

6th International Forum of Design as a Process



SYSTEMS & DESIGN

BEYOND PROCESSES AND THINKING

2016

Electronic book

PROCEEDINGS

June 22nd – 24th, 2016

EDITORIAL UNIVERSITAT POLITÈCNICA DE VALÈNCIA

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6th International Forum of Design as a Process Systems & Design: Beyond Processes and Thinking

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INTRODUCTION

“Systems and Design” aims to provide a global view from the perspective of systems in general, and how they have contributed to a new vision of design. Since ancient times we can observe how systems have participated in thought, customs and development of civilizations, and how this symbiosis (systems-design), has influenced the existence of those goods and products that currently surround us. The construction of our world and its future evolution is with no doubt largely influenced by systems and how they contribute to its formation and development.

In the last decades, the design is subject to a permanent renewal result of the multidisciplinary influence and the systems. The design of the intangible is an inexorably part that will be subsequently processed by transformation functions resulting products or services properly optimized.

Therefore, analyzing how the design is affected by the systems, and measuring their degree of participation and influence today, it has been one of the objectives of this Congress.

They have brought different perspectives, from the contribution of researchers from different universities and continents. And with this vision and in this context, we have tried to cover the different considerations about Systems and Design provided by SD2016 participants.

Bernabé Hernandis

POSITIONING PAPER

Systems and Design: Beyond Processes and Thinking

Celaschi, Flaviano; Celi, Manuela; Formia, Elena; Franzato, Carlo; Imbesi, Lorenzo; Peruccio, Pier Paolo & Hernandis, Bernabé.

Scientific committee

Abstract

A contemporary vision of design needs to be encompassed in the actual mutation of the productive and cultural contexts facing different systems of change. Conceived as a collective work, this introductory paper looks at these changes in the design field by identifying six possible perspectives that, albeit laying on parallel dimensions, present many interrelated aspects: productive, professional, creative, cultural, sustainable, prospective. The conclusive paragraph brings forwards an in depth analysis that offers an engineering vision of design cultures.

Keywords: *Industry 4.0, productive, knowledge, creative, cultural, sustainable, prospective systems*

1. Productive system. Awaiting the “digital tsunami” of the revolution in production processes¹

When we are in the middle of some phenomena, very close to them, indeed, when the phenomena are right on top of us, it is always very difficult to describe them. As described by Massimo Bergami (2016, 13), “Up until now we have witnessed the appearance of gradual innovations that have added new tools and means of communication to our everyday life. In reality, the impact of the new technologies on processes is greater than what is immediately visible. It is also likely that this trend will suddenly accelerate due to the conjunction of enabling factors that are rapidly converging. Among these we could

¹ Flaviano Celaschi, PhD, Full Professor at Alma Mater Studiorum, University of Bologna (Italy), Director of the First and Second cycle Design Degree Programmes at UNIBO, Founder and coordinator of the Latin Network for the Development of Design Processes, Founder of the Advanced Design Network at the University of Bologna.

mention the diffusion of networks and ultrafast connectivity services, new abilities to rapidly manage large volumes of variable and diverse data, breeding grounds of revolution in industrial systems due to manufacturing computerization, the immersion of simulation systems that flip planning logic, the diffusion of cognitive computing, the effects of virtual/augmented reality, and the democratization of innovation potential, all obviously in addition to the 4.9 billion connected things in 2015, destined to become 6.3 in 2016, and 20.7 in 2020 according to estimates by Gartner.”

With disarming clarity, nations at the forefront of production systems like Germany and the USA call it “Industry 4.0,” intending with this slogan to establish that what is about to engage, and in part has already engaged the global production system is a revolution comparable in scale to the previous revolution in industrial automation that was led by Japan in the 1980s (Celaschi, 1992), recognized as a “revolution” comparable to the industrial upheaval linked to Ford and Taylor in the early 1900s, both analogous to the industrial revolution associated with steam in England in the late 1700s.

Personally I agree with this vision that underlines the moment, defining it as “revolutionary”. As with the production revolutions that preceded us I am convinced that we can clearly use such a strong adjective because that which happened already in the first of these great revolutions is happening again now: the systemic set of innovations regarding the production system (what we would call B2B in professional jargon) and the set of innovations that regard our personal lives and communities every day (the rooms, the homes, the cities, where we live, in other words B2C) will be integrated into a single system that is more complex than in the past.

The processes that govern our everyday lives: food shopping, fueling and urban movement, fun and entertainment, education, sport training, emotional or sexual encounters, medical treatments, financial wagers, preparation of food, buying and selling houses, performing religious ceremonies, etc. will be strongly influenced, for the first time in real time and in digital form, by what can happen in the other half of the world (B2B), up until now characterized by being separated, closed, secret, and intended only for authorized personnel.

Production processes are at the center of this fourth revolution, due to two different drivers:

- Because the manufacturing dimension of making products and providing services is heavily influenced by the digital revolution that permeates it, redefining the relationships between operator and machine (control interface), but also the relations among suppliers, information management, geographical localization of factories, and their own productive nature.
- Because all this rethinking of the B2B dimension of production systems opens up to and can/must cross over into the other half of the world represented by people’s lives (singly and collectively), heavily influencing their effects, but also being themselves heavily influenced in real time by the changes that will be triggered in the consumer and life part of the world.

