Producing Project

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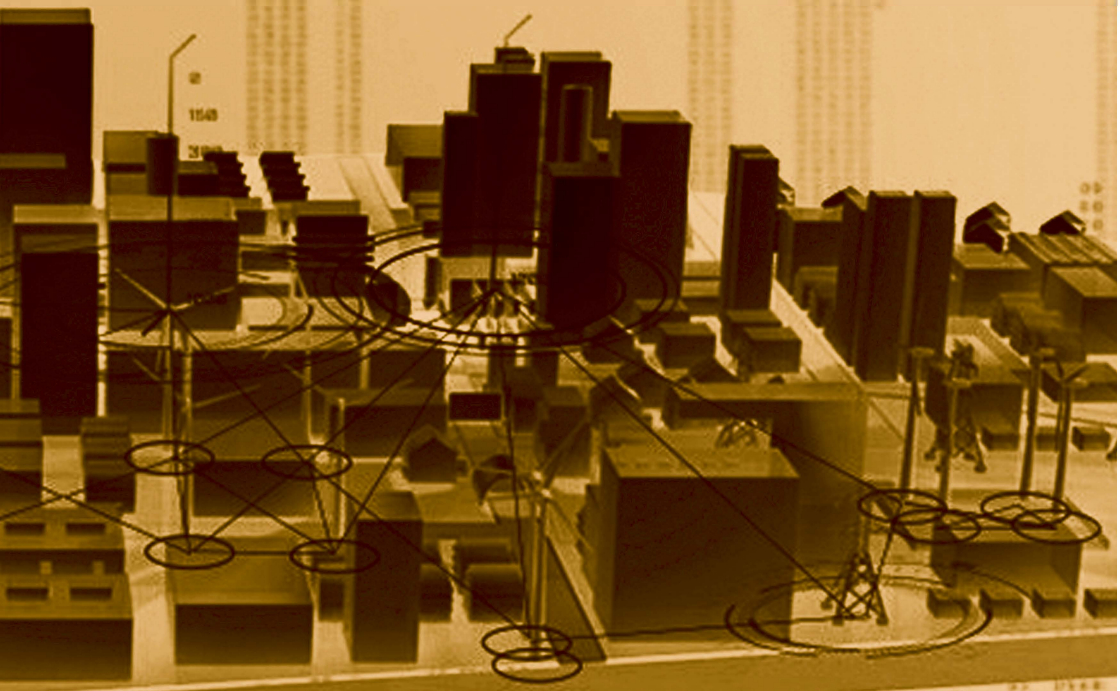
FABRIZIO TUCCI



