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Re-futuring: Awareness and design process in hyper-technologic era[1]

Re-futuring: Conscientização e processo de design na era hiper-tecnológica

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Abstract
The complex relationship between man and technology is the starting point of an interesting design process, aiming to highlight the lack of awareness in most of the behavioral choices of man. Man is distinguished by its nature of finding short-term solutions, with the almost complete inability to prefigure long-term effects resulting from his unconscious decisions. Technology, on the other hand, is developing fast, becoming day by day more potentially uncontrollable. Specific attention is given to the innovations that can cause unpredicted impacts on human life: knowing history by its sociological implications allows us to recognize some recursive patterns that can then be transformed into opportunities. The goal is not an attempt to predict future trends in technological innovation but to find the right formulas in order to raise the level of responsibility in individuals' behavior. In this paper the role of the designer is analyzed within the technology of 3D printing, enhancing its potential ability of changing both technological and human environments. A first answer to the problems triggered by 3D printing can be found, for example, in the positive phenomena that are activated within collaborating groups by sharing space and knowledge, in communities with a bottom-up approach, where the designer is actively involved.

Keywords: human factors, ethics, awareness, 3D printing, rapid manufacturing, behaviors, transdisciplinarity, re-thinking, re-making, metadesign.

Resumo
A complexa relação entre o homem e a tecnologia é o ponto de partida de um processo de design interessante, com o objetivo de destacar a falta de consciência na maioria das escolhas de comportamento do homem. O homem se distingue por sua natureza de encontrar soluções em curto prazo, com a impossibilidade quase total de prefigurar efeitos em longo prazo resultantes de suas decisões inconscientes. A tecnologia, por outro lado, se desenvolve rapidamente, tornando-se a cada dia mais incontrolável. Atenção especial é dada às inovações que podem causar impactos imprevisíveis sobre a vida humana: conhecer a história por suas implicações sociológicas nos permite reconhecer alguns padrões recursivos que podem ser transformados em oportunidades. O objetivo não é uma tentativa de prever tendências futuras em inovação tecnológica, mas de encontrar as fórmulas certas, a fim de elevar o nível de responsabilidade no comportamento dos indivíduos. Neste trabalho, o papel do designer é analisado no âmbito da tecnologia de impressão 3D, aumentando a sua capacidade potencial de mudar os ambientes tecnológico e humano. A primeira resposta aos problemas desencadeados por impressão 3D pode ser encontrada, por exemplo, nos fenômenos positivos que são ativados dentro de grupos que colaboram através da partilha de espaço e do conhecimento, em comunidades com uma abordagem *bottom-up*, onde o designer está ativamente envolvido.

Palavras-chave: fatores humanos, ética, consciência, impressão 3D, produção rápida, comportamentos, a transdisciplinaridade, repensar, retomada, metadesign.

[1] The paper was originally presented at the 5th International Forum of Design as a Process "The Shapes of the Future as the Front End of Design Driven Innovation", held at Tecnológico de Monterrey University – Campus Guadalajara (Mexico), Sept 18-20, 2014. The paper was included in the proceedings of the event, edited by Flaviano Celaschi *et al.* (ISBN 978-607-515-147-2). This is a reviewed version of the paper, improved with the contributions from the Forum.

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Introduction

The global society is engaging in more and more complex problems, regarding environmental, social, behavioral, technological and ethical issues. It concerns with questions that could not be solved by the same attitude that have generated them; this is the reason why a "radical change of mentality" (Capra, 1982) and the (re)introduction of new values of responsibility is needed. Awareness is the fundamental requirement of responsibility, especially when rapid technological development has different speed from the slow social repercussions progress. This gap of speed represents the potential risk of misunderstanding and loss of control.

Therefore, it is pivotal not only recognizing the opportunities that are projecting from now on, but also trying to imagine which could be the future consequences, and advantages, of those opportunities. The traditionally linear approach, which looks to technology as a tool able to solve problems and satisfy needs, cannot be enough, especially in a context in which it (the technology) grows at exponential speed through complex and interconnected paths. Stop doing for a while and look out for innovative long-term solutions: we have to be aware of what we have and how we interface with it. Studying human behavior could permit an upgrade in mentality and, moreover, in the constant evolution of the concept of design. For this, a spreading phenomenon involving universities is another interesting and crawling reflection point. The partnership generated by companies who look for ideas, freshness and opening in university, is an occasion where innovation research and culture meet where they are allowed to cohabit with the aim of a correct progress: under ethical issue and without the duty of economical and political ones.