Bergami, summarizing an intense contemporary bibliography, briefly suggested some of these drivers, which we will try to list: additive production, power of computer networks, cloud computing, sensors and Internet of objects, internet of behaviours, neurosciences applied to cognitive behaviours and decisions, big data, open sources, continuous innovation, futures studies, extreme design, automation and artificial intelligence, augmented and immersive reality, digital modeling, rapid prototyping, cyber security, photonics, traceability of production, use, and decommissioning processes.

Manufacturing passes from being producer of objects to being producer of production services, industry mixes with the lives of people and follows and influences each choice, quickly and continuously drawing from them useful indications of how to redefine the production itself (Frison, 2016), transforming us, as an integrated system of ubiquitous actors and consumers in real time, from factors of linear growth into

factors of exponential growth. Just in the EU the directorate general of production activity estimates a need for 800,000 professionals by 2020 capable of operating in this new system of production and consumption, in a market that is estimated to be 27% of the global market, so 3 million new actors in the world².

From our point of view we must observe that even now we educate designers that in recent years are trained to work in a context in which the production system and the consumption system dialog amongst themselves. Since the first Maldonado (1972), the definition of designer has placed the accent on the need to mediate between production system and consumption system (Celaschi, 2008). However, the mediation that we find ourselves managing is no longer a soft action between two hard systems, but now has become the queen of the tableaux. The mediation system has taken over the scene, and herein lies the true transforming force of the production system of industry 4.0.

The framework that I suggest as matrix for reflecting on this document is therefore a system divided into four quadrants influenced by two worlds, one digital and one manufacturing, that come together, and by two systems, one production and the other consumption, that mix. Each of the four quadrants identified interacts continuously and in real time with the other, breaking down every door and resistance, systematically pervading the globe, without creating immediate dystopias but structurally modifying the model of life and production of billions of people.

Every aspect of the digital tsunami that awaits us is therefore soaked with design cultures, within the factory in the rethinking of production processes and products, outside of them in the rethinking of use processes and consumer and life models.

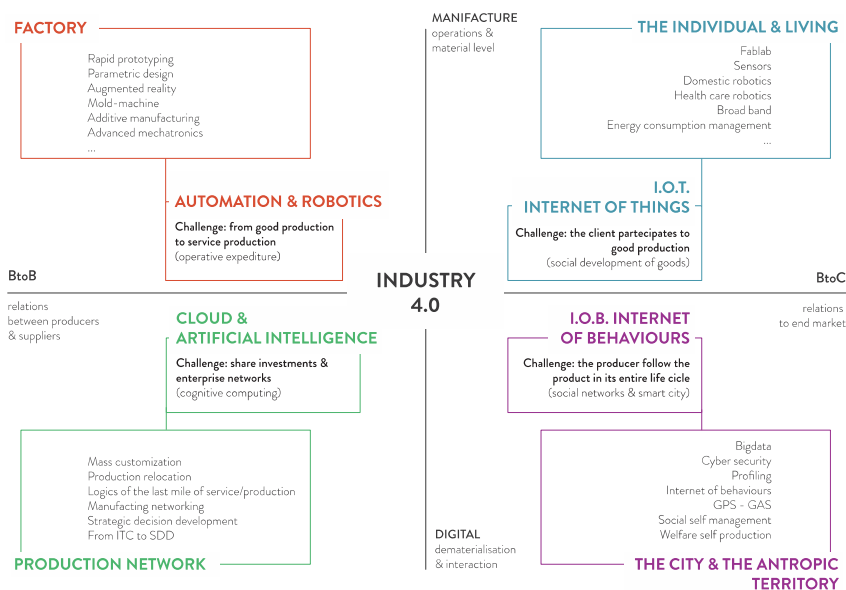


Fig. 1 Industry 4.0

² From the introduction speech by Khalil Rouhana, DG Connect, European Commission Component and System, conference Industry 4.0, Parma, 18/03/2016.

2. Knowledge system. Personal Factory, Design Cognitariat and Post-industrial Society: the design profession along with the transformation of the creative labour³

Along the crisis of industry, knowledge and the creative labour come to be the primary workforce capable of generating value and innovation. Industry is living an historical shift of its role within society and production through the admittance of the new technologies and the service sector.

The process of digitalization is leading to a transformation of the nature of the enterprises, while opening to new forms of micro-factories and “personal capitalism”, in order to share locally and globally skills and knowledge, as well as resources and tools, to the accomplishment of projects and products.

The new generations of designers have come to terms with deindustrialization and, while their predecessors had a role in the assembly line with manufacturing processes, today’s designers are aware of their service and strategic role concerning innovation.

Then, the young designer is experiencing a special space for self-organization, while incorporating all the productive aspects in his own office and even experimenting with self-branding, thereby revealing a spontaneous and alternative space to the official production.

Can we still speak of industrial design, while production seems to assume a completely new shape and organization, while delivering new outcomes? What are the characters of the post-industrial production in order to address design education and the role of the creative practitioner?

2.1 The Knowledge Cognitariat of Design

If the physical ‘objects’ are in the background of the creative activity of the project, design itself becomes a service in a collaborative network of players, where every segment is helping to finalise the end result. As property and goods were at the heart of the industrial capitalism and could be used for measuring the degree of innovation of production, the post-industrial era is investing in the immaterial assets of knowledge. The labour of the mind comes to be considered the primary workforce for generating value and design is an activity that can be located in-between ‘doing’ and ‘knowing’, material and immaterial.

