A contemporary didactics of innovation in product design. Grip Factors identification and evaluation

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Abstract: A deep reflection on innovation revealed that the standard approach used to present it to the design students did not properly come from a designer’s point of view: the focus on the search of causes, the definition of effects, the forecast of the future impact of an innovation on the market is a typical analytical approach, mainly appropriate to a scientific discipline (economics and sociology). A phenomenological approach, typical of the research of Design, was helpful to observe the successful characteristics that allowed some products to survive the market and society changes through the years. These features were called Grip Factors: through their definition, analysis and evaluation, the designer acquires the importance of an inclusive, humanistic vision of innovation, which must consider all the complexity of the contemporary scenario: economics, society, technology, anthropology, … in order to filter and summarize different needs in only one product.

Keywords: Innovation, Product, Design, Grip Factors, Humanistic

1. Introduction

The contemporary way to “create” innovation in product design gives Designers the main responsibility for its success, because of their skills to control and filter many points of view: economical, technical, communicative, social ones… and to summarize them in only one product.

Exhibitions, articles, publications, conferences, reviews reveal that Design & Innovation have become a combination of forces which is strongly related with the progress of our society. The EU document "Design for Growth and Prosperity (AA.VV., 2012)" defines design methodology, in particular, as the main engine of this progress.

Designers are expected to create innovation, but how do they debate about it?
A research on the main online libraries (Figure 1) revealed the branches of knowledge mainly involved in producing publications on innovation: mainly economists (marketing and management ones) speak about it.

“No advanced economy can maintain high wages and living standards, and hold its own in global markets, by producing standard products using standard methods (Porter at al., 1999)” : innovation often generates value, and therefore money.

The second most involved sector is the sociological (sociology, educational sciences) while our disciplinary field, Architecture and Design, is set at the third place for number of publications (but only if we include the substantial contribution of other related fields as engineering and other technical ones).

The “shocking” revelation was that Designers produce innovation by studying it on texts, theories, methodologies, interpretations, definitions, strategies mainly drawn up by economists. Why? Why has the Design not yet found its own way, independent and peculiar to deal with innovation?

Beyond the economical point of view, it is possible and useful to encourage a “humanistic” vision of innovation, through an integrated and multi-dimensional approach which takes care of many different causes and effects of a product: economics, society, technology, anthropology, ...

This was the starting point of a PhD thesis, about the proposal of a more contemporary way to consider innovation, to evaluate it and to transmit it to the product design students.

Figure 1. Publications with keyword “Innovation” on the title, searched on five online libraries (May, 2014) and divided in branches of knowledge (numbers represent the percentage of the total).

2. Innovation and Design
2.1 Innovation: a connection of different words

Usually we define Innovation according to the dictionary meaning or through the interpretation of an acknowledged personality (i.e. the economist Schumpeter); this is useful if we consider innovation as
yet happened, and we can define it from the point of view of its motivation, source, nature, intensity,...; Designers, instead, usually innovate through a sequence of actions: they create, draw, analyze, make a synthesis, invent,... and so on. From this point of view, set up on a “future” time, beyond its standard meaning, innovation is a term that can be truly defined as a connection between the terms Creativity, Project, Design, Synthesis, Invention, Intuition, News. Such terms are important as they play a fundamental role in every innovative process typical of Design: innovation is the final result of different actions developed in a different order.

2.2 Between Design and Innovation

The original meaning of Industrial Design, which includes the project of form, function, materials, is no more efficient in transmitting the role that design has taken on the contemporary society. At the present time we give design the deep value of Idea: it becomes tangible and accessible for the user as a product, service, process, ... and its power rises together with its attitude to be shared. The sharing requires two transitions: at first we must accept the “new”, then we must consider it useful, because it can improve a previous condition; these two transitions (acceptance and improvement) are also required for every process that generates innovation and produces “future”.