First, in order to make the present situation understandable and to try to suppose which could be the future scenario, we have pointed out the role of History, which gives us an interesting interpretation of the relationship between Humans and Technology. History contribution lets us recognize "patterns" (Kurzweil, 2008) that tend to recur in the course of time. Humankind, driven by the survival instinct and by the need of overstepping its limits, evolves itself first in a biological way and then in technological ones. Therefore, "Humans and Technology are indissolubly bound by the permeability that involves and shapes both of them in a continuous and reciprocal way" (Kelly, 2011). They are inseparable all along.

Humans follow instincts that, in a continuous evolution, impose choices and behaviors. First of all, there is the empathy feeling, which combines the similar in an innate inclination to share needs, emotions, feelings. This kind of feeling is confirmed by the primordial necessity of showing one's own mood that has allowed the "birth of the language, of the civilization, of the writing" (Manzi, 2006). The act of sharing has been possible since humans have understood that sociality is the way to survival: the group protects itself, strengthens itself and sharpens its intelligence. In turn, intelligence is strengthened by the manual skills development, which becomes one of the most peculiar aspects of humankind, crucial for the life evolution. Humans require contact, handicraft and authenticity to keep a mental and physical balance.

On the other side, Technology appears in trajectories that allow us, through the trend analysis, to recognize some of the main features: it follows an exponential acceleration, faster and faster, overwhelming, dominant. Since the invention of writing, then with printing and afterward the digital revolutions, a sudden spread of general knowledge is possible, through the sharing of data (Bennato, 2011), experiences, and knowledge that potentially make the individual more and more powerful, but loaded with responsibilities, isolating him socially (Hughes, 2006). Moreover, Technology is increasingly autonomous: its self-organizing, self-repairing, self-generating abilities makes it more and more "independent from Humans' action" (Granieri, 2009).

Given the size of the issue, particular attention is given to the social aspects relating to the liaison between Human and Technology in order to outline starting points from which to begin to build guidelines, hence identifying the designer active role and involving all those protagonists, engaging innovation, which requires new attitudes. The contribution of some people met and interviewed during the first survey phase had a key role in the research. Floridi (1997), an Italian philosopher former founder and director of the Information Ethics research Group at Oxford University, reminds us how "collaboration is necessary so as the individual can keep evolving himself", after having explained the mechanism through which a person learns information. Therefore, we define the way in which some technological innovations generate effects and behavioral changing.

Values and methodology

Understanding the process through which innovations enters the everyday life becomes essential: some figures, called innovators, choose to adopt a certain innovation whose use modifies behaviors, introduce it and make it accessible to the community, who in turn modifies its behaviors, generating new lifestyles. The values, shared by the community, change and influence the individual ones who belong to it. These are not sudden consciously visible changes: adopting a new technological asset driving to a modification of an attitude has different adoption times and is perceptually softer. Consequently, the newly created needs, the newborn meanings and the new derived culture originate a process in continuous evolution. Innovators belong to the curious, passionate, expert sector. On the other side, reaching common people needs motivations that allow them to adopt the technology once confirmed, guaranteed and approved by innovators. Make people ready for the coming of technology and get it used to the ones that are near to come is fundamental in order not to be caught unprepared.