In the knowledge society, the digitalisation process permeates every trait of the professional activity; it determines times and resources, and thereby reduces the entire design process to producing and processing data that has been re-elaborated by the knowledge and creativity that are put into play. The computer becomes the ultimate tool (Gorz, 2003), and unlike instruments requiring innate specialised skills and abilities, today’s user-friendly software opens up the field to a vast, totally new group of young people, who would not have had access to design earlier.

In this way, the rate at which software is updated measures how quickly innovations are made to products, and design training becomes lifelong education and learning how to use updated technologies, thereby constantly redefining the rules of the game. In order to increase the value of their own cognitive ‘fixed assets’, the creative class needs to continually update and reinvest its knowledge through a constant training, in its daily grind producing and managing ideas, knowledge and techniques (Gorz, 2003). Even when off the job, they form and transform their knowledge and abilities: as a consequence, the continuous mobilisation of this live workforce through a constant creative effort occupies every moment of their life, so blurring the border between the time devoted to work and the time for leisure.

Everything in designers’ daily lives - relationships, affective and emotional aspects, language and the ability to co-operate - is used as an investment to produce value. Thus, the anthropology of young

³ Lorenzo Imbesi: Arch PhD, Associate Professor, Cumulus Executive Board, EAD Executive Committee, Design Unit Coordinator, Department of Planning, Design, Technology, Sapienza University of Rome.

designers is creating a ‘creative proletariat’ class, or to use a neologism, a ‘creative *cognitariat*’ (namely a cognitive proletariat of creativity) primarily through the imposition of new technologies (Imbesi, 2008).

In satisfying a broad demand of aesthetics, the ‘creative *cognitariat*’ is pushed to reinvent its own role every day, generating new products and services, as well as new markets and consumption models. The emergence of this new character with a bent for mobility and innovation, is spreading in our global cities, a bit as our 19th-century ancestors on the assembly lines created the *cit  industrielle*.

2.2 Self-Capitalism

While observing the transformation of the nature of labour and enterprises in Italy, Bonomi and Rullani state the emergence of a new form of “personal capitalism”, where people may organize autonomously smaller entrepreneurs, while sharing locally and globally skills and knowledge, as well as resources and tools, to the accomplishment of projects and products. If the big Fordist corporation was self-sufficient with a pyramidal structure of organization, the model highlighted by the Italian industrial districts is made of a number of little and medium enterprises, networking each other horizontally and geographically positioned (Bonomi, Rullani, 2005).

At this end, the crisis of the big multinational companies seems to re-evaluate the experience and the organization of such ‘personal capitalists’, then leaving a special space for the self-organization of the individuals, with their unique trait and special contexts. Knowledge and creativity raise to be important levers with the support of the new technologies, to create innovation and value and to develop new autonomous experiences of production. At the same time, this is affecting also the way the young designers operate and manage their work. In a world where the number of designers are increasing and then the competition is more difficult - and without mentioning, at the same time the crisis of industry is restricting the spaces and the chances for them to work - the younger generations are trying to explore alternative professional approaches, also becoming themselves “personal capitalists”.

In the knowledge society, if it is true that the computer has become the tool of production *par excellence*, also its liberated accessibility is bringing closer the worker and his product, then opening up to new economies and new design experiences. This ‘*homo flexibilis*’ of project often becomes an entrepreneur himself, building new biographical and production scenarios by experimenting with new forms of self-production that develops new critical keys beyond the immediate marketability (Imbesi, 2008).

With the help of information technology and the advancement of rapid prototyping and its related accessibility, for the first time the designer is in the position to close the circle of production, playing on his own every segment, ranging from design, to production, distribution, communication and even sales. The young designer - who has now learned to exploit his abilities to individually connect to a collaborative network of peers - can integrate every productive segment in his office, as a real entrepreneur, and even his name appears to be used as a real brand.

The design studio happens to be renewed in a design office management; the prototyping workshop becomes a factory that produces small series of products; the tasks of the agent for distribution can be executed through Internet portals and e-commerce, just as every aspect connected with communication, such as designing the packaging, processing the corporate identity and all strategic aspects of product marketing may be handled by the same design office. The work of the designer may be extended even to curating the exhibition design of the points of sale and the selling itself, as it often happens in many international design fairs, where young designer are often self-promoting them.

Thus, the creative “cognitariat” of design discovers new capabilities for experimenting new experiences of self-organization and self-brand, while releasing a spontaneous and alternative space beside the official production, which may still be intertwined with, and then disseminating power for design.

3. Creative systems. Facing the tension between Authorial Creativity and Creative ecosystems⁴

In the prologue to his *The rise of the network society*, Manuel Castells affirms: “our societies are increasingly structured around a bipolar opposition between the Net and the self” (2012, 3). Very effective global networks are connecting individuals, groups, regions or even countries towards the fulfillment of the multiple goals that they search for achieving, with the same ease they could switch off them the next day. The ever-changing scenario gives multiple, temporary and weak opportunities to discuss, criticize, elaborate ethical positions and reasons for action. Individuals, grouped into several and frequently contradictory movements, go back to comforting primary identities, such as religious, ethnic or national ones, as today European vicissitudes demonstrate. While networks are shaping the world, we search for our identity to signify our social position and role.

Professionals, including design ones, are living this bipolar opposition. Designers design within powerful networks, frequently without being the protagonists of the design process. Many other actors, already involved in the design process (such as specialists of other area or the same entrepreneurs) or recently summed up (such as stakeholders or final users), could become equally or even more important for designing.

