"Make it beautiful". An old request with difficult academic answers.

Silvia D. Ferraris, Lucia Rampino & Venere Ferraro

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Abstract: The evolution of Design as a discipline witnessed a controversial attitude towards the role of aesthetics in the work of designers. Following the functional creed, in many technical academic entourages evolved the idea that a designer job is anything but developing an aesthetic language. In the meantime, in the not-academic world, outsiders think that Design is largely about "making things beautiful".

Based on these grounds, the authors have in recent past years started to teach their students to consider the aesthetics of their design by reflecting on the form-giving issue. To introduce it smoothly into a technical university environment, they choose to avoid words such as "beautiful" or "attractive", rather they speak of "language of products" and of making products "recognizable". The authors apply this approach in their teaching through the development of specific exercises and tools. In this article, the overall meaning of this kind of experience is discussed to highlight faults and possible further developments in the perspective of an ever-evolving design discipline.

Keywords: Form-giving, Aesthetics, Product Language, Product Character

1. Introduction

1.1 From Modernism to Postmodernism

In the making of this article, the authors report a simple but wicked question, on which they started to reflect on some years ago. In their educational activity at the Politecnico di Milano they usually find them-selves not asking their students to design "beautiful" products, why is that?

In their understanding, one answer comes from an historical reading of the discipline's evolution. First, design discipline - particularly in Europe - roots deeply in the modern era and ideals, which are still eradicated into it. Modernity assumption was that of struggling "to conquer the world – as if a better, more beautiful, more humane, faster or more efficient future could be calculated and engineered." (Erlhoff, Marshall, 2007, p. 265). In this view, rationality became the leading factor in both architecture and design and it developed into teaching programs. Very influential has been the impact of the Ulm School "the first school of design to place itself absolutely and intentionally in the

intellectual tradition of modernism" (Burdek, 2005, p. 51). A school where design evolved toward a more scientific/rational process able to integrate different technical, social, psychological, economic factors and where aesthetics became a less fundamental factor. As such, the school of thought of modernism had significant impact in the way the discipline evolved up until now and, especially, in the way it is taught - even today - in schools with a technical rather than artistic approach. Indeed, even if time has passed, in many technical universities, design teachers are expected to teach students to design "functional", "innovative", "sustainable" and – lately – "smart" and "engaging" products, rather than "beautiful" ones. It means that the discipline is permeable to collect new concepts into it, such as "sustainability", but that - in these environments – the approach to aesthetics risks to be still influenced by the original "form follow functions" creed of its dawn age.

In the evolutionary prospective of the discipline, however, even the counter-reaction to modernism was not helpful to determine the role of aesthetic in design. Indeed, the response to the rational coldness of modernism raised with the opposite assumption of postmodernism that "appreciated ambivalence, irony, arbitrariness, polyphony, triviality and spontaneous human qualities" (Erlhoff, Marshall, 2007, p. 302). Indeed, the postmodernist pluralist approach set no boundaries and claimed "beauty" to be subjective, imponderable, and undefinable (Burdek, 2005). This interpretation reinforced the idea – rooted in technical design schools - by which aesthetic factors are not objective and, therefore, tend to be overlooked in technical design-teaching programs.

1.2 The comparison with scientific and technical disciplines

While the history of design gives a point of view about the reasons why aesthetic contents lack in design programs of technical academia, another reading raised from the authors discussion. Possibly, they argue, when design is part of technical schools' programs, it suffers the comparison of disciplines that are more technical (i.e. engineering) and scientific (i.e. mathematics and physics). Those disciplines base their knowledge creation on the application of scientific methods, and strive to collect data that are measurable and objective, to base their research upon. Consequently, they have difficulties in comprehending the "soft" nature of design when it deals with qualitative and not measurable data such as aesthetics and user experience. In these technical contexts, design scholars are struggling to prove the discipline authority, challenged by the request of objective evidence, not just at the teaching level, but especially when it comes to doing research in degree thesis and Ph.D. dissertations. In such an unwelcoming environment, the aesthetic matter is often overlooked.