Only the designer has the mental attitude to live in the future, as it was the only possible time dimension in which he could consider his work as “real”; the scientist, instead, works in a "physical" real-world; the artist works in a "symbolic" real world; the mathematician works in an “abstract” world, indifferent to the time parameter (Jones, 1992). In the field of Sociology the term “Innovation” is defined as "a step in the future of a collectively organized mind (Cerroni, 2012)".

In order to outline the concept of innovation we can add more considerations; it is always related with an enhancement: the key feature of innovation is the introduction of an improvement (in politics, society, economics, technology), differently from the concept of “newness”. Innovation has also an inherently “practical” dimension, differently from the concept of “invention” (Schumpeter, ried. 2013). The applicative feature of an innovation reveals the difficulty in controlling each parameter of an innovative process: this uncertainty is related to the risk of “making innovation” and many of the words spent by scholars pertain to lighten this risk or to avoid some negative consequences.

From a sociological point of view, this uncertainty also reveals a dimension of charm and attraction: the unknown element is potentially able to improve an aspect of our existence.

2.3 Overview of the main forms of innovation

There are many forms of innovation because there are several points of view about it. Economists, engineers, sociologists talk and produce scientific articles, papers, books about innovation.

For a designer it could be helpful to understand the points of view, the motivations and also the predictable consequences of «making innovation».

"The concept of innovation is a positional concept: an innovation is related with the context in which it operates (Luciano, 2010)". This definition is fundamental whenever we approach one of the different forms of innovation; it is always changing and always considered relatively, so much that some types of innovation are mutually conflicting: for example the competence enhancing innovation is opposite to the competence destroying one. With this premise a taxonomy of the various forms of innovation is proposed, aimed at a contemporary interpretation and updated for designers, whose index is shown schematically in Figure 2.
The proposed classification includes references to the Economic field (Schilling, 2009), Design, (Rampino, 2012) even with extensions to other areas, including the sociological one; an original part has been inserted, related to the project matrix (product innovation) directly derived from educational experiences and research at the University of Florence. Some macro-categories have been identified: the approach to innovation, the motivation (why), the source (who), the push to innovate (internal, external, systemic), the nature of innovation (process, product, market, organization) with a substantial focus on the product innovation, closer to the world of design; other categories are based on the intensity of innovation (incremental / radical), the environment.
(architectural / modular), the effects of innovation over the skills of a company (enhancing / destroying).

It is interesting to observe that the fever around this topic generated new theoretical definitions over the past decade: Open Innovation (Chesbrough, 2003), Disruption (McQuivey, 2013), Jugaad Innovation (Radjou et al., 2014), Reverse Innovation (Govindarajan et al., 2013), Pop Innovation (Magaudda, 2013), a fascinating hypothesis of a real connection between science and popular imagination proposed by movies and books.

3. Scenario and points of view about innovation

The great interest about innovation is an indicator of the multiplicity of involved competences: to understand the different points of view it is important to explore the contemporary scenario where society, technology, economics, politics produce innovation.

3.1 Complexity

The concept of complexity of the contemporary society can be better understood if divided into factors (Radjou et al., 2014): the scarcity involving natural resources, public financial resources (governments) and private ones (citizens); diversity, that is the co-existence and sometimes the competition of different generations in active roles of workers and consumers, thanks to the rise of the average life duration and the delay of the retirement age; interconnection: the new roads opened by the contemporary communication technologies allow to instantly connect people (employees and customers of a company, i.e.): this causes a change in the type and frequency of relationship between individuals; the speed of change: new products and new expectations are born even before the existing ones have become outdated; globalization: the connection of individuals, knowledge, markets, products (Rullani, 2008) has always been a trend in the history of the society but now, thanks to the speed of transportation and communication, it is really evident.

3.2 How to deal with innovation – Technology and society

It is interesting to understand how the individual faces an innovation. Petrarca (Familiarum rerum) argued that "we fear new things and despise the common ones [...]": the mind is unprepared to newness, so that it can be disturbed, while at the opposite it uses the common, well-known, things as a shield towards all the difficulties. Several years later Freud (1924) specified that:

"sometimes, if the circumstances are not of primary nature, you can also encounter the opposite behaviour, that is a strong attraction to all that is new".