Adrian Forty (1992) already challenged the myth of the designer’s omnipotence, stressing that, even if the literature have represented design as an act of pure creativity of the individual, society is a fundamental factor for inspiring the design process and creatively interpreting its results: thus, they are essential for the design success. However, today networks are taking on specific design potentials, becoming designing networks.

New information and communication technologies let many actors collaboratively interact in design processes, even if they are not designers, and web-platforms of design crowdsourcing, with commercial purposes or social ones, are making it even easier. Large design processes are being developed in real time, by actors distributed all over the world, without need of pivotal actors. Even the last winner of the Pritzker Architecture Prize, Alejandro Aravena, is well known for the development of wide participatory design processes, besides for his masterpieces.

Moreover, the design process continues within the use of the resulting devices. As foreseen by Pierre Lévy in 1990, in the knowledge ecology of the cyber culture, there are not clear limits that separate technical development and use: “no technical advance is determinate a priori, before to be tested by the heterogeneous collective, by the complex network in which it has to circulate and that eventually it should be able to reorganize someday” (1992, 204, authors’ translation). As it was explained at the beginning of our positioning paper, industry 4.0 fades away the boundaries between production and consumption systems.

Instead, we should consider the ecosystems of creation as a whole. As other types of cultural ecosystems, creative ecosystems host countless, diverse, articulated connections that incubate creative processes aimed at interpreting, criticizing, rethinking and transforming the world, including design processes.

⁴ Carlo Franzato, PhD in Design from Politecnico di Milano (2008) and Industrial Designer from the same University (2004), he is Professor in Design and Dean of the School of Creative Industries at Unisinos University (Porto Alegre, Brazil). His research focuses on complex collaborative design networks developed by designers, other professionals, organizations and institutions, users and citizens.

From an ecosystemic point of view, the design process is considered within those creative relations that it contribute to weave. Thus, the design focus shifts from the development of products, services, product-service systems or any other type of artifacts, to the practice of the creative relations. This way, the designer could aspire to be one of the most important actors of the designing networks, since his or her technical skills could serve as a platform for the cross-disciplinary convergence of the various actors of the creative ecosystem.

This way, the design process results in a method for the creation, the practice and the evolution of the strategies that organize the various actors for collaboratively designing. Through the design action, it becomes possible to lead with the instability of the ecosystem. In this direction, the designer's aptitude of reading the signals emitted by the ecosystem, allied to scenario-based design methodologies, come to be the core of design process, since they permit to consider the regular and the evident, the possible and even the deviation and the unpredictable, the chance and the error.

In the described context, even if design emerges as a very important process among the processes of the creative ecosystems, even if the designer – as we affirmed – remains immanently an important actor, which is the role of a most authorial design? We can highlight at least three possibilities of this form of expression that is so important for the design history:

- Critical design. Designers can use the design process to criticize our relationships with the natural and social environment, and, through their artefacts, propose alternative scenarios that discuss contemporary lifestyles and open to the democratic discussion of our future (see Dunne, 2008);
- Adversarial design. In this direction, designers can go on using the design process with political purposes, defying the status quo, the network society as well (see Disalvo, 2012);
- Advanced design. The previous possibilities are related to our present, but looking to a next future that we can socially construct. Anyway, designers can use evolved design processes to imagine a faraway future and design towards it (see Celi, 2010).

Interestingly, these possibilities for authorial design match the previous processes of designing within creative ecosystem in the metadesign level, in which it is possible to critically reflect upon the design process, in order to evolve it. In fact, as presented in the 5th international forum of design as process (Franzato, 2014), metadesign allows the speculative design processes that support critical, adversarial and advanced design, besides to allow the opening of design processes to designing networks. In this sense, metadesign is a crux for contemporary design processes.

4. Cultural systems. The role of design in the new system of cultures⁵

The infra-ordinariness of design is a distinctive feature. In the model of Design as Mediation Between Areas of Knowledge, Flaviano Celaschi affirms that “The design that we study appears to us today as a form of knowledge that creates relationships between other forms of knowledge. A discipline that would appear to take shape around the sensitivity of not producing an independent knowledge of its own (or at least one that has not yet succeeded in doing so) in competition with the capacity for analysis and with the levels of knowledge gained by other, historic lines of study in modern science. If anything, it is precisely by respecting the rules and the sets of analytical knowledge used up by other disciplines that it takes hold

⁵ Elena Formia, PhD, is a Fixed-term Senior Assistant Professor at the Alma Mater Studiorum, University of Bologna, where she is member of the Advanced Design Network. Since 2008 she has been Scientific Secretary of the Latin Network for the Development of Design Processes, taking part in the organization, promotion and spreading of its various initiatives. Her research interests cover the concept of design cultures and the relationships between humanistic knowledge and design sciences.

of them as input and as a basis for bringing about an organised transformation of the world of goods that surrounds us.” (Celaschi, 2008, 21)

The systemic model proposed by Celaschi was on some level a continuation of a previous thread of debate that first saw the light more than 40 years ago, when it then became apparent that design had to be recognized as a subject in its own right - a necessity based on objectivity and rationality. An example of this is the historical definition given by Tomàs Maldonado (1972), who spoke about design as the process of coordinating, directing and guiding different factors belonging to different spheres of knowledge that interact within a complex system: the functional factors, alongside those concerned with production and with socio-cultural and economic aspects, are the four elements that influence design. A few years later, John Haskett (1980) coined the non-definition of design, seen as an expansive and confusing discipline, full of incongruities, with many manifestations and whose boundaries are uncertain and polarized by different driving forces (“Design is to design a design to produce a design”). More recently, with the idea of “multi-faceted design”, Ezio Manzini (2007) highlighted the fact that design can interact with and connect different spheres and fields of knowledge. Together, these all contribute towards expressing a new kind of innovation which is, at the same time, technical, social, cultural and esthetical. According to Alessandro Deserti (2009), if we place design on a hypothetical map, its development can be described in terms of a progressive expansion from a “solid centre” – which can be described as the link to the traditional interest in giving shape to new products – to much softer peripheral areas, that overlaps extensively with other disciplines. From here comes the idea of a “product-system”, as a complex combination of material and immaterial factors and qualities, all of which have to be addressed with a new strategic mind-set.