1.3 The not academic world perspective

While the discipline evolved into different schools of thoughts, the world outside academy became more demanding. The authors have a considerable experience of collaboration with industrial companies. Therefore, they have witnessed the development of clients' requests to design. The role of design has gained ground. Educated managers know that design can be a key factor for innovation and success (Verganti R., 2009); hence, their expectations are high and regard a large set of design qualities. Typically, the new products should at least be "innovative", "user friendly", "cost-effective" and - possibly - "green". Nonetheless, even if the demand to design regards several qualities, none of them undoes the basic request for something "functional and attractive". That is, these two qualities are given for granted. Thus, the request to product design always embeds the request to make products also *beautiful*.

About this issue, the authors notice that both the terms "beautiful" and "aesthetic" appears with different levels of meaning, from a shallow to a more educated one. The first case is certainly

> "Because a specifically formulated design aesthetic is lacking, the term is usually used in its colloquial sense in the context of design. That is to say: in advertising, marketing, branding, and even elementary design criticism, aesthetic is a loose synonym for "beautiful", "tasteful", or "inoffensive". Many who use the term "aesthetics" actually mean "styling", or identify what are assessed as the beautiful or ugly features of a certain object." (Erlhoff, Marshall, 2007, p. 16)

The second case derives from a growing design culture that gives a wider meaning to the terms "beauty" and "aesthetics" in relation to the values that a product can *communicate*. In this perspective, a role of storyteller is assigned to designers, who should *speak* the "language of things":

> "Design has become the language with which to shape […] objects and tailor the message that they carry. The role of the most sophisticated designers today is as much to be storytellers, to make design that speaks in such a way as to convey these messages, as it is to resolve formal and functional problems." (Sudjic, 2008, p. 22-23)

Indeed, when company managers ask for design qualities they generally mean "captivating" and "stylish" objects. The more educated of them are aware that this quality refers not just to shape and color, but also to the overall meaning that is assigned to it in the socio-cultural discourse. (Krippenforf, 2006; Verganti, 2008, 2009)

2. Teaching aesthetic aspects of product design

In sum, the authors, who teach product design at the master Degree in Design & Engineering, Politecnico di Milano, recognized three major factors that characterize the framework of their activity, as regards to aesthetic contents:

- The tendency to underestimate the input of aesthetic in product design, due to the design discipline historical background;
- The tendency to suffer from an "inferiority complex" about other technical and scientific discipline taught in the same university;
- The inescapable demand to designers for the aesthetics of products.

In this perspective, the authors introduced both a specific lecture and an exercise to their product design studio. Since the very beginning, the aim was to find tools and approaches to deal with the aesthetic matter in a technical degree course. The results proved the exercise prove to be stimulating and largely appreciated by students. The authors first introduced this activity in the academic year 2010/11. Then, every year they updated it with small adjustments; this article refers to the academic year 2014/15.

2.1 The reference to product language

Based on the before-mentioned grounds, the authors started to teach students to consider the aesthetics of their design by reflecting on the form-giving issue. To introduce it smoothly into a technical university, they choose to avoid words such as "beautiful" or "attractive", rather they speak of the "language of products".

To this end, they define product design as a unity of *form* and *meaning*, just like semiotics defines language like a unity of syntax and semantics (Bürdek 2005; Krippendorff, 2006). The analogy between the *linguistics* syntax - which is "the way in which words are put together to form phrases,

clauses, or sentences" (Merriam-Webster, 2016) – and the *syntax of form* revels the intent to find the way in which basic elements are put together to form objects. In this perspective, the educational activity focuses on the description of the very basic elements of form (dimensions, proportions, outline, composition, details) and surface (color, texture, finishing) and, after, it defines the way these elements can be combined through different form-giving approaches ("primitive vs free forms" and "additive vs integral") (see paragraphs 3.2 and 3.3).

