Technological innovation in architecture and in digital

Beginning from a discreet traditional statement that interprets the role of technique in modal/instrumental terms, it is possible to observe an extension of its potentiality, in the forming as well as in the work of contemporary architects: the role of computer and of digital technologies, in the last twenty years, has gone through a speed up such that they are nowadays fundamental instruments totally integrated into the discipline of architecture.

A high grade of diffusion does not seem to correspond to a sufficient grade of assimilation of the instruments’ limits and potentialities in the architectural production.

Instruments, means and machines have always been important in their capacity of influencing, modifying, transforming forms and aesthetic qualities of the artistic products; in the field of architecture, in particular, a meaningful example has been given by the introduction and diffusion of the drafting machine, with its aesthetical implications, in all the scales of drawing.

No doubt, the relationship between art and technique, beyond the epistemological overlays of significance of the terms “ars” and “technē”, is in fact a relationship between aesthetic intentionality (poiesis) and way of its achievement (praxis).

Is moreover extremely evident how starting from the first cases of computer schooling up to the successive maturations, the expressive and conceptual codes of architecture have suffered a deep transformation: the introduction of the computer and of the digital techniques, with their high velocity of diffusion, puts questions on at least three conceptual levels:

- The transformation of techniques, contents and methods in the forming of new architects, related to the introduction of computer instruments;
- The advanced integration of the digital supports for architecture with the world of building industry productions;
- The instrumental implications of computer techniques in the formulation of design processes.

The digital support: an instrument of control or of conception?

There’s no doubt that the material character of architecture puts some limits to the velocity of assimilating the digital instruments in spite of their capacity of revolutionizing rapidly forms and aesthetics of the artistic products.
The introduction and increase of the “new objects” (prosthesis, appendices, accessories, etc.) with a high technological content, availables in the daily life, is not able to cancel the intrinsic characters of the building materials (including the more advanced); these offer a natural resistance to the progressive loss of weight of architecture, keeping its peculiarity of object substantially “stable” inside the requirements of “firmitas” and “utilitas”.

Under an epistemological point of view, the digital instrument makes today possible to define and discover requirements and performances of architectural objects through virtual simulations with a low grade of approximation towards reality; this low grade, nevertheless, represents in any case a very big separation between the digital dimension of the object simulated in a virtual context and its materialization in the real context, both in terms of performance or efficiency and in formal/aesthetical terms.

Between the different roles taken by the computer instruments (beyond the possible limited metaphysical interpretations) it seems to be evident the configuration of three thematic ambiets:

- The digital instrument as a place of aesthetical investigation and of design representation.
- The digital instrument as a system of technical control of the implications and of the energetic and environmental building performances.
- The digital instrument in the relationship form/structure of architecture: a new dialectics between framework and architectural envelope (bones vs skin).

**Technological innovation and constructed forms: the customization of urban form**

Conceptually congruents with the binary characteristics of the world of computers, the formal relapses of the digital instruments on the works and on the building systems are doubles and mutually opposed.

In one way, the digital project makes easy the construction of “database” of readymade objects, elements, systems and archives that, even though potentially unlimited, they are then taken into the professional activity through operations of selection and assembly (copy and paste) tending to a homologation and to a reiteration of “pre-packed” solutions (produced for the mass market).

On the other hand, the versatility of computer means (both as interface and as a system integrated with building production) permits, in the field of the more advanced experimentations, the high (often unlimited) capacity of customizing formal and constructive solutions; moreover, being the CAD-CAM customized instruments themselves, a further element is added to the process of integration with the building industry.

These mutations in the process of conception, production and realization of the building construction, cause an ever-increasing production of “architectural rarities” (like the objects from the fashion design or from the automotive industry) accessible just for selected clients. The architectural object, if we observe various design experiences in the last years, has become a
“unicum” (solitaire) in the urban scene, regulated by principles that look like the originality at any cost and the spectacularity of the form.

In the building (unicum) in this way interpreted coexist two kinds of character: those coming from the handicraft culture (although technologically advanced) and those coming from the mass production in large homogeneous quantities; this is a typical aspect of the post-industrial process, in which also architecture meets with its ambit of materialization, midway between industry and handicraft world, to the extent that from the first it gets organization, times, productive continuity, quality, and from the second the flexibility to demands and, most of all, the capacity to produce object unique of high added value.

**The icon value of form: the bi-dimensional objectivity of new architecture**

The technological innovation, with the transformation of the architectural codes and forms, has modified the relationship between constructed form and instruments of design control.

The architectural form, in its unicity, becomes a media icon, and a new objectivity transforms the traditional peculiarity of architectural objects from “tridimensional-tectonic” to “bi-dimensional”, shifting the barycentre of the formal definition to the exterior building skin, to the architectural envelope.