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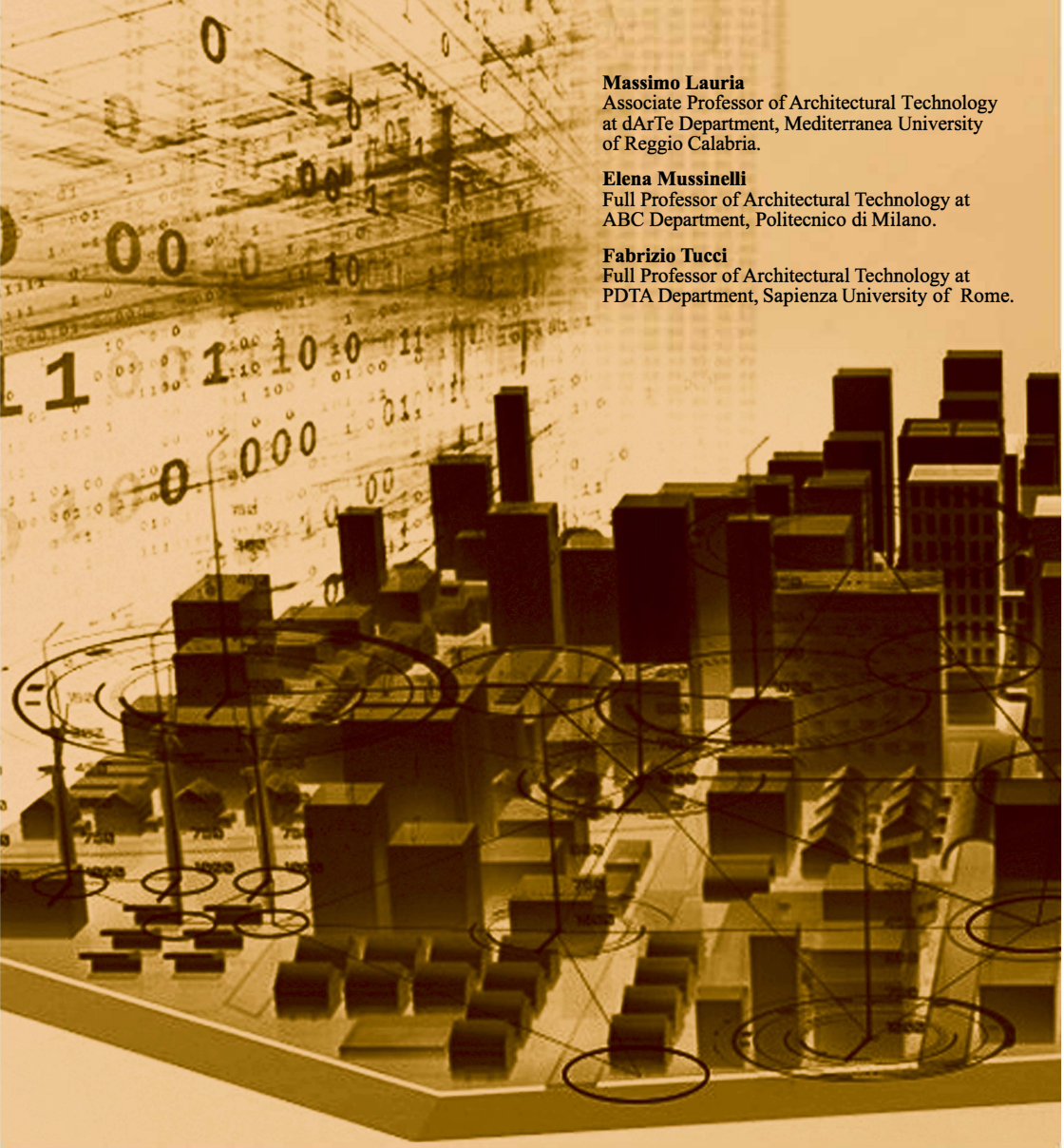
Massimo Lauria
Associate Professor of Architectural Technology at dArTe Department, Mediterranea University of Reggio Calabria.

Elena Mussinelli
Full Professor of Architectural Technology at ABC Department, Politecnico di Milano.

Fabrizio Tucci
Full Professor of Architectural Technology at PDTA Department, Sapienza University of Rome.



The transformations created about the design activity by the several challenges started by the economic crisis, climate change and environmental emergencies, together with the impact of the Web and ICT on social and productive systems, highlight many critical issues, but also significant prospects for updating concerning places, forms, contents and operating methods of "making architecture", at all levels and scales.
In this context, the cultural tradition and disciplinary identity of Architectural Technology provide visions and effective operating practices characterized by new ways of managing and controlling the process with the definition of roles, skills and contents related to the production chains of the circular economy/green and to real and virtual performance simulations.
The volume collects the results of the remarks and research and experimentation work of members of SIT*d*A - Italian Society of Architectural Technology, outlining scenarios of change useful for orienting the future of research concerning the raising of the quality of the project and of the construction.

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3.20 ENABLING TECHNOLOGIES FOR CONTINUOUS AND INTER-DEPENDENT DESIGN

Flaviano Celaschi[*]*, Daniele Fanzini*[*]*, Elena Maria Formia*[*]

Abstract

Design is undergoing a great transformation due to the introduction of new technologies, new models, new organisational systems and new missions, the connotations of which are not yet completely clear. What does design mean today? Who is the design destined for? What value does the activity yield? How is design linked to the production process? What is the relationship with those who commission the project? But above all, who are the project commissioners of today? Beginning with the concept of the mutating city, or rather the city as a living organism that evolves over time in relation to the circumstances and needs of its inhabitants, this paper deals with the issue of technologies that enable continuous project production methods in response to some of the above questions.

Keywords: Mutating city, Continuous project, Codesign, Enabling technologies, Building Information Modelling

Introduction

The change in design processes follows the change in factors on which the project is based. In this sense, the rhythm by which we try to renew our toolbox of processes, methods, technologies and practices for carrying out a project is now apparent. The contemporary city, the place to live *par excellence* of the new millennium, in which the ability of humans to adapt is really put to the test, is apparently still linked to the modern idea of the industrial city.