Likewise, the *semantics* of design has to do with the way we naturally assign *meanings* to objects in reference to their properties and our experience with them. As said, this attribution come with a specific language and in relation to the socio-cultural context.

> "The idea that objects have a property is neither natural, culture free, nor universal. They are the result of linguistic attributions. Attributions are performed in language, and they reflect the perceptual, emotional, or experimental coordination (linguistic habits or conventions) in a particular community. […] Language clarifies, distinguishes, qualifies, and regulates experiences with objects. Without adjectival constructions one would not be able to distinguish among the properties of things, the personalities of people and what objects are said to have or not to have." (Krippendorff, 2006, p. 155).

In the light of this reading, the authors introduce to the students the idea that the design is a human activity by which the physical generation of an object (the syntax) is intrinsically connected to the generation of its meaning (the semantics). Then, since "language is a very complex concept" (Krippendorff, 2006, p. 150), the teachers focus on the concept of *character* (see paragraph 3.3) pointing out how the form-giving process of an objects affects the making of its character.

The exercise "the form of the product" comprises: an introductory lecture; an analytical exercise and a design exercise, as follows.

3. The exercise "the form of product"

3.1 Vocabulary of form and surface terms

The introductory lecture describes a vocabulary of terms and two form-giving approaches to use for understanding and analyzing the products.

The idea of a vocabulary came up during the design studio courses, where the authors realized that, very often, there were misunderstandings with students due to the lack of a proper vocabulary for discussing the product morphological features. The aim of better defining the vocabulary is, therefore, to share a common language during the form-giving process.

Together with other colleagues (Ferraris et al., 2011; Ferraris 1b et al., 2013; Gorno and Colombo, 2011), the authors selected a vocabulary of proper terms to help students analyzing the form of industrial products. In more details, the authors selected a list of parameters (i.e. "proportion") to describe the morphological features; then, for each parameter they chose the corresponding definitions and characteristics, and they selected some images to be as clear as possible.

The authors chose the word "parameter" instead of "attribute" (which is also equally applicable); because they wanted to highlight that each parameter defines a physical aspect of the form, which *could* be measured, even though this analysis is exquisitely quantitative. Hence, the effort is to let the analysis be as "objective" as possible, with no intention to say "how" to give form nor to attribute any a-priori value to any parameter. It is strictly a definition of meanings.

For instance, the definition of the parameter "proportion" is "a relationship between things or parts of things with respect to comparative magnitude, quantity, or degree […] which can vary between being balanced/unbalanced". (Ferraris et al, 2013; Gorno and Colombo, 2011) Balanced/unbalanced is a characteristic, which attributes quality to an object. That is, when looking at the proportion of an object, it is possible to state its "degree of balance", meaning that it can be *extremely* balanced or *extremely* unbalanced or any degree in between. To clear the definition, the authors also referred to a schematic description of the concept and to some products, as in Figure 1 where there are two armchairs, the *very balanced* Vanity Fair by Poltrona Frau, and the *very unbalanced* Ron Arad's Big Easy, by Moroso.
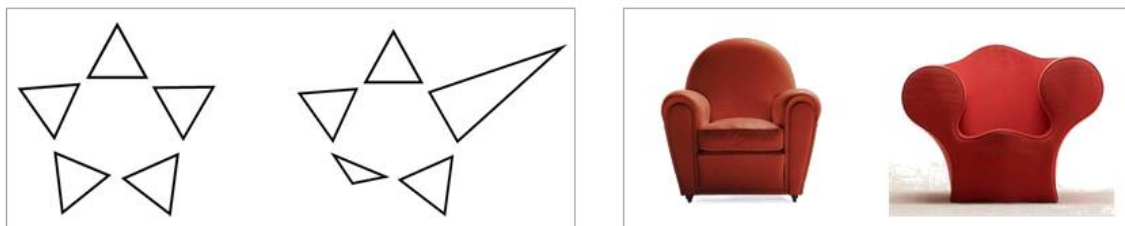

Figure 1. Proportion parameter explanation: balanced vs unbalanced

The teachers are always very careful not to add any value attribution to this reading. Therefore, they never say "balance is better than unbalance", "more beautiful" or "more correct", or anything like that. On the other hand, when possible, they point out how different proportions translate into different *characters*. Indeed, the first armchair could be "serious and classic", while the second "funny and playful".