In order to understand innovation

"we have to literally figure it as a [...] demonstration of our ability to generate future, [...] question of individuals, society, culture at once. Innovation requires a renewal in thinking of it[...]; it is a step into the future (Cerroni, 2012)"

and, in other words, it is also a "challenge to common sense and everyday attitude (Jedlowski)". The myth of Ulysses reminds us that this concept was perfectly clear in Greece many centuries ago.

Innovations are the fruit of compromises, tensions among different subjects and different groups; if society naturally tends to innovation, also the technology does it: the first because of the continuous regeneration of stereotypes and common sense, the second because of the advance of science and research.

How do Psike and Tekne interact?
"The technique does not tend to an objective, it does not reveal the truth, the technique works (Galimberti, 2000)." It is a millennial relationship: technology and society have always been crucial topics when discussing on innovation. In the past years we could find two main theories about it: the technological determinism affirmed that technology itself is the key of the social progress (Innis, 2001); on the contrary, the social determinism (Breton, 1995) endorsed the vision of a society where only humans need to lead the development of new technologies. Actually, in a contemporary approach, it is more realistic to talk about "Co-production": technology and society evolve together, in a continuous exchange system, by following an integrated vision (Jasanoff et al., 2013).

"A technological innovation can unfold its transformation potential only if the socio-cultural context is able to receive it (Campanelli).

An example of this cooperation is the crowdsourcing technique, that is the acquisition of ideas and suggestions directly from the crowd (society): this is possible thanks to new ICT and social networks (technology).

The improvement of society and technique can not finish. Beyond political choices, economic strategies, scientific discoveries, fashions and social trends, current crisis and future expectations, ... our human nature (of imperfect beings with imperfect technologies) is always in evolution, in a constant tension towards the completeness.

We are not free to choose whether to innovate or not: our environment chooses it for us.

4. An integrated proposal

A deep reflection on the innovation revealed that the standard approach used to present it to the design students did not properly come from a designer’s point of view: the focus on the search of causes, the definition of effects, the forecast of the future impact of an innovation on the market is a typical analytical approach, mainly appropriate to a scientific discipline (economics and sociology).

But our discipline has a lighter and more efficient way to deal with innovation: the phenomenological approach, which

"highlights the ability to produce knowledge, ... through ways that not necessarily reproduce those scientific in the positivist sense. Research of Design assumes a phenomenological feature, or observation of the reality to derive general rules and principles, ... (Bertola et al., 2006)."

This approach was helpful to carefully observe the successful characteristics that allowed some products to survive the market and society changes through years, decades, centuries, after the “approval” of several generations of users, after the birth of new materials and technologies. During didactic activities, it was possible to notice that those products are harder than others to innovate, because of their assessment.

I called Grip Factors the requirements able to keep these products still alive, even in our complex contemporary scenario. If we think to a violin, almost-unchanged after 4 centuries, we can easily focus on the concept. Archetypes and dominant models were the main field of the research which, after several experimental attempts, led to the proposal of a definition.

4.1 Definition

The proposed Grip Factors are summarized below, divided into seven macro-categories

I - Interpretation
Clearness of meaning

The grip grows if the meaning (Sense, Contents, Message, Value, Affordance) of the object is clear and it cannot generate any doubts. Where this condition is not satisfied, a point of innovation could be found. Many products have clearness of meaning: a yoghurt jar, fireworks... they cannot be used for other purposes.

Specific answer

The Grip grows if the object offers a specific solution to a specific question. The accurate «definition» of a problem is a fundamental step towards its solution (Munari): it is important to find the specific question to solve: a trolley correctly answers to “how to move luggage on flat surfaces”.

