International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319-6734, ISSN (Print): 2319-6726
www.ijesi.org ||Volume 9 Issue 5 Series II || May 2020 || PP 21-23

The Mechanical and the Digital New Deal

Almudena Ribot
Escuela de Arquitectura, Universidad Politécnica de Madrid UPM, Spain

ABSTRACT
It is time to reconcile two fields that are working quite separately in architecture up to now, mechanical and digital. Their collaboration is an urgent task if architects wish to maintain leadership in design technological innovation.
At a global scale, software and production separation has been the biggest occidental mistake of this new century, due to our single focused etherealview. Covid 19 crisis has taught us that, although we will be able to find excellent solutions and vaccines, we will have many problems to produce them in huge scale as we have relocated our production outside. On the smaller scale, local management and production are key issues in climate sustainability. In this sense, in order to give what our society needs, architects must rethink their way of design, joining their digital way of thinking with the available mechanical production which industry and rapid prototyping work with.
This text explores the arguments to work in this conciliation and search for opportunities joining these two contexts. The essay also proposes seven strategies to design and think architecture in this new post-scientific and post-digital era.
KEYWORDS: *Architecture, design, post-digital, mechanical, mass customization.*

Date of Submission: 06-05-2020 Date of Acceptance: 20-05-2020

I. INTRODUCTION

Architecture has recently passed through several crisis, world financial crisis and currently covid-19 global disaster. Despite this, if we consider sociological data, it looks like society will continue to require architects, but new demanded architects will be asked with expanded expertise.

According to United Nations Department of Economic and Social Affairs Population Dynamics studies by the 2050 of this Century, global populations will be ten billion inhabitantsand global poverty rates will decrease. Also, by 2050 68% world´s population would be living in urban areas. Our world is undergoing an unprecedent period of great climate, economical and spatial changes.

Consequently, it is becoming increasingly urgent to attend two issues. First, architects must be able to adapt themselves, time and again, the new economic and social contexts and, most important, the technological ones. As Jeremy Rifkin says progress age is over and our future is in the resilience period [1]. Secondly, we must find ways to join these two worlds, this century´s digital context with twentiethcentury mechanical one. Software and production separation has been the biggest occidental mistake of this new century, due to our single and obsessional ethereal view. Covid 19 crisis has taught us that, although we will be able to find excellent solutions and vaccines, we will have many problems to produce them in huge scale as we have relocated our production plants, factories and systemsoutsideour countries. As Marc Andreessen states we have had "a failure of action, and specially our widespread inability to ¨build¨" [2]. These issues are our stakes, we must increase our resilience capacity of design and join digital and mechanical contexts designing with industrialization technical knowledge and rapid prototyping.

ARGUMENT

We can considerer that mechanical point of view has prevailed until digital technologies spread during 90´s. It involves a scientific objective attitude searching for universal rules valid for everybody. It is the industrialization world.

Digital context is very different, it is the information, it gives value to similarity and multiple identities, subjective and variable. It moves towards free forms, organic growth and complex logistic as massive customization.

In our practice these two environments are typically working in separated fields, in fact at the universities,where we learn architecture, they usually are different subjects. Moreover, non-technophobes' architects also feel digital world as something alien.It is an opportunity to work in their conciliation. We find three reasons for it.

First reason, architects and designers have been leading digital design innovation from 90´s and we must keep doing it. In this time Greg Lynn and Frank Ghery are the best-known architects atthis field. We cannot understand their designs without computational technology. Ghery´s architecture may be designed without computer; his digital drawings are in fact born as hand models. Lynn is straighter, his shapes and surfaces follow an animated design software. Many authors stand that both use digitization as a simple tool, that makes thempossible to achieve complex shapesbecause they still belong to mechanical world. But, in any case both ways of doing show us a new way of *Making*.

The most interesting thing and the real change in this post-digital stage we are living in is, as Mario Carpo says, that now is begetting a new way of *Thinking*[3]. Thismeans a real revolution as we can see in these few notes:Known science look for universal laws and it is not interested in individuals as subject matter. New data science is just the opposite and it works better with the very specific and small things. It means that we move**from generic groups to individual cases**. Computers search quicker than humans classify. Our human idea of setting up groups and classifications, for better understanding the world around, can now be questioned. It means that we are losing taxonomies and overall views and a **new searching science** is becoming. As computers do, sometimes is more useful repeat an action an extraordinary large amount of times, meaning that appears another way of **working by trial and error**. And the point we find more outstanding: many people now proposethat it is better separate scientists for computational tools, **leaving computers work by themselves**instead following rules. This is so exceptionally transformative as it must have been, during the industrial revolution, set apart workers´ hands from machine productive processes.

Second reason,design and production distance has been greatly reducedblurring both worlds limits. We can observethis in digital fabrication: we design and produce without intermediary documents, in this context there is noneed for translation between authors´ thoughts and their work. Graphical display is also changing, it is evident bidimensional drawings are losing weight in favor of modelling, only in one generation we move from "bi" to tridimensional drawings. In occidental culture bidimensional abstraction has deep superiority over tridimensional models and this idea is very difficult to overcome. From the Renaissance we appreciate more painting that sculpture. Also,two-dimensional architectural versions are well considered to keep measures and data. And this is true, they are reliable,andmost important, very economical to be reproduced, during mechanical era. Despite this idea is deep-rooted, current reality is giving us different outputs and that bidimensional prevalence is going to fade out.

Third reason is that both worlds, mechanical and digital, are working separately into similar contemporary feedback logics. Both fields are not exclusive in themselves and they use all resources atdisposal. Industrialization always seeks for the economy and optimization in order to reduce processes. In contrary, digitization uses all the resources becauseit is not affected at all by diversity and it tends to accumulate. In both cases they use a positive feedback logic.

Post-digital architecture works in the same way. Wedesign from an existing scenario and insert our results in the general cultural world, in a global cycle in which others have already contributed. Nicolas Bourriaud is right sayingthat we use the whole world culture as our toolbox, and we embed our work "into a sign and signification network instead of considering it original and autonomous" [4]. Current architects are aware that other designers will appropriate our designs and will re-program the ideas we produced.

In similar way, industrialization is indissociable from architectural history and it is a key ingredient inany current research, we really use mechanical culture as part of our tool palette. Likewise, digitization, not only as an instrument but also understood at their full potential, is already our reality. Use of parametrization and digital technology use is already widespread.

II. CONCLUSION

Therefore, is time to think architecture in a different way following a post-scientific and post-digital logic:

1. Design from mechanical processes and simultaneously from systematization and data.
2. Use digital process in both ways, as mediator and generator.
3. Make objects and specific prototypes andat the same time design collections, looking for families and genetic."Mechanical culture produces objects while digital produces numerical progressions " [5]
4. Design beyond geometryforwards parameters and conditions.
5. Design with parts such as they are, only parts, not segments that can be added to achieve the hole. Independent parts that have as much relations as the system allows them, in an infinite exchange. "product can be used to make a work of art;this work can become an object again… "[6]
6. Take advantage of virtual frozen, less stable and durable shapes, less closed.
7. Move from individual to collective, accepting ranges vagueness y blur authorship. Move towards the multiplicity and the different.

In the end, search for industrialized and digital massive customization, recovering artisanal process variability without its quantity limitation. Carpostands that massive customization is the best design invention of

all times and architectsare the inventors [7]. If we can join these two worlds, mechanical and digital, and we can implementit we will be able to share with everybody else our inventions.

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Almudena Ribot "The Mechanical and the Digital New Deal." *International Journal of Engineering Science Invention (IJESI)*, Vol. 09(05), 2020, PP 21-23.