In this first part, the authors aim at giving the students some reference points about the connection between the product form and its meaning, particularly the character.

3.2 The four approaches to form-giving

The introductory lecture covers the topic of form-giving, describing two basic approaches by which designers combine shapes and lines to generate the form of objects. These approaches correspond to two opposite outputs: "primitive vs free forms" and "additive vs integral forms".

In the first case, the authors distinguish between two opposite ways to give form to objects: one is the *combination of basic primitive forms*, while the other is the *combination of free forms and lines*.

The first case is that of some historical styles of the before-mentioned modernism:

> "The reductionist aesthetic of De Stijl was characterized on the two-dimensional plane by simple geometric elements such as circles, squares, and triangles, and in the three-dimensional world by spheres, cubes, and pyramids […] The Bauhaus and its successors, such as the Ulm School of Design and the New Bauhaus in Chicago, looked to this tradition, especially in their foundation courses […]" (Bürdek, 2005 p. 27)

Yet, it must be noted that, also other styles, such as Art Deco, used geometrical and abstract forms with a decorative purpose, visible in some noticeable examples such as Chrysler Building in New York.

This approach to form-giving is visible even nowadays. Its main characteristic is that the bi or three-dimensional primitive figures, once combined, are still recognizable in the final product.

On the contrary, in the free-form approach the object is generated from free lines and shapes without any visible geometrical scheme. Again, this approach is at the basis of some important styles in the history of design, one is *streamline*: "Developed from natural forms […] streamlining became a symbol of modernity, progress, and the expectation of a better future" (Bürdek, 2005, p. 179-180). The other is the "organic design" that is inspired by nature-like forms and/or principles.

In the lecture, the approaches are defined through historical and contemporary examples, possibly showing two opposites in the same product category, as in the following kettles.

Figure 2. M. Berntsen, Quack thermos flask, Georg Jensen GmbH, 2003; Aldo Rossi, Bollitore Il Conico, Alessi, 1988

In the lecture, the other approach to composition refers Dieter Mankau's formulation (Burdek, 2005) of the concepts: additive, integrative, and integral forms, well expressed by the image below. The additive approach is a visible combination of different elements (in the examples: the container, the handle, the spout), while the integral one derives from the subtraction of the functions from a main figure, thus the integrative is the step in between.
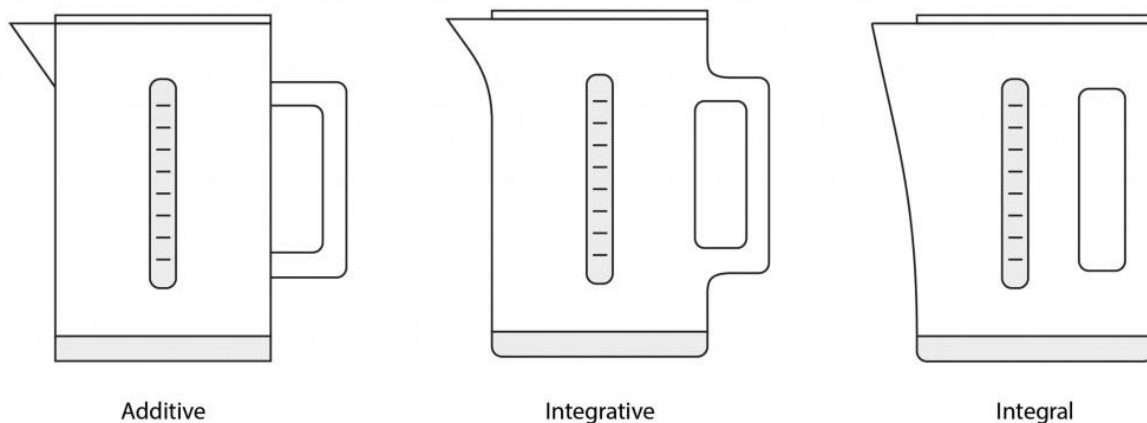