However, simply by measuring the parameters of functionality and quality of life, the difference is clear: overconsumption of energy, rising air temperatures, the high cost of procuring water and food supplies, the increase of uncontrolled poisonous substances, the disproportionate and rapid movement of peo-

[*] Flaviano Celaschi is a Full Professor at the Department of Architecture, University of Bologna, Italy, flaviano.celaschi@unibo.it.

[*] Daniele Fanzini is an Associate Professor at the Department of Architecture, Built Environment and Construction Engineering, Politecnico di Milano, Italy, daniele.fanzini@polimi.it.

[*] Elena Formia is an Associate Professor at the Department of Architecture, University of Bologna, Italy, elena.formia@unibo.it.

ple and things, the overproduction of waste or the lack of recycling, etc., indicate a scale of emergency which cannot be tackled with the tools of the past. The costs involved in the abandonment of brownfield sites, the real or perceived increase in crime, the awareness of the flow of city users active in the territory, the cost of certain services and events, population density, the perception of the happiness and wellbeing of citizens (social networking) are of no lesser importance.In the face of these problems, certain difficulties attract our special attention as researchers. The most evident are: the design of temporality and temporal variables involved in transformation, the need to experiment in the field rather than in laboratory, the sharing of objectives with citizens, but also the processes necessary to achieve this, the education of the masses about using the territory and resources with less devastating results. Rizzo asserts that great change occurs when environmental entropy is too elevated, this brings about a move towards a different energy model and consequently to the birth of new technologies and new economic, social and political institutions (Rizzo, 1989). This interpretation is particularly interesting in reference to our living environment, the most significant changes to which – using as an example the transformations brought about by the industrialisation of goods and services production processes – have an energy matrix with negative implications: progressively increasing the amount of energy used, we have indeed increased the entropic process and degradation of our living environment with evident consequences for today. As highlighted by Rizzo (1989), the use of energy-consuming technologies does not necessarily cause an increase in productivity, if anything it may result in a reduction of labour, which nevertheless represents one of the possible ways of using the available energy. In order to re-establish a good relationship with the environment, the paradigm needs to be inverted: the true revolution «does not mean the substitution of human work with advanced technological tools, but the invention and application of technological systems which allow a greater amount of labour to be made better use of»[1]. Not only, therefore, to reduce energy consumption, but to make better use of the work which the energy is capable of providing, to protect the environment and fundamental values of our society: «How a city is designed, built, maintained and managed depends on its energy supply»[2] and the move from quantitative growth and high entropy to qualitative and low entropy growth is the solution which needs to be pursued through technology.

The city, therefore, is going through necessary and essential mutation. Thus, it is also necessary and essential to study and disseminate different approaches to the management of this transformation, which is continuous, as is the work of the designer who aspires to achieve it.

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1 Cf. Rizzo, 1989, p. 73.

2 Cf. Rizzo, 1989, p. 74.

Design policies for the mutating city

Key factors of change, like those referred to in the introduction, cause serious problems for the city, with unimaginable consequences in the future. The dimension and cost of this fragility is impossible to know; the growth or attenuation is impossible to perceive. However, this latent element is in fact the ground zero for evaluating and quantifying the gravity of the phenomenon, to design/forecast the intended change and to demonstrate the will to invest in the transformation. As asserted by the first studies on the crises of current urban models elaborated in the Sixties, traditional top down planning approaches are no longer effective. This situation is countered by the vision of the mutating city which is continually self analysing by means of the representation and social sharing of the elements of transformation and which plans, in real time, possible solutions based on awareness and participation. A vision which is fed by the relationship of interdependence between the built environment and the mental state of the people – space-feeling-action – (Fanzini, e al., 2018) and which allows design anticipation to be used as an instrument for increasing the resilience of the ecological-social system. Design experience and the use of enabling technologies means that projects based on the following operational structure can support sustainable urban transformation:

- study of fragility factors and the impact on the area under examination;
- acquisition of sensitive data and its social sharing;
- codesign and involvement of the stakeholders and citizens in data analysis;
- Setting up communication systems which aim to define what is ethical and unethical urban behaviour, comparison with other similar urban centres (continuous competition and comparison), presentation and celebration of ethical citizens and behavioural guidelines;
- implementation of adaptable systems of governance which exploit the potential of the widespread social network (citizens as sensors) to support the central decision-making processes.