These definitions have maintained a certain continuity over time and are strictly tied to the essence of design as a discipline, in being a subject that, historically, has cut across culture and science, art and technology, culture and technology (Mumford, 1952; Maldonado, 1979). The philosopher Vilem Flusser (2003) spoke about design as a “bridge” between the two forms of knowledge (scientific and artistic) or between what is termed the “two cultures”. The direct reference to Charles P. Snow is evident and can be taken as granted. Between 1959 and 1963, the British scientist and novelist set out his theory whereby it is possible to create connections between disciplinary boundaries, between sciences and humanities, and between scientists and intellectuals, optimistically to introduce a mediating “third culture”, defined by John Brockman in *The Third Culture: Beyond the Scientific Revolution*, published in 1995. While the purpose of this rapid overview is not to bring up the theory proposed by Snow more than 50 years ago, it is clear that scientific literature on design has progressively recognized and rationalized its capacity to be commonplace, disruptive, dynamic, open and relational; that it can work in a complex and not linear way; and that it can use an abductive model of reasoning when being generated.

The system of knowledge around design has progressively grown, consolidating its relationships with other subjects. British professor Guy Julier introduced the idea of a *Culture of Design* (1st ed. 2000, 2nd ed. 2007, 3rd ed. 2014) as a possible lens through which to analyse the ubiquitous role of design in contemporary society (both as an object of study and as an academic subject). The idea of a “cultural turn” has penetrated many humanistic disciplines since the early 2000s - from history, to anthropology, human geography and sociology (Nash, 2001; Barnett, 2002) - posing interesting questions about how to interpret the world around us or, in other words, our material culture. This change has progressively influenced the fields of design. In recent studies, the definition of culture itself has been closely examined, i.e. “which culture(s) should we refer to as scholars in the field of design?” (Penati, 2013). One of the most solid models remains the concept of production-consumption-mediation as a form of interpreting and studying design artefacts, processes and activities (Lees Maffei, 2009). The culture of the designer (education, ideological factors, historical influences, professional status and market perception),

together with that of production (materials and technology, manufacturing systems, marketing, advertising, product positioning and distribution channels) and consumption (demography, social relations, taste, cultural geography, ethnography and psychological response) are the domains in which to study the culture of design. They inform each other in an endless cycle of exchange and can be nurtured through the integration of many disciplinary skills. The emphasis on mediation has, naturally, acquired more significance, and mediating channels are now increasingly the focus of attention.

This discourse is highly complex and has been interpreted from many perspectives. Within the concept of the Industry 4.0 introduced at the beginning of the paper by Celaschi, we can examine whether this interpretative model still remain central and valid. Facing the challenges of the “new industrial revolution”, we are asking further questions: Is it the network/system of knowledge already in place sufficient? Are there any other forms of culture that we should take into consideration when approaching and interpreting these new frontiers?

The French scholar Yves Citton has recently come up with an interesting proposition. In bringing up the importance of interpretation, he notes that the interpretative gesture offers a privileged condition for the encounter and synthesis between intuition (aesthetics) and order (scientific), between the immediate evidence of the textual data and the critical autonomy of the subject (Citton, 2012). Faced with the challenge posed by the new 4.0 Industry, the value of the designer, in a hermeneutic perspective, could, once again, play a key role in mediation.

5. Ecosystems. Against a throwaway culture⁶

Time has passed since “industrial design has put murder on a mass-production basis“ as in the words of Victor Papanek (Papanek, 1970). Quite apart from any ethical judgements about this kind of behavior, it is nevertheless obvious that the designer is still an “accelerator” of events, a force he shares with the consumer. Even more today in the 4.0 Industry era: together they are capable of influencing market dynamics and therefore the production of goods and services. In one way or another, the choices a designer makes have a global fallout. His destiny is to play a crucial role in society.

In a 4.0 Industry scenario, sustainable design paradigms have to change. As production processes, logistics and resources modify their roles and even new players (e.g. Internet of Things, Big Data, Augmented Reality, etc.) enter the system, a product-centered environmental process to design seems to be ineffective in tackling contemporary issues.

An ecodesign approach, based on reducing, reusing, recycling, dematerializing, using renewable energy, disassembly and other strategic efforts to minimize the impact of products and services, only partially faces urgent sustainable challenges. It is necessary a shift in design methods and even more important, a behavior change. Rapid prototyping, sensing, clouding computing, IoT, Artificial Intelligence and other drivers of 4.0 Industry are powerful means by which we can modify our culture and, by extension, our Planet. “We have to accept that technological products are not neutral - Pope Francis clearly says -, for they create a framework which ends up conditioning lifestyles and shaping social possibilities along the lines dictated by the interests of certain powerful groups. Decisions which may seem purely instrumental are in reality decisions about the kind of society we want to build” (Francis, 2015).