Satisfy the needs

All the objects satisfy one or more needs. In comparison with the Maslow’s pyramid of needs (figure 3) the grip seems to grow if the product satisfies needs closer to the base of the pyramid. “In the primary needs the formal and the symbolic feature has a lesser importance (Rampino, 2012)” because the product is not exhibited or shown to other people in order to set our role in the society. On the contrary, objects that confer a social status (jewellery, cars, clothes), frequently changed, are far from the base.

II – Formal values

Completeness

The grip grows if the relationship between form and function is balanced. An object is «finished» when form doesn’t prevail over function and when function doesn’t prevail over form.

"What is true is also beautiful, independently from taste, formal style, elegance (Michelucci, 1997)".

Beauty
It could be obvious to say that with the growth of beauty, the grip of the product also grows. But if we consider objects in which formal values are not contemplate as a requirement (a hammer, a door key, an air-conditioning fan, ...), when beauty is introduced in their designs it becomes a winning parameter (Dyson company revolutionized its benchmark by introducing formal design and elegance to those products which formerly were mechanical and functional only).

III - Technology

Industrialization

If the object can be produced with industrial processes, the grip grows: behind its production there is an economic appeal that acts as an engine: someone has the determination to set up an industrial process to realize that product, despite difficulties; if the product is still in production, it means that it has success in generating profit. It works.

An industrial production is also able to optimize materials and processes, even for different markets.

Material optimization

The grip grows if materials are used at the extreme of their possibilities (a wooden kayak, a bottle, a radiator). If the economic advantage is clear, the increase of performances with the simultaneous reduction of material is also able to carry out many positive consequences, for example in terms of sustainability: less material means less weight, waste and CO₂ emission during production and transportation; a perfect use of materials is also able to reveal the truth of the product: “Less is more (Mies)”, the unnecessary is not present, with positive reflections in its affordance, too.

Complementary materials

The grip grows if materials are used in a complementary, creative and helpful way. Without the usage of two or more materials, the performances of many products would not be reached, and perhaps those objects would not have any reason to exist; we can think of small yogurt jars (a thin removable aluminium protection over a functional plastic container), of beach chairs (flexible textile and strong wooden structure: this unmatched mix of materials keeps this object safe, light, foldable, movable, ... and still alive two centuries after its birth), of wine barrels, bows, ...

Asset of the technology

If the technologies used for the production of the object are in a dominant-design phase, the grip grows: at this stage it is possible to find optimized answers in the choice of materials, of the working processes, of the supply chain.

IV - Ergonomics

How to handle the product

If it is easy to handle it, the grip of the product grows. This feature (obvious for all the products related with sport, tools, traveling) can improve the way to move furniture during transport and assembly, or the way to store and move goods on a construction yard, ... A light aluminium ladder is easily movable by only one person: many maintenance services can pay only one operator).

Safety

The grip grows if the product does not provoke outrages or problems in posture. The grip also grows if the product can solve these problems. The idea of a side door to easily access the bath led to a new generation of product, safer for people with walking difficulties. The PC mouse, accused of causing
pain and contractures to wrist, was modified in order to solve those problems and was successfully relaunched.

V - Plus

**Change in the behaviour**

If the product forces the user to change its behaviour, it means that its usage has a high level of advantage; its grip grows. The “remote control” revolutionized the way to use gates, garages, televisions; ABS system forced to change the way to operate on the brake pedal.

**Necessity gradient**

The grip grows if the product establishes a point of no return; at the opposite we can say that the product is absolutely not necessary. Between these two opposites we can try to establish a *necessity gradient* and use it as a tool to evaluate the strength of that product in the market. It would not be possible now to find a contemporary TV with buttons to change program or a tennis racket made of solid wood. On the other hand, some objects will probably disappear in a few years (resistance lamps, satellite external decoder, ...).

**Second life**

The grip grows if the second life of the object is thought or projected. If a problem can be observed, sooner or later someone will find a way to solve it: for this reason it is fundamental to foresee how to place an object (not only big ones) when not in use. Without this concept, some products as foldable treadmills or cyclettes could not be sold for the home usage.