The bi-dimensionality, characteristic of this new objectivity of the architectural icons, therefore express itself through the façade envelope: the form, consequently, yet is not controlled with the plan, neither with the construction of interior space or of the constructive system, nor through the plastic articulation of volumes.

Beginning from the Nineties, much architectural production has chosen as topic of investigation the envelope, concentrating on it its investigation and the continuous up-to-date of its expressive codes; in particular, this objective and bi-dimensional approach modifies the traditional dialogic structures in its comparison with the context, defining “personalized” relationships (mass customization), that a certain sense empty the idea of context (near or far), transforming it into “surrounding”.

**The modification of space: architecture from object to image of object**

To see the work of architecture as an object means recognizing in it a physical and a material value.
Many architectures of the last years express a loss of this figure, even though concentrated in the external skin (bi-dimensional materiality), because the building seems to prefer more and more a comparison with a space not physical or parametric, but virtual: a space with logics that come from the world of media and that, thanks to the opportunities offered by technological innovation and by the recent and rapid mutation of the architectural codes, takes on a shape of a place of “information” and “data” fluxes.

The external skin of building makes its role of control and protection fading into the background, and acquires the function of permeability to this passing of information; filter of environmental interaction, interface between inside and outside the building, flexible and deformable, its formal value depends of the entity and quantity of information that pass through it: the object is transforming into the image of object.

Architecture is reduced to “image”: it expresses the exaltation of figuration, of ephemeral and of spectacle, it goes away from the concept of matter so much that it loses completely its objectivity.

Simultaneity and emotional impact oppose the traditional principles of architecture, like history, logics, sequentiality; it’s easy to make out why in this new context the “dialogue” becomes more difficult: architecture seems to be able to talk with persons (driving his perception by the means of spectacular solutions), but it meets with many difficulties in making persons talking to each other.

**Envelope and computer instruments (virtual): the role of computer in the form definition**

Computer is the instrument that makes possible this phenomenon of dis-objectification, and that permits even to change very quickly the criteria and the codes that define the final form of construction. Fusion between virtual and real world is explicit non only in the constructed buildings, but also in the design process: the new systems of 3D elaboration make possible to change information and data in all the phases of the project, and this makes easier to get over the traditional limits of construction discipline, so much that it creates virtual configurations closer and closer to the constructed reality.

The architectural experiences, from “blob” to the complex geometries, anticipate every day more the investigation levels on the building envelope, with al least two different approaches:

First of all, the “form of movement”, that is to say the analogical transfer of movement (bit, reflection, intermittence, fading), typical of digital reality, to the building skin. Interactive, dynamic, intelligent facades, that through technology take architects to root into a formal direction that from one side brings to an end this process that transforms the object into the image of itself, and on the other hand it returns architecture to its textile-semperian origin. Very representative in this sense is the Kunsthaus of Graz, in which the Berlin architects Jan and Tim Edler created a multimedia screen that adapts itself to the sinuous form of Peter Cook’s building façade, throwing innumerable motion images, produced and controlled by a very sophisticated software that, in fact, controls the architectural object form.
Secondly, the “movement of the form”, that is to say the acquisition by architecture of the kinematical dimension, typical of the virtual and video-digital ambients. The project of the Prada Transformer by Rem Koolhaas, or the Sliding House by the London Office of dRMM, have in their form a raison d’être that consists in the possibility to move: this way of using the movement seems to be quite difficult as it becomes in conflict (over the virtual immaterial space) with the inevitable materiality of architecture, with its weight, its functionality and, after all, with the two permanent poles of the Vitruvian triad (firmitas and utilitas).

**Reality and virtuality: a tectonic trajectory**

Is possible to find, investigating the relationship between reality and virtuality in contemporary architecture, tectonic elements in design experiences, while in them every day more and more enter the logics of the computer means and of the mass communication?

A very recent experience in which the relationship between reality and virtuality keep itself into a tectonic dimension, at least, between the limits of discipline of architecture, is the Portugal Pavillon at the Venice Biennial of Eduardo Souto de Moura; here, an exquisitely conceptual operation gives to façade the role of mirror and measure of context: a bi-dimensional support that rejects all the levels of autoreference and of relationship with context, constructing with it an interaction made with an action of projection of reality, that in it reflexes itself.

The Cartier Foundation in Paris, by Jean Nouvel, is a building that also plays with the relationship real/virtual, without suffering the contamination of media logics or without the necessity of using instruments of artificial control. Three levels of glass are constructed in a way that is not possible to see if what you see is an object or his reflection, confounding the perception of reality: illusory operations, made through formal devices that belongs to the world of architecture, and that are not inherited from other disciplines.

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