Humans adapt themselves to technology, running after its rapid evolution and causing two different effects: on one side, the unsuitableness feeling for the elusiveness of technology that forces a continuous, sometimes exhausting, update; on the other side, the excitement feeling for the disposal of something that always allows you to overstep your limits. These two reactions are in contrast and risky provoking a sense of powerlessness in the individual lacking a correct awareness. At this stage,

the designer must intervene as a connector and mediator: connector between innovation and its adoption within the community, as to supply knowledge able to allow correct choices and responsible uses; mediator between the individual needs and the community ones, as to neither the first nor the other ones could be imposed without the right knowledge. Renzo Giusti, Senior Designer at Experientia (Socialfare, n.d.) (2013, Torino) agrees with this matter: his philosophy is precisely the physical approach and engagement of future technology users in order to define and guarantee conditions for the best form of well-being, through methodologies as the user experience, participative workshop, direct contact with subjects. Social Fare, an entity just born in Turin, follows a similar method, about which Roberta Destefanis (2013), a Systemic Designer, tells us how the combination of social action and technology could contribute to the Common Good. Therefore, the designer is guaranteeing responsive behavior and choices that otherwise would run the risk of being misunderstood, thus becoming damaging.

The context in which the designer can move into necessarily requires the awareness of the present overview to be completely understood. This is why we have examined four main developing areas of interest, in which Technology has a key role (Information Technology, Genetics, Robotics and Nanotechnology). They follow one another thanks to the permeability of sectors; they reveal great potentialities and advantages, likewise enormous risks and dangers. The first area in which the repercussions are already globally visible is Computer Revolution. Here some of these consequences: the diffusion of knowledge made possible by the digital revolution; an always connected Network that permits the reduction of physical and temporal distances; the birth of a generational gap between those who "lived the digital revolution from the beginning, being born before its start, and those who are born during the ongoing revolution" (Granieri, 2006); the beginnings of the digital gap that separates those who own and use information from those who haven't got any possibility to reach it (Cukier and Mayer-Schoenberger, 2013). When Technology invades the medical science, in the Genetics field, the ethical issues assign all those responsibilities, once held by Nature, to Humans: a new awareness is impelling to help humans with new, mostly unexpected moral decisions. Nanotechnology concerns the technology of the smallest dimension of materials, devices and productive processes which permit time and especially space saving and could be great if managed with responsibility. Finally, Robotics is the field that makes technology more and more similar to Humans in attitudes and, above all, in brain connection, threatening their independence and making them hybrid.

Case study

An area of interest that involves not only the four identified sectors but also a current and urgent matter is the 3D Printing. It is considered as the ICT Revolution continuation in the tangible production and a true revolution of the traditional production process. The availability and the accessibility of Open Source proposals and the opportunity of the personal self-production support a bottom up approach, thanks to cheaper devices and to a natural co-operation that is activated with the "learn by doing" process. The risk we have to avoid to run is the misunderstanding (Figure 1) of this technology in a background used to consumerism and unwilling to care about environmental, social and economic degrade.

The peculiarities of this type of technology, in terms of repercussion and application, consist in very low cost of introduction, use, maintaining and maintenance, reduced machinery dimensions, as for the domestic printing, rapid evolution and improvement in performances, materials, achievable quality, the opportunity of crossbreeding different materials in ways that no other traditional, even computerized production is able to do, potential opportunity of using any kind of material in semi-fluid deposit, also at room-temperature (also food production is possible[2]), the potential introduction in different fields, from the specialized industry[3] to the individual use, up to the self-building[4], reproducibility and self-reparability of machines in Open Source version[5].

These features set new paradigms of use, which in some conditions could disrupt the industrial traditions we had been accustomed to. Serial production is no longer

Figure 1. 3D Printer in an Amsterdam shop, 2013 (original image by Fabrizio Valpreda).

[2] Barilla said to be in the testing phase of the 3D printing process for its pasta in restaurants (3D Printer Plans, 2013).
[3] Like in the case of Rolls Royce for its aircraft components (Worstall, 2013).
[4] W.Afate 3D printer: technological early adopting in the field of high social disadvantage (W.Afate, n.d.).
[5] Like RepRap (n.d.), Makerbot (n.d.) and Ultimaker (n.d.).

exclusively industrial (Brambilla, 1954, p. 10-12) but becomes mass production, reproducibility of objects that are natively digital becomes free and accessible[6], the typical costs of mass production objects with 3D printing is negligible if compared to the traditional method.