VI - Sustainability

**Prevision of the consequences**

The grip grows if the product is sustainable and if externalities do not probably occur. A consolidated object expressed its externalities in use, form, materials, life-cycle, recycling possibilities: the amount of the positive consequences of its production prevails over the negative ones. On the contrary, a product which could generate externalities (new materials, incomplete life cycle analysis, negative implications on the society, ...) will offer a poor grip: the producing company could be sooner or later forced to change something in its production chain.

**Moral value**

The grip grows if there are not any moral doubts about the project. An object that does not cause overexploitation of natural resources or damages for future generations, an object that actively forces the user towards a correct ecological behaviour has more possibilities to survive in the market and in the scenario.
VII - Scenario

Communication skills

The grip grows if the product supports and promotes the communication, interaction or sharing among people. The new ICT technologies are undergoing a great boost because they support these features (*sharing* becomes a form of communication itself, regardless of the content of the post). Even a uniform (doctor, soldier, ...) can give us a lot of information about the person who wears it: today even in a hair salon we can find operators wearing uniforms. Recently Coca-Cola introduced a new label with proper names: this is a chance to "connect" friends or family members, by generating an atmosphere of joke, positively associated with the brand.

Multicultural appeal

The grip grows if the product features can be appreciated in different cultural environments; those supporting the multicultural acceptance prelude to the sharing.

Ease in finding

The grip grows if the product can be easily purchased, in real or virtual shops, answering the requirement of *speed* in the contemporary social scenario.

Multi-generational benefit

The grip grows if different generations can use the products. People of 5 different generations use the same kind of glass or shopping cart... they also use it in the same way anywhere in the world.

Auto-innovation

To keep the attention in product standards (ISO, UNI, EN, DIN,) can increase the Grip. The existence of standard rules for the production of an object forces dimensions, materials, specific features of the object itself; the designer is limited in his possibility of project but, as soon as a legislative change occurs, all the involved companies suddenly produce new products which cause a “disruption” of the previous ones. This could be called *auto-innovation*. Those who are able to foresee a legislative change will probably win the race to realize the first new product.

4.2 Grip Factor Evaluation

The Grip Factors Evaluation (G.F.E., figure 4) is a tool designed to graphically represent the strength or the weakness level of each factor, after having assigned a score to each Grip Factor; an analytical report provides additional information.

It could be used in different stages of an innovation process:

- in a benchmark analyses, in order to compare the features of two or more products;
- before starting a new project, in order to find the points of weakness where innovation is more necessary; it could be important also to evidence the strong factors for which that product is purchased.
- during the evaluation phase of a new designed product, in order to understand the improvements in comparison with the previous condition, even before launching marketing strategies and analysis.
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The G.F.E. is a discretionary assessment, which depends on the judgment and experience of the compiler; it is not possible to provide an objective methodology to evaluate a product, remembering the inherent dimension of uncertainty and risk of every innovation.

The utility of G.F.E. is above all in making the evaluation more systematic and structured, providing a reminder of the positive grip factors of a product, through a multi-dimensional vision of innovation.

During the research the G.F.E. was applied to several case studies, revealing the needs to set also a hierarchy of importance for each Grip Factor, related to the product sector.

4.3 Final thought

By changing the approach to innovation, from a point of view mainly focused on obtaining results (economics) into a correct seek for a “design content integrity” (Mari), this could help to consider the Designer as a new “humanist”, able to filter all the inputs of the scenario into a resulting product that reflects his mental attitude, by answering to social needs, more than satisfying only economic impulses.

After the design discipline was divided from the original architectural (humanistic) branch, this kind of approach could remind young students that a Designer is first of all a philosopher / creator, warning them about the risk of becoming only a “player of taste and trend”. In the first case he will better do a project, while in the second one he will only do a project.
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