As “industry mixes to life” (Celaschi, *infra*) we cannot ignore anymore the complex relationship between action and reaction in natural and artificial systems. From the smallest units to the largest entities, we are

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all part of a complex system as described in the milestone documentary film “The Power of Ten” (1968) by Charles and Ray Eames.

Designers and architects were already aware of this in the 1950s when they realized how complex and difficult design actually was. Too many variables became involved and an interdisciplinary approach was needed with inputs by experts from more than one field of knowledge. The process that gradually developed and grew during that period helped to break down disciplinary barriers and moved in the opposite direction to the monodisciplinary and specialist approach of the first half of the nineteenth century. In particular, architectural projects and design met with the culture of complexity at the Ulm School with the introduction of new “design” disciplines such as cybernetics, theory of systems, information theory, semiotics, and ergonomics. Nonetheless system is not a real object: it is a simulacrum, a tool used to simulate reality and “exists only as we thought it. It is an arbitrary concept and also its limits are fixed arbitrarily by the observer in relation to cognitive ends he pursues it” (Bologna, 2008).

Sustainability is not a private issue. It is a common value shared by the entire community.

In a 4.0 Industry era, designers are asked to design open industrial systems to avoid production waste, and create ecologically sustainable communities. The focus moves on the design of an entire system located in a precise social, political, economic, and cultural context. Designers establish relationships with the natural world and even replicate some of its more virtuous processes, rather than entering into conflict with it. “After 3.8 billion years of evolution – Janine Benyus writes in *Biomimicry* - nature has learned: what works, what is appropriate, what lasts”.

This confirms a shift in the idea of industry, away from linear models in which waste is considered the norm, to integrated systems where both digital technologies and traditional manufacturing play an important role, in which everything has a use because it is converted into value-added input for other processes.

In such a cultural scenario we can recognize a strong interest on the organization of autonomous forms of enterprise. It means self-production in a design context: from do it yourself to digital manufacturing. Some of these activities are part of the so-called informal economy: “if we call formal economy the processes of production and exchange of goods and services regulated by the market and typically carried out by industrial and commercial profit-oriented enterprises, operating under the rules of business law, tax, labor - Arnaldo Bagnasco recently explains - than we could call informal economy all those processes of production and exchange that tend to escape one or more aspects of these distinctive characteristics (Bagnasco, 1999).

In an interesting pamphlet of 1978, Ivan Illich investigates the keen issue of unemployment and flanks the word creative, highlighting the potential of vernacular activities - for instance, the assistance offered to children and the elderly, bricolage or other household chores - as a historic opportunity to break the dominance of conceptual pair capital-labor which, from the time of Adam Smith onwards, makes up the corner stone of Western economy.

The informal economy makes way in the interstices of economic processes by enabling new projects from the bottom. If the traditional literature describes the two economies as in opposition to each other, nowadays it is necessary to think of a unique production system consisting of at least two souls. The definition of this model requires the presence of an official economy, formal, recognized, which is accompanied by an informal economy - also called submerged, underground, hidden, shadow or gray – unregulated, because it is out of accounting of GDP per capita of a nation.

The interdependence of ecological and social issues as well as the re-growing phenomena such as informal economy and social capital (network of relations) are the basis of the concept of “integral ecology” (or “systemic approach” by Fritjof Capra⁷) outlined in chapter four of Pope’s Encyclical (Francis, 2015). From this point of view also new technologies, on one side, and designers, on the other, could play active roles in fighting the throwaway culture, which is the result of the irrational belief in infinite growth. Not more production but better production in which the waste products of a production cycle become a resource for another production process. This is one of the most interesting challenges we need to face in order to activate virtuous growth processes in a territory.

6. Prospective Systems. Strategic Design & Anticipatory Design: different approaches to systemic change⁸

Design, as a driver of innovation and change, is a complex discipline characterized by unique ways of learning, abductive thinking and often untranslatable processes. Since Design discipline has grown its borders from material products and artifacts to the immaterial side of the project, many adjective have been used to define the design ability to shape, influence and determine the pathway to change.

Strategic and anticipatory nature represents different ways of facing future perspective in design activity.

Both of them aspire to a wider aim of design, not only connected with the solidity of the products world and the connected markets, but with the immaterial side of goods (meaning, ethics, social aims), both of them have the aim of planning and designing not only for the immediate tomorrow and nevertheless they show different attitude.

6.1 Strategy: the art of planning

The term Strategic design and its culture were born around a strong emphasis on the “company” as the main subject of the strategic design culture. Since Peter Behrens, whose first works for AEG have been defined a first contribution to design management (Burdek, 2005), emerged the first tendencies to valorise the design competences in the wider context of the entire company. Michael Farr, in particular, was the first one to intertwine knowledge from system theory, design and management defining a design path inside companies: “Design management is the function of defining a design problem, finding the most suitable designer, and making it possible for him to solve it on time and within a budget. This is a consciously managed exercise which can apply to all the areas where designers work.” (Farr, 1965)

Further reasoning in the seventies focalized two main issues dealing with design management: the necessity to foster corporate strategy and the need of develop methodology for information processing. The influence of the operation area was at that moment justified by the necessity of growing a continuous practice of product development and of the companies’ inadequacies in including design practice into the process of product development. In the eighties the design management had a great impulse thanks to the acknowledgment of its capability of increasing the product value on the market: companies have soon learned that the product, when bringing a semantic value, can be better or differently placed in the market

⁷ The systems view of life, integrating life’s biological, cognitive, social, and ecological dimensions, is implicit in the conceptual framework of *Laudato Si’*. The Pope states explicitly that that solving our global problems requires a new way of thinking, and he makes clear that what he has in mind is thinking in terms of connectedness and relationships — in other words, systemic thinking” (Capra, 2015).