Thinking if the current use is really the final one seems to be very important: the 3D printing industry was born as a process of rapid prototyping and now is likely being sold as a new "factory of desires" (Innovation Center Iceland, 2013). This is what is happening, for example, in Iceland, as told us Þorsteinn Broddason (Innovation Center Iceland, 2013), a marketing expert hosted in November 2013 at the Turin FabLab (ITA), where he held a seminar talking about the spread of FabLabs in his country. The people enthusiasm and participation in these laboratories, especially women, surprised everybody. What was shocking is the complete lack of awareness of what the consequences of these new production habits could be, bereft of any design methodology and without any purpose.

The comparison between Iceland and Italy suggests the possibility that 3D printers can arrive in the homes of us all in the very near future. As already happened with traditional printers, the society may not be ready to accept and understand their use. The first alarm is represented by the "loss of some identities" (Schirrmacher, 2010): in the first place, the role of the designer could disappear when everyone can design and produce everything. The new technology can be transformed in "mere production of gadgets" (Lanier, 2010). In addition, the traditional knowledge might be overwhelmed by the novelty and could be lost forever (Micelli, 2011).

In order to get responsible for our own future, it becomes necessary to stimulate an increase of awareness, by tickling solid principles through practical insights based on sharing.

There are two basic starting points so that the awareness can grow and stabilize good communication, strong capillarity of digital, through which knowledge can spread and reach the masses, collective use of technology, through the sharing of spaces can stimulate the sharing of ideas and facilitate the consolidation of principles. In this way, a solid ethics is build, especially because it is shared and respected.

Sharing spaces means building collaborative platforms within which the protagonists are called to interact and play different roles. Each of them is "essential for the network to work" (Capra, 1996) and make it complete and in constant evolution. The innovators introduce new technologies, keeping in mind to make them understandable to the individual; companies promote cooperation and finance the group; institutions ensure the continuous updating of universities and training courses; artisans find their place as holders of a traditional knowledge teaching the "know-how". The individual who becomes part of the community participates with interest and passion, which can generate new ideas and suggestions for improvement. Finally, the designer shall facilitate the dialogue between all these roles with his skills as a mediator between subject and needs. This kinds of places are a relevant sign that people are changing their directions, not only to use but also to encounter technology, production, lifestyle in general: a more attentive approach is spreading mainly through young people.

New ideas, experiments, innovation, synergies, freshness, curiosity, initiative, and dialogue take place in these sites based on collaboration. Tuition can be strengthened and reinforced by the practical implementation. Companies would find new ideas much more suited for the future consumers than those intercepted by market analysis. Artisans and craftsmen would capture the attention and interest of young generations who have the desire to understand, to learn and to translate tradition in modern terms, by reviving and recognizing the value of their land. The designer would enhance the contributions of each of these roles (Figure 2). As a mediator, he would improve and guarantee relationships in such a way as to assure each role equally important: only when all the "actors of a system" (Von Bertalanaffy, 1984) can acknowledge the importance of their role, then everyone would do their best to ensure the most effective contribution as possible. Participation must be encouraged in order to create a sense of belonging to a community. Individuals would be encouraged to get into these places open to all. Equipment and machinery would be provided and always available as well as experts. The designer has the tricky responsibility of mediating between subject, his needs, instincts, peculiarities, and object thought for a responsible use, which can be a product or service as well.

Conclusions

The dialogue is the keyword that allows communication, discussion, which permits to evaluate and improve, save resources and energy. An innovation takes place only if it is possible to retain the uniqueness that bounds it to tradition; that secular uniqueness gives value to the entire cultural heritage, to the territory but also to people that inhabit it. Starting to insist on a form of innovation that can reach everyone thanks to its sharing nature, opens the doors to dialogue and cooperation, which could be able to cross the limits of uniformity. Every user could customize his own product or service finding self-realization through "doing" (Papanek, 1971). In fact, allowing the users to intervene on their objects gives them personal fulfillment. This can also be an efficient marketing strategy and, if managed responsibly, it can increase individual awareness regarding the final purchase and the use of a product. In addition, 3D printing is able to give enormous power to the customer's individuality.

The need of a proper user education becomes evident. Starting from teaching the potential of the machines and which their limits are and in what measure some materials can be strained are the first steps to achieve the proper education. Efficient communication must ensure the spread of morally correct practices from which will emerge a correct behavior, conscious of the fact that spreading such a technology would lead to great results for all the community. It is not one's intent to try to slow

[6] In *Shaping Things*, Sterling (2005), talking about "spimes", outlines a possible future of the Internet of things.