In this proposal, the mutating city becomes the paradigm to verify anticipation by design, through the presentation of scenarios and models for urban transformation. The discussion is supported by a theoretical background: the constant-latent-receding factors constitute a base element of the proactive design driven process. An approach which adapts the concept of anticipation developed by social sciences to design (Celaschi, 2016; Formia, 2017, Celaschi et al., 2018). In this sense, the urban dimension represents a platform of meeting and exchange, both because it is a natural place for the sharing of expertise and because it includes a variety of stakeholders. Some examples around the world are moving in the direction of anticipating models and scenarios of continuous, sustainable and shared change. Among these are the *Città Leggera* (Italy); Incheon Living Lab (South Korea); Sencity (USA); Rock Project (Italy); Guadalajara Digital (Mexico).

In these projects, the digital transformation mediated by the relationship with people (Industry 4.0) overtakes the functional paradigm of the smart city and becomes, thanks to the mediation of design, architecture and built environment technologies, a strategy which counters the dystopian vision of the city of the future. This reality is continually monitored and effectively represented in order to share the changes and investments necessary for the inefficient to be corrected and regenerated day-by-day.

Enabling technologies and the continuous project of the mutating city

In order to re-establish a balanced relationship with the ecosystem, as frequently cited in the introduction, Rizzo (1989), proposes a difficult if not actually improbable existential and epistemological passage towards a low entropy society, characterised by a dominance of qualitative and spiritual values over those of purely quantitative and high energy intensity. Over thirty years later, while the basic principles of this proposal are upheld, it assumes new meanings and operational implications: availing of new and powerful exosomatic instruments (as also defined by Rizzo), the epistemological and existential pathway necessary to save humankind, finds the means necessary for its realisation.

To understand how this can be made possible we must return to the mutating city concept expressed in the second paragraph, which views the city as a unique Living Lab. A living place because it is made up of various types of living (or at least active) and interacting components that, thanks to enabling technologies, is able to monitor its own status in real time and to share the results. A place which Dioguardi (2009) foresaw almost ten years ago as a structure in which real socio-technical networks of intelligent terminals are activated in the form of real “urban laboratories” (Dioguardi, 2009, p. 173).

The interaction between citizens and their own living environment by means of continuous monitoring of conditions makes them responsible and calls them to account for the real issues of that living environment, in a parametrical and geolocalised way, and to participate, also on a project level, in finding solutions to those problems. All this conditions their behaviour and facilitates the autopoietic assumption of responsibility. The implications are extensive and promising: with regards the environment, for example, this makes the union between ecobiological reflection and social anthropology issues possible, a concept which Casurano (2017) presents as the basis for a new and balanced ethic of the project. This union breaks away from the schemes we are used to, which are based on scales of differentiation, roles, contractual relationships, and are viewed mainly as a contrast of responsibilities rather than as the promotion of possible partnerships. If we look at what is happening today in the field of urban regeneration, a subject which unites all the various realities of our territory, we can see how the relations between planner, user, developer,

financier are not as defined as in the past: the roles alternate and, very often, the agreements of partnership and collaboration make the difference. The impacts on the planning process are evident through cocreation, codesign, tangible collaboration tools and practices. The key factor is the moving from the "fixed" logic of the project activity, which represents partial decisions defined at a given time, to the "continuous" and interdependent concept of the project; its framework is the fluid exchange of information between animate and inanimate components of the city, between administrators and users, between citizens, through the functional and intelligent use of the information systems. Industry 4.0 (Celaschi et al., 2017) offers an interesting approach to the human-machine partnership, launching a strategic message to the operators: enabling technologies will increasingly provide possibilities for value creation, not only through specialisation, but also and above all, the appreciation of widespread creativity:

> «with this approach, intelligence can be the result not only of the cognitive and emotional capacity of individuals, but also the ability to relate to and collaborate with the various components of a system, living beings and forms of artificial intelligence» (Bagnato, 2014, p. 50).

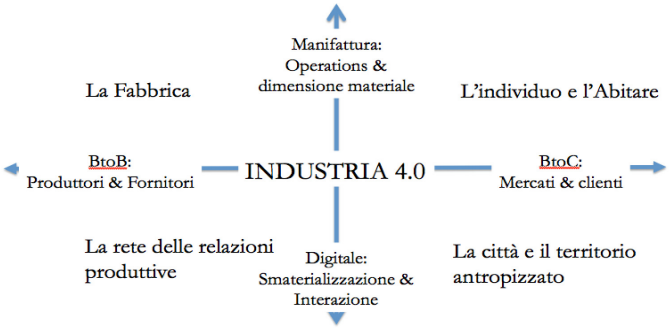

Fig. 1 - Areas of man-machine collaboration in Industria 4.0 (source: Celaschi, 2017).