Additive   Integrative   Integral

Figure 3. Form-giving approaches: additive, integrative, and integral forms

The additive approach relates to a more functionalist approach where the parts of an object with different functions are visible and clearly added one to another. In the integrative case, the product components are perceived as distinct but integrated. In the integral approach, a basic form predominates on the functions that are cut out from it, as in the following coffee makers.

Figure 4. Richard Sapper, Coban, Alessi, 1997; Luca Trazzi, Francis Francis, Lavazza, 1999; Nescafè Dolce Gusto, De Longhi

Once defined these approaches, the authors systematized them into a scheme that works like an analytical tool. The scheme combines the opposite approaches as in Figure 5.

Figure 5. The analytical scheme with examples from the product category of table lamps

The authors describe the effect of the combination of the two approaches with several examples of products. However, while the examples are perfectly corresponding to the definitions, as in Figure 5, usually objects are not so unambiguously fitting in one single area of the scheme. That is why the scheme proved to be a very useful tool for the students to make the effort to look carefully at products' shapes and place them correctly in the scheme. The aim is not to look for the "right" answer, which sometimes does not really exist, but rather to improve the form-analysis skills.

3.3 The relation to the "character"

The aim of the introductory lecture is to highlight the relation between form and language of the product. It points out that designers configure the form of products through different approaches and selecting several parameters so that these choices determine the overall "character" of the product. By using the concept of "character", the authors recognize that:

> "People, as well as things, appear to have character -- high-level attributes that help us understand and relate to them. A character is a coherent set of characteristics and attributes that apply to appearance and behavior alike, cutting across different functions, situations and value systems--esthetical, technical, ethical--providing support for anticipation, interpretation and interaction." (L. E. Janlert et al, 1997, p. 297)

Thus, the ultimate purpose of the teaching activity is to let students be aware of form-character connection, pointing out that designers oversee it and, thus, they shall take it as challenge and opportunity.

3.4 The exercise brief and steps

After the lecture, the students were asked to analyze and redesign a given category of products, which in 2014/15 were desk accessories. Each student had to pick one category of objects (i.e. calculators) to analyze it from the point of view of form and character. After the analysis, the students applied the same form-giving approach and the same character to the design of another desk accessory (i.e. a tape dispenser). In the end, the students created a group of products with the same form-giving approach and character, so that this new group has the same "family feeling", as in the following examples.

Figure 6. desk accessories Buro by Lexon, desk accessories by JS

It is important to highlight that the exercise does not set "aesthetic rules to shape the artificial world" but sets a framework of reference.

3.5 The exercise output

The first step of the exercise is an iconographic research. In this phase, students look for examples of one product (a calculator, in the following example by students Menchini, Raffaelli, Rancan) and, then, place them in the scheme. This way, they learn to look carefully at shape, composition and details and they start to understand how complex the form-giving issue is.

Figure 7. Scheme of the form-giving approaches

Afterwards, among the collected images, students choose a product they find particularly interesting and analyze it according to the form-giving approaches and the given vocabulary. In addition, they try to define the product's character. For this last request, they do not have any specific vocabulary or tool to use; they use the words they prefer as freely as possible. In the following image, the analysis of the Graphia's calculator is displayed. In Figure 7, it appears in the top right area of the scheme.