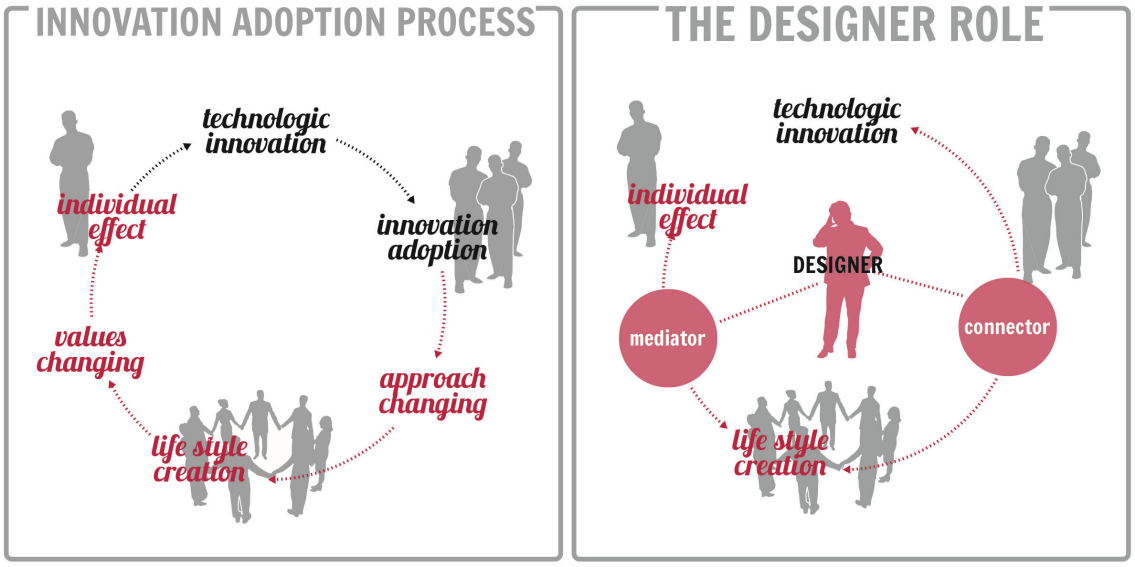

Figure 2. The process scenario and the role of the designer within the net of subjects involved (original image by Aleksandra Novakovic and Michela Regis).

down or even halt the advent of new technologies; on the contrary, it is creating the right soil so that they can flourish. The shared use prepares the user to a probable future individual practice, enhancing risks and opportunities. The sense of belonging that is generated within the common areas leads to the adoption of certain attitudes that follow instinctively and natively those principles that are shared by the majority of the members of the group. This simple expedient is the first step to long term thinking behavior. Managing in an ethical way the spread of use of 3D printers can be the first step towards a proper attitude regarding our always more technological future.

A positive example stands out from the Turin's FabLab scenario. In addition to the above participatory community, the FabLab (FabLab Torino, n.d.) effectively adopts those connecting principles and a systemic cohesion between the Lab itself and local schools, universities[7] and companies. This type of organization is generating a driving force in business and an increase in knowledge that, traditionally, in the Turin area has always been linked to the large-scale industry. Here we can find a precious case study: new generation of designers and their typical activities are intersecting with skilled craftsmen experience with electronics, mechanics, woodworking and whatever else is interesting in order to connect with the result of generating new artifacts through digital and traditional cultures.

It should be emphasized that the 3D printing is only a small part of a much broader phenomenon which has to do with a general paradigm shift of the entire production process. A new technology requires a culturally florid background in order to make the innovations flourish. Being part of a community means "being aware of belonging to a system" that lives in a "limited planet" (Capra, 1982), that must be responsible for the well-being and consider which could be the future impacts in a long-term period, recognizing the value of a proper education and collaboration, giving credit to innovation in order to find solution for the major problems that still afflict humanity, understanding the needs of the individual and the needs of the community.

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[7] i.e. during the Polito Design Workshops and the experience of "Per fare un albero ci vuole il laser" [To make a tree you need a laser].

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