⁸ Manuela Celi, PhD in Industrial Design, is Assistant professor at the Design Department of the Politecnico di Milano. Since 1999 she has cooperated with the School of Design. Since 2009 she has been working on Advanced Design topic being interested in methodology, process design and design for futures.

acquiring new customer's segment. But it is in the nineties that the idea of a Strategic Design takes place: a more holistic approach, the central role assumed by many designer in the product development process and the grow of a corporate culture and image were calling for a designer profile with mixed competences between project, economy and culture. In particular there has been a strong emphasis on a systemic interpretation of the project connected to the so called Product Service System (PSSD) dimension: emerges an orientation toward different kinds of social and market actors, a clear intention to produce innovation, and an emphasis on a systemic interpretation of sustainable development (Meroni, 2008). Francesco Zurlo in his definition of the term Strategic Design describes the strategic adjective as a hat that covers more approaches (operations, tools and knowledge building models) and is involved in theoretical and practical aspects (design leadership, design thinking, design direction, business design, research, etc.). In a wider sense when design is involved in the decision making process its role becomes strategic. Strategic Design is the activity able to plan or design to impact favourably the key factors on which the desired outcome of an organization depends. Another definition of strategy refers to methods or plan to bring about a desired future, such as achievement of a goal or solution to a problem. This openness toward future is connected to the design ability to foster change inside organization but, dew to the origin of such practice –as we have seen- and to the context primarily limited to enterprise (commercial or social) this change is normally connected to a predetermined objective. An horizon toward which the designer look designing scenarios, producing visions and then prototypes and artefacts able to catalyse and exploit the present resources to produce a certain range of results.

If we consider the literature coming from the Future Studies area and the contribution of Voros (2003) in particular it is soon clear that this perspective encompass only a limited vision of the futures. To foster a process toward what we “want to” happen, means to consider only the perspective of the preferable futures. In other words futures that are more emotional than cognitive, futures that derive from value judgments and for this reason are more subjective depending on who is doing the preferring.

6.2 Anticipation: the art of reacting

Paradoxically the only time in which we can act is the future and Design is an activity heavily projected in to the future. Even if the consciousness of the centrality of the futures study within our discipline is slow to grow the actual strength of the international scientific debate about the study of the future - and Anticipation Studies in particular - allows us to meet this important area of concern together with other human and social science (sociology, psychology, anthropology, technology, economy, art) involved in the dimension of time yet to come. The future awareness or better what Miller (2007) calls future literacy, is crucial in the design profession for many reason: its huge responsibility in shaping goods, its ability in planning products longevity or life cycle, its contribution to service design and social design, but most of all for its unique capacity of imagining, shaping and communicating new values and perspective.

According to Poli, Miller and Rossel (2013) “all efforts to “know the future” in the sense of thinking about and using the future are forms of anticipation. Equally the future is incorporated into all phenomena, conscious or unconscious, physical or ideational, as anticipation”.

One important motivation the conscious use of the future is the statement that perfect anticipation of change is both practically and theoretically not achievable in our universe.

Our incapability of predicting - but also determining the future - is connected from one side to the lack or unavailability of both the data and models but, most of all, the consciousness that our universe is “creative” in the sense that novelty happens – provided that suitable enabling pre-conditions are given (Poli, Miller & Rossel, 2013). The certainty that characterises scientific disciplines and underpins the repeatability of scientific experiments does not belong to those of the project; this is precluded also to the disciplines of anticipation. Starting from this assumption the pretention of designing the future is an

oxymoron nevertheless we can recognize that design, constantly dealing with uncertainty is a discipline able to deal with the future dimension. The world of design is constantly subject to a state of continuous emergency; the product is increasingly temporary and precarious and takes on increasingly ephemeral connotations. In this condition of accelerated obsolescence that causes distress, some high-value technology products are promoted through the “future-proof” expression to emphasise their permanence in time and their adaptability to subsequent developments. When establishing new ways of future-oriented projects, there are no future-proof methods, however, as this means being able to predict today what will happen tomorrow with certainty, while the project of the future requires the unconditional acceptance of uncertainty (Celi & Celaschi, 2015). The capacity to understand context constraints, strong and polymorphous reframing capabilities and mediation skills are the knowledge areas that Design, and Advanced Design field in particular, can offer to anticipation. Zamenopoulos and Alexiou (2007), who already explore the possibility of an anticipatory view of design, also suggest another capability: “More importantly, design also involves the capacity to anticipate the correspondence between theories and models, which can only be verified by experimentation or the actual realisation of the design artefact” (Zamenopoulos & Alexiou, 2007, 431).

The design of the future must move on the ground of the possibility and its many never unique expressions. This approach, this ability can be recognized as an anticipatory attitude of design able to leave the horizon open to different possibilities, able to interact with several different actors and to produce multiple scenarios and solutions.

7. What is Systemic Design?⁹

Systems, existing from the beginning of creation, have evolved since ancient times generating a scientific and academic discipline through which the complexity of living beings, nature and even the evolution itself of current science is explained to a large extent.

The study of systems through modeling and subsequent simulation has enabled us to gain new knowledge and thus explain the behavior of countless phenomena. Their Identification and later classification, according to their origin, type or intangibility, have allowed us to represent, understand and study their past, present and future development, on the basis their expected behaviors.