CHARACTER

↘ simple
↘ handy
↘ informal
↘ funny/playful
↘ clean
↘ light

PARAMETERS OF FORM	PARAMETERS OF SURFACE	APPROACHES TO THE FORM
harmonious	coloured	primitive
stretched out and thin	soft touch	static
straight outline	matt	stable
sharped edges	plastic	integral
minimal		

Figure 8. Analysis of form and character of calculator

Last step is the redesign of a product featuring the character of the analyzed one. The challenge is to develop a form within very limited possibilities that derives from the previous analysis. Also, the students must apply the form approach and the character without altering the archetypical function and layout of the product.
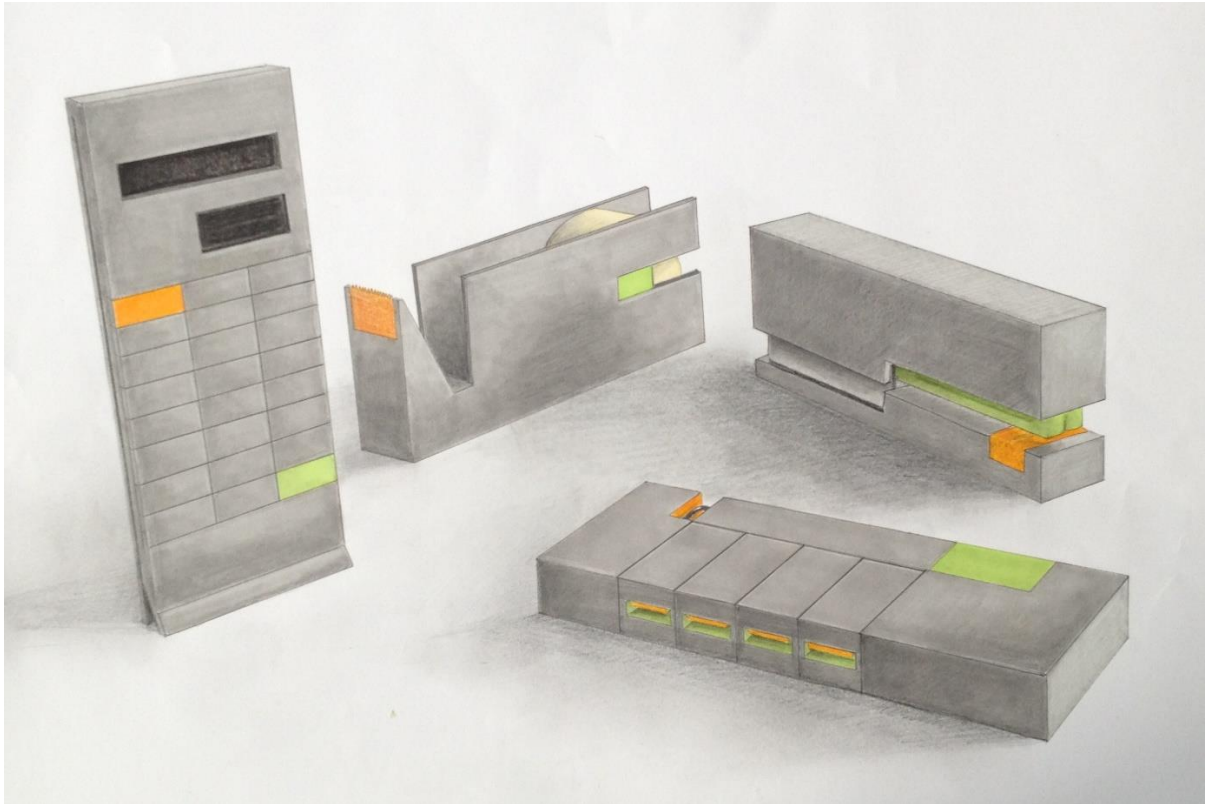

Figure 10. Redesign of desk accessories with the same form-giving approach and the same character of the calculator in figure 7, so to make a set with the dame family feeling.