Apart from advanced sensor technologies which allow the real time connection of the physical realities of the city (traffic flow data, for example) to the intangibility of decision making, there naturally emerges the need for the harmonious and shared design practice which Ratti (2017) defines as "of mutation". In other words, technologies able to facilitate the interaction between different individuals within the complex decision-making process. In the planning sector, the diffusion of Volunteered Geographic Information, VGI, has allowed for the investigation of social dynamics and preferences of citizens, contributing to the identification of new relationships between communities and places in which communities live and to sustaining the transdisciplinary relationship between planning, design and VGI, which brought into being the new discipline of Geodesign (Mourao Moura et al., 2018).

This same experience can be replicated at other levels of the project, from the building sector to the objects which furnish public spaces, giving life to other new disciplines and new organisational models of production. Building Information Modelling (BIM) is established as a new technology able to facilitate design management as a form of collaboration in the fields of engineering and architecture. It can also be applied at all levels (from the environment to the territory, to an individual artefact) and to all projects (from new builds to restoration, to urban and environmental regeneration). This particular technology is becoming rather widespread, due also to it now being an obligatory requirement for new public procurement contracts. The applications available on the market prioritise technical planning, neglecting another important aspect, namely that which precedes the activation of a project, or the definition of the essential framework. The principal use of BIM really stems from the possibility of establishing a profitable collaborative relationship between all the individuals involved in the planning process, primarily the commissioning body, whose task it is to define, in an informed and reasoned way, the planning alternatives and choices in the design definition phase.

In the field of industrial product design, it is stated that:

> «planning can begin with two different approaches: it can take its lead from the requirements, or it can be led by an exercise in creation, visualisation and prototyping» (Rizzo, 2009, p. 129).

The ability to read the potential of a territory, to express the visions and requirements adequately (firstly in spatial terms) and to establish the rules for the management and control of the design process are the premises for the practice of the "continuous project". Within this, BIM can work "as a metaphorical change driver" (Cribini 2016), an efficient vehicle for change to guarantee collaboration, interaction of expertise, collaboration between individuals, continuity of decision processes. This is true if it is mainly used for its cognitive mediation potential, rather than pure and simple standardisation.

Enabling technologies, the continuous project of the mutating city and the impact on production organisation models

Numerous examples of the biological metaphor of the mutating city, namely of the city as a living organism, can be found in the literature. As well as the previously cited work of Ratti (2017), it is interesting also to quote Bagnato's point of view (2014, p. 51), which specifically refers the biological metaphor to the world of vegetation in order to define the future conditions of the production model in view of a possible fourth industrial revolution:

> «to be rooted in the territory, reproducing widespread productive units, not to be hierarchical, to leave each party (individuals) free to follow their own strategies, to be oriented towards problem solving using the resources of the external, economic and physical environment» (Bagnato, 2014).

These same elements can be traced in the "holonic virtual" enterprise concept (Merli et al., 1994) – which we can today express as digital – coined to describe a systemic type of production configuration which is highly flexible, reactive and adaptable. A model which has led to the concepts of "neogood" and "neomanufacturing" and which breathes new life into the building sector, giving form and meaning to the networked production model presented and designed by Gianfranco Dioguardi, who, in 1983, used the term "macro company" or "company systems" to describe the overview of actors involved in achieving the production objectives of a company. In light of these considerations, the concepts of macro company or company systems, thanks to enabling technologies, can today be transferred to the project, viewed not as a single phase in the production process, but as combined enterprise management which, thanks to information modelling, is able, while maintaining the performance logic of the measurement of results, to include various points of view, different project aims. At the SIT*d*A Conference 2018 in Reggio Calabria, Filippo Angelucci explained:

> «in some circumstances, management still expects an authorial rather than an evolutive project, without confronting the subject of the metamorphosis of space […] we have the possibility to become enablers through technology […] that is, to find connections, compatibility, to build through different levels of intervention».

Enabling technologies are capable of greatly increasing this possibility, to the point of surpassing those very organisational models which still base their effectiveness on the contraposition of responsibilities.

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