Open, closed, adaptive, emergent, and other systems are defined according to their structure, behavior and evolution. In the field of design, taking the existing knowledge about system into account inevitably generates new approaches inherent in current design processes, suggesting new strategies that allow us to improve the management of the intangible in order to optimize the design of the tangible.

The social and business environments, the territory and the products are common areas, where knowledge management optimization is sought as to observe the largest possible number of factors affecting the decisions underlying the design of new products or services.

The challenges posed by the complexity of our times requires observation and study to be carried out with different approaches and research lines able of interpreting many complex relationships, considering their behavior and involvement in the design process from a multidisciplinary point of view.

⁹ Full time professor, Founder of the *Grupo de Investigación y Gestión del Diseño* of the *Universitat Politècnica de València* and Director of the *Red Internacional en Diseño Sistemico, rDis*. Director of the *internacional journal, rdis*. Bernabé Hernandis Ortuño graduated in Organizational Industrial Engineering and diplomated in Investigación Operativa y Sistemas and holds a PhD in Design. His specialization research areas are the systems theory, complex systems, design methodologies and systemic modelling for product-service innovation.

Therefore, systems deserve our greatest attention, in the light of their permanent existence as a constitutive element of our reality able to represent, in any discipline, the complexity of our world.

Furthermore, within the design field, it will be necessary to study, consider and analyze how systems are part of the academic and scientific domains to which we, as researchers, devote most our time.

Perhaps, as they evoke our not too distant past, today systems constitute an indivisible whole underpinning the behavior of many of the processes we base our work on both in the field of education and in that of research. And, probably, in a not so distant future, they will be studied for their structural uniqueness. We must not forget that since ancient times there has existed a continued interest in analyzing the tangible and intangible aspects that constitute reality.

However, the synergy process stems from a complexity which requires the existence of added elements to justify its balance. Perhaps systems are indispensable elements constituting the necessary blocks to stabilize continuous change.

What can we learn from the study of systems in order to optimize the design process? This will be a key issue to deal with in the next decade. Perhaps, System Design is currently able to provide a way to address the issue of what approach we should use to tackle the complexity of design without losing its inherent creativity power. This complexity should investigate the social and economic aspects of the territory, the companies and the products, considering both the tangible and the intangible, so as to provide sustainable solutions that envisage a future beyond processes (HERNANDIS, 2015).

The conference “SYSTEMS and DESIGN: Beyond Processes and Thinking” aims to present some of these new approaches leveraging this forum to pool new thoughts, voices and insights that pursue any of the objectives described above. Although it may seem that everything has been invented and designed already, multiple inspiring visions still arise that suggest new approaches in the traditional disciplines. Mankind continually reinvents itself, coming up with new ways of working and turning new methods into future proposals. Studying systems from a design perspective with a view to improving the reality as much as possible, as well as bringing a new distinguishing visions to design, might pose a challenge worth solving.

Through knowledge management we are able to transform the intangible aspects associated with different sociocultural, business, territorial and technological dimensions by using design as a transforming function capable of converting intangible knowledge into tangible solutions (i.e. products and services demanded by society).

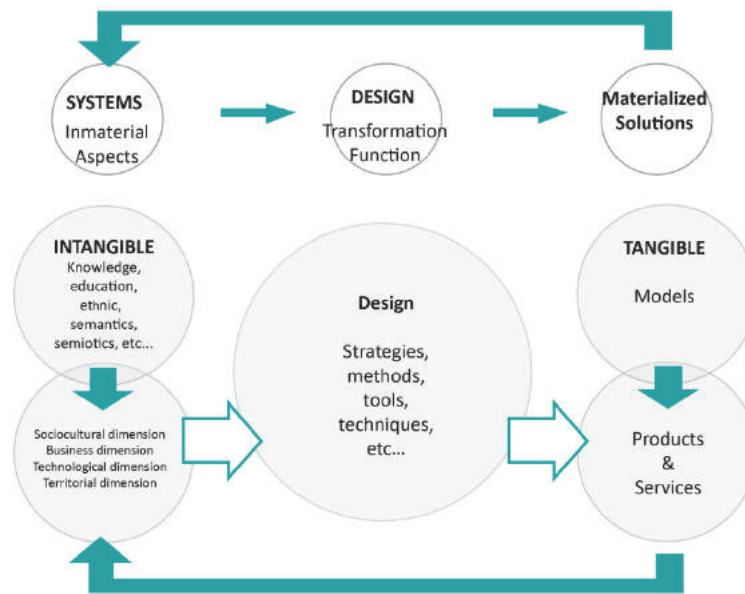


Fig.2 Management of the intangible in order to optimize the design of the tangible. Hernandis, B. (2015)

This stands for a conceptual model expressing that the function of the intangible is susceptible of being transformed into tangible through the intervention of the transformative role of Design. The design of intangibility, i.e. the knowledge necessary to represent systems, generates tangible subsystems, namely products or services, through the design transformative function (1).

$$[D(I)_k] \times \Phi(D) \equiv [D(T)_{p/s}] \quad (1)$$

One may say that the designer uses knowledge management consciously or unconsciously as a starting point for the ideation of the product. The handling of the intangible becomes more and more relevant over time as different methods emerge for knowledge extraction and subsequent organization. This calls upon the designer to have a broad knowledge about the possibilities offered by new methods based on innovation and creativity.

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