Reviewing urban transformation methods toward an open and shared designing process through new technologies.

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Abstract **- Since late 50s, some architects envisioned computer-managed spaces to better fit user's needs. At that time, the technology to implement their visions was not available yet. The same concept behind those visions is the basis of the participation process that started during the 60s in the urban design process. Mostly, it just failed.**
Today, urban spaces are pervaded by smart devices that have revolutionised our way to meet, communicate, work and experience the inhabited environments. Actors once fully involved in the process of decision making about urban transformation, start now to take advantage from this revolution that foster both more powerful tools and broader working teams.
This paper briefly discusses how data provided by new technologies can drive open-source approaches in designing and managing urