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# PRO-INNOVATION

## PROCESS PRODUCTION PRODUCT



edited by

**Giuseppe De Giovanni**

**Francesca Scalisi**



**PALERMO  
UNIVERSITY  
PRESS**



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## INTRODUCTION

The beginning of the third millennium has marked a period of unprecedented change for cities, architecture and product/visual design. Over the last two decades, economic, social and environmental causes have stimulated and conditioned research and production, directing them towards substantial paradigm changes, proposing new challenges to create more smart, more resilient, more responsive and adaptive, more efficient and more sustainable urban systems, buildings and objects – from nearly Zero Energy Buildings (nZEB) to Positive Energy Architecture (PEA) – designed and built faster, with lower costs and with a positive effect on the environment, society, health and productivity: more innovative, in a nutshell. It is a common knowledge that innovation is, now more than ever, the tool needed to recover from the global economic crisis, to aim for economic prosperity and quality of life improvement, to increase productivity, to foster competitiveness, to support the challenge of globalization and environmental sustainability, both at an ‘incremental’ level (improvement of an already existing production process) and ‘radical’ (to create a new unmatched method or production system).

Innovation concerns Process issues, i.e. sequence and organization models, management and control of the process stages, operating methodologies (ideational, design, productive, operational, management and of disposal of the work/product) of the whole life cycle of the artifact, regulations, new professional experts and technical skills, ways to involve professionals and users in the several decision-making stages, etc. Production can also be affected by innovations involving tools suitable for the optimization of the different stages of the production process including machines and robots for digital manufacturing (CNC milling, laser cutting, 3D printing, etc.), for prototyping and for prefabrication, relating to analysis and design/simulation software (also with virtual reality) CAD and CAM, BIM, digital, parametric, algorithmic and generative, environmental, structural, energetic and thermal; installation and assembly techniques and technologies, etc. Finally, Innovation can also deal with smart, advanced, composite, recyclable, sustainable, nanostructured, shape-memory, phase-change, self-repairing, responsive, adaptive, low-cost and high-performance materials/components/objects with a low environmental impact, automation, detection, management and control equipment for performance optimization, ‘passive’ technologies for efficient casings, including natural ventilation and cooling systems, water collection, storage and recycling, and off-grid renewable energy production. In this regard, the publication ‘Pro-Innovation: Process Production Product’ collects essays and critical

thoughts, research and experimentation on the subject of Innovation in the building and design industry, which can provide some starting points for debate for the international scientific community or show successful examples of innovation, sustainability and social inclusion. The papers are grouped into two sections (Architecture and Design) according to the scientific field they are referred to.

On the link between Shape and Structure, Bellini and Ruscica's paper is worth mentioning. They highlight how the potential of construction systems based on structural conceptualization and respect for static equilibrium, with reference to reciprocal structures and tensegrity systems, can help to teach the importance of the control of shape and structure, activating a fully unitary process. While on the links between Structure and Plants, Quadrato observes how the structural elements, in the Italian architecture of Marco Zanuso and Aldo Favini, between 1950 and 1975, while preserving an internal system of topological and tectonic relationship, they became technical tools capable of ensuring not only a static, spatial and figurative validity but also a technological one. On Prefabrication as a possible (flexible and adaptable) response to the housing emergency, Ruggiero critically describes a housing construction program underway in the City of London (based on the implementation of off-site production principles), outlining its aspects on technological innovation and questioning the potential and problems of a new building culture.

On the subject of Digital Manufacturing, Vacanti, Ferrari Tumay and Vian talk about the Fab Labs not only as places of experimentation and research but, above all, as joints of a network that, over the last few years, has succeeded in starting collaborative processes between geographically distant places, highlighting how the Ma(r)ker, co-producer and co-designer, hybridizes new technologies with traditional production systems, manufacturing artifacts that have symbolic values of belonging to a specific territory. On the potential applications of 3D printing, we mention Inzerillo's paper which describes some experiments, as a result of the relations between research and real actions of companies—design-oriented—which invest in their own territory, developed in Palermo and whose innovation is focused on the market of Carbon fibre reinforced plastic and the integration of digital production processes.

Also Conato and Frighi deal with innovation, analysing the relationship between Buildings and Intelligent Materials, highlighting how these product innovations can define process innovations in the organization, management and control of every step of the life cycle of an artifact, allowing the creation of tailor-made buildings oriented towards a more efficient architecture. And Baratta, Calcagnini and Piferi's paper has a critical reflection on the subject of innovation in the sector of Brick production, a more traditional material, identifying the more recent and interesting solutions on process, product and process innovation that have enabled this material to efficiently respond to an increasingly strict regulatory framework and to meet contemporary formal and market needs.

