*: the former, more primitive, is related to some automatic emotion arousal from the shape; the latter, more complex and more based on cognitive capability, is related to analogous reasoning and metaphorical thinking.

We model the mechanism of meaning/emotion arousing according to the following picture<sup>1</sup>:

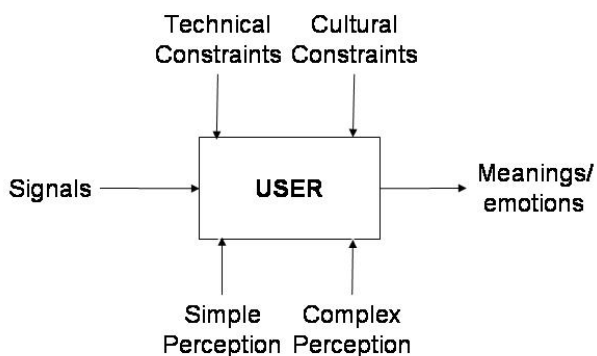


Fig.2 – A model for the Design: the user catches signals and transforms them into meanings and emotions; the designer rules the result through shapes affecting simple and complex perceptions, taking into account technical/economic constraint, as well as cultural constraints.

- **Signals:** any kind of information sent to a user, through any kind of physical channel: shapes colours, sounds, flavours, but also words, smiles, and so on.
- **Meanings/ emotions:** they are the results of the processing of the gathered information; proper proportions, big eyes and curves can gives the meaning of puppyness, and then positive mild moving emotions; the pentatonic musical scale can recall far east, exotic environments, and then fascinating emotions on diversity; ambiguities in the expressions can recall “bistable”

<sup>1</sup> We use the IDEF0 formalism: *Integration Definition for Function Modeling*; for further details see [1]

meanings (as in the painting with Swans/Elephants by Salvador Dali, or many optical illusions, etc.), and then the recognition and the explanation of the ambiguity can reward the user, providing simply pleasure [8]. According to many studies of well known neuroscientists, emotions are the result of complex interactions among neural networks, arousing the production of specific neurotransmitters; the role of the emotions seems to be to survive both as individuals and as a species, and the various neurotransmitters have been evolved and increased in number, during the evolution of species (Pan 1998); according to those studies, a simplification of the brain structure into three levels (reptilian, limbic and neo-cortex) is suitable to locate the main kinds of emotions [6]

- **Simple perception:** from the point of view of the role of the involved neurotransmitter (and then of the emotions), the two older part of the brain (in the evolutionary sense) are the site for primary emotions (seeking, sex, fear, social interaction and approval, etc.); various neurotransmitter are involved and many of them related to pleasure (e.g. dopamine) [6] we can provoke those emotions arousal through the proper external stimulations, providing experiences with design artefacts.
- **Complex perception:** the neocortical part of the brain is involved in logical and cognitive functions, but those functions interact with the lower brain levels, providing still similar emotions; so, when we are presenting some elements in a communicational artefact gathering signals belonging to different fields (e.g. senses, richness, sex, etc. as in the Philips Senseo Crema coffee machine), users are able to recognise the single elements, to collect them in a logical net, and to connect them to other meanings, arousing then emotions.



Fig. 3 – The coffee machine Senseo Crema by Philips; the bowed position of the machine, together with the two cups, the name Senseo Crema, the idea of coffee, a darks, warm, tasteful and sweet-smelling beverage recall unavoidably a situation of a couple, in a sensual environment, rich of emotions and suggestion.

- **Technical constraints:** of course, the designer must take into account possible problems about physical feasibility, material properties, costs and so on, in order to guarantee all the engineering characteristics making the artefact suitable to specific markets;
- **Cultural constraints:** the constraints that should be taken into account are not only the technical ones, but also those that depend on cultural factors; as an example, a product inducing the idea of a strong role differentiation for the two genders, masculine and feminine, could be unacceptable for many Scandinavian people, while it could be considered as acceptable in many far east countries; the same for products inducing the idea of a strong “money-divide” with different rights for different classes; many studies have been carried on this topic, and behaviours have been mapped on the cultural values of more than one hundred countries [3]

### 5. NEW TOOLS FOR DESIGNERS

While the model is weakly suggesting the road to be followed, it is not possible apply rules guaranteeing a result. Nevertheless, some conceptual tools can be used, making the boundary between rules and creativity a little bit farer than now. The main tools are related to the perception and to the cultural constraints.

- **Simple perception:** many studies on art, aesthetic emotion and neuroscience have been carried on; among them, the research of Ramachandran [7] is really useful also for possible practical applications. Ramachandran points out ten principles able to provoke emotion

arousal, all of them based on perceptual characteristics of the artefacts; the principles (Peak shift, Perceptual Grouping and Binding, Contrast, Isolation, Perceptual problem solving, Symmetry, Abhorrence of coincidence/generic viewpoint, Repetition, rhythm and orderliness, Balance and Metaphor) describe characteristics than can be reproduced in artefacts, in order to reply emotions in the users. Most of them are strongly related to the reptilian and to the limbic brains, and only the last (Metaphor) is for sure mainly related to the neo-cortex.

- **Complex perception.** Complex perception, as here presented, refers mainly to the networking of various meanings, linked for analogies or contextual similarity; this is what we call a metaphor, in the sense in which Lakoff intends it [4]; we consider a metaphor in a formal way, as a simultaneous travelling onto two semantic networks, partially superimposable, but belonging to different semantic fields; so, when Romeo says (W. Shakespeare, Romeo and Juliet, Act II, Sc. II, “*But, soft! what light through yonder window breaks? / It is the east, and Juliet is the sun. / Arise, fair sun, and kill the envious moon, / Who is already sick and pale with grief, / That thou her maid art far more fair than she...*”, we have a reference to the sun similar to the net represented below, and we transfer immediately all the properties of the sun to Juliet: she lights Romeo, warms him, gives him energy, and so on; metaphors are a very powerful way to convey on new artefacts very old mental structures and emotions.

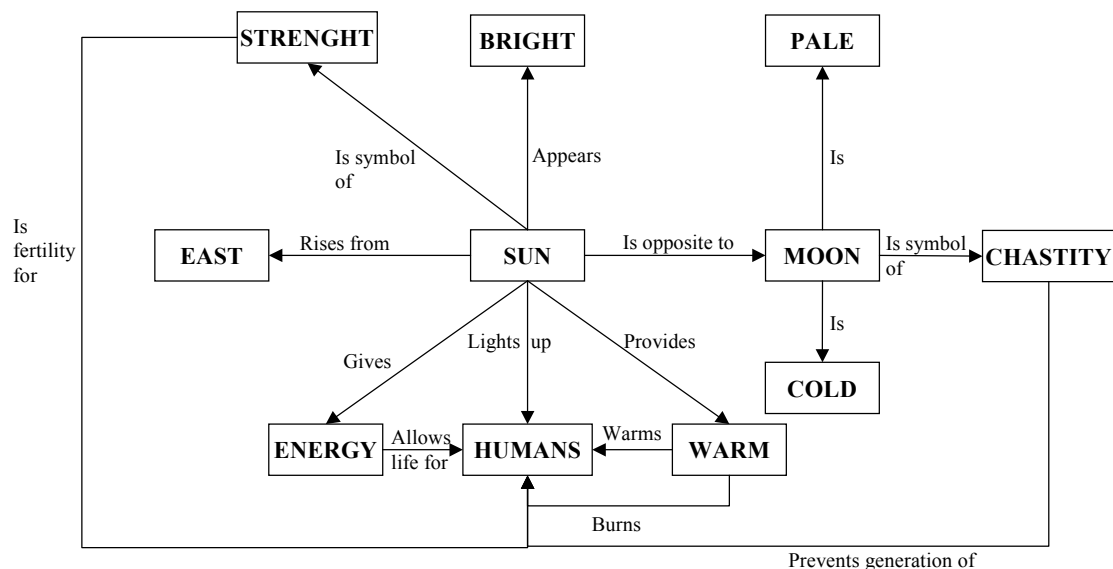


Fig.4. A semantic network of concepts related to the sun, but applied metaphorically to Juliet in the discourse of Romeo

- **Cultures and organisations:** as already said, Hofstede’s work is an excellent basis for modelling possible cultural conflicts or compliances; his work present a set of six indexes (Power Distance, Masculin-

ity/Femininity, Individualism, Uncertainty Avoidance, Long/Short Term Orientation, Indulgence/Restraint) and observed behaviours according to the polarity of any index; over one hundred of countries are examined

and located in respect to each index; looking to the behaviours induced by an artefact it is possible evaluate whether or not this behaviour is compliant with the ones associated to the indexes of a specific country.

## 6. TEACHING AND EXPERIENCES

The proposed model changed deeply the content of the courses held by the authors in first and second level graduations in Design, allowing a kind of learning based on study of methods and of disciplinary contents instead of examples of behaviour.

Students are involved also in practical exercises, in which they have to design something according to the presented model, or to examine artefacts according to the principles expressed in the model, always with satisfactory results both for teachers and students.

Presently the model has been experienced partially and in a progressive way, step by step, according to its evolution and tuning.

Experiences, confirming or influencing some changes have been carried on along years, in many experiments; among that:

- Studies and projects in the field of health care, with design intervention in perceptual aspects; entire department of Istituto Nazionale dei Tumori in Milan has been re-designed for what is related to colours in walls, floors, ceilings, doors, furniture and many paintings with selected subjects and structures have been put inside; we have no measures about the impact, but a survey on the satisfaction of doctors, nurses and patients;
- Studies and analysis of the feminine stereotypes (vamp, showgirl, woman manager, fashion addicted, housewife, mother, widow, ...), associating to each stereotype the perceptual characteristics and the metaphoric net of values;
- Project for interventions in public transportation networks of the underground of Milan, in order to change the mood and the emotions of the travellers;
- Studies about the perceptual elements and the attributed emotional properties for pens

and many others.

## 7. FINAL REMARKS

In the paper the term “artefact” has been frequently used; this choice is due to the fact that the proposed model can be applied to any different kind of Design; the authors applied it to products, to communication and to services.

The model is just a starting point, and verifications must be carried on deeply before to be able of accepting it totally. More, many points have to be studied and evaluated in depth, especially for Interaction Design; it is strong believe of the author that the approach can be applied also

to interactions, but further studies are required, in particular taking into account Procedural Rhetoric [2] and the difference between synchronic interaction (for instance, doing the things together and simultaneously, such as singing in a chorus), and diachronic interaction (for instance, as in a card game, in which the players have to move in turns); studies on games and electronic games are currently on progress to explore the topic.

Experiences and projects are further planned in the health care environment, in order to evaluate the effect of positive emotional environment in the effectiveness of therapies and of work condition.

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