The fact that clear boundaries are set for the redesign, is useful to set a path to follow. In addition, the boundaries represent a reference for the evaluation of the results, whereas an exercise of completely free form development would be less ponderable. In this context, the assessment of the results is based on the ability to reach the overall family feeling that is checked by comparison of one object to another. This way, the evaluation is not based on objective measures, but at least on a qualitative comparison.

4. Discussion

4.1 About the exercise

Thanks to some years of positive experience, the author can say that the exercise proved to be useful and well structured, highly appreciated by students. Yet one fault was noticed and recently corrected. In the redesign phase, indeed, some students demonstrated a tendency to follow too much the hint coming from the form and character analysis, so that they ended up designing objects impossible to use. In a way, this mistake proves that design needs to take into consideration – always and simultaneously - different aspects: form, mode of use and feasibility. Thus, if "form follows function", the result can be very poor from the aesthetical point of view, but the opposite applies as well when "function follows form".

To avoid this problem, teachers added the concept of the product "archetype" (Ferraris et al, 2015) as a reference to their redesign. As Heskett (2002) remarks, people have been creating ranges of suitable forms for specific purposes since antiquity. Accordingly, some of these forms fit certain needs so perfectly as to become archetypal (for instance, the shape of a vase, a glass, or a fork). A form that perfectly matches a certain function is not the only reason why a formal archetype consolidates: a product's form can also become archetypal as the result of industrial choices. This is the case with the establishment of a product's dominant architecture. Thus, all products in a given category tend to be similar: table fans, washing machines, refrigerators, televisions, and cellphones are some examples (Rampino, 2011). Students are thus asked to stay adherent to the established archetype (Ferraris et al., 2015) in the given product category, so to guarantee an acceptable level of product usability.

4.2 About the discipline

The analogy with the language proved to be useful to build a framework of reference, basic contents and analytical tools. The appreciation by the students and by the colleagues is encouraging indeed.

It must be said, that two mechanical engineers are part of the teaching group of the course, and, about this exercise, they see the importance of the aesthetics matter and recognize it as central part of the design discipline. This experience let the authors think that, possibly, the designers' inferiority complex derives from a prejudice that can be overcome through this kind of activity. Likewise, the use of terms such as "beautiful" are worth using in a design school, even if a technical one, as long as they are clearly based to a framework of reference.

4.3 Limits and future developments

The whole discussion of the article deals with product design education at technical academia, focusing in particular on Master Degree – Design & Engineering – where students attend a very technical design course, in which the design discipline is merged with mechanical and material engineering. For this reason, the article point of view does not describe a big picture on the teaching of aesthetics in design courses, but rather covers a specific issue that might concern similar teaching contexts.

The authors understand the product design field is in rapid evolution. One important change is about artifacts that are more and more embedded with sensors, electronics, processors, smart devices and smart materials. These elements make products dynamic and interactive. Thus, "a domain which was once considered pure industrial design is faced with many interaction design challenges" (Djajadiningrat et al, 2004, p. 7). In this perspective, the traditional design skills that focus only on physical aspects of products fall short, since they fail to address the temporal and expressive aspects of interactive behavior (Gardien et al., 2014). Indeed, the interesting field of development of design aesthetics now emerging relates to the more complex idea of "the temporal form giving" as described by Valgårda et al. (2015).

The exercise does not take into consideration any of these important disciplinary developments. From one side, authors believe that students should master at first the static features of products and, only after, to face more complex issues such as that of temporal form-giving of interactive products. On the other side, the idea of developing this exercise towards an aesthetic of interaction is a challenge that authors will certainly take up soon.

4. Conclusions

This article debates on the opportunity of introducing aesthetic issues in the teaching of design at technical universities. The authors demonstrate that it is advantageous, if a framework of reference is given. They also believe education should be permeable to changes and keep evolving. For this reason, the exercise "the form of product" follows a constant development process, balancing the need to set fundamental solid knowledge with the request of updated design features.

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