Other aspects of innovation in the building sector are dealt with by Rogora, Carli and Trevisan who propose the Role Play as a way to interact between designers, citizens



and public administrations to favour common decisions in the processes of transformation of the built environment in a sustainable way with a method that enables to verify the effectiveness of the achieved results. Angrisani and Orsini investigate the innovative potential of the Parametric Design Process, applying it to three case studies on an urban, architectural and technological scale, by checking how it can favour smarter, more resilient, more adaptive, more sustainable cities, buildings and components, in the context of new design processes managed by algorithms that provide solutions and improvements on efficiency, performance, choice of materials and cost optimization. While Cianfanelli, Pelosini, Tufarelli and Malpelo report an experimentation of these new devices applying generative design to evergreen Made in Italy products, with the aim of understanding how these new procedures can be used to provide valid solutions and if they are destined to replace the role of the designer. On the roles and skills of the Professional Designer, Bisson, Pizzolato and Palmieri's paper should be noted. They consider how this role is evolving, with reference to the collaboration with the industry world, asked to offer new skills in operational contexts sometimes unexplored.

Regarding the subject of environmental sustainability, it is worth mentioning: Sposito and Scalisi, identify in the Environmental Product Declaration (EPD) or Type III Environmental Label a useful tool to guide the professionals and users in the choice of low environmental impact building materials and with equivalent functional requirements, analyse and compare the records of wood products (for building systems and components) on the market in relation to their end-of-life; Buoninconti, De Joanna and Vaccaro present the ongoing research at the CITTAM of the University of Naples 'Federico II' for the development of a product evaluation methodology, which can be integrated with the BIM, guarantees sustainability certification and, in fact, contributes to the digitalization of the executive project; Clemente, Altamura and Cellurale, within the Italian building regulatory framework recently characterized by the definitive implementation of the Environmental Minimum Criteria (CAM) for the building industry (Ministerial Decree 11/10/2017), compare two architectural design experiences for training, highlighting how the same CAMs can represent a perfect driver for the recovery of an economic sector that is struggling to restart; Cannaviello focuses on the subject of energy redevelopment of logistics services and on the nZEB System capable of responding both to the need to optimize not only energy-environmental quality, and aesthetic and communicative quality of the traditional building site monobloc.

Other research integrates the overview about innovation. On the basis of a study carried out by Confcooperative Habitat, Mastrolonardo, Di Dio, Spataro, Sala and Schillaci describe research aimed at improving how to work actively on communities for a tangible social impact capable of offering a model that knows how to enhance common urban spaces within the interventions, through a procedural model proposed and modulated on an evolved platform. For the creation of a Simulation Centre aimed at providing education and training in the medical field, Bisson, Ianniello and Palmieri propose guidelines and toolkits, capable of combining traditional tools with virtual reality tech-

nologies, to create complex, more realistic systems, useful to build an effective and targeted training, fostering the horizontal collaboration among the many operators, even geographically distant. Vignati and Terenzi report the experimentation of a new Innovative Product both to respond to the specific need of children in preschool age and from the technological point of view, capable of encouraging and facilitating their motor skills through games and digital technologies. Finally, Zappia and Morozzo della Rocca, as part of the new subject dedicated to the History of Nautical Science, Nautical Heritage, describe the studies and results achieved in defining guidelines and methods for the conservation and restoration of historic boats.

The papers collected in this publication provide a summary, obviously not exhaustive, of the Innovation that is characterizing the beginning of this century, presenting many proposals and new points of view of the process, of its management and of the building production that indicate new paths to thread and new professionals.

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The beginning of the third millennium has marked a period of unprecedented change for cities, architecture and product/visual design. Over the last two decades, economic, social and environmental causes have stimulated and conditioned research and production, directing them towards substantial paradigm changes, proposing new challenges to create more smart, more resilient, more responsive and adaptive, more efficient and more sustainable urban systems, buildings and objects – from nearly Zero Energy Buildings (nZEB) to Positive Energy Architecture (PEA) – designed and built faster, with lower costs and with a positive effect on the environment, society, health and productivity: more innovative, in a nutshell. It is a common knowledge that innovation is, now more than ever, the tool needed to recover from the global economic crisis, to aim for economic prosperity and quality of life improvement, to increase productivity, to foster competitiveness, to support the challenge of globalization and environmental sustainability, both at an 'incremental' level (improvement of an already existing production process) and 'radical' (to create a new unmatched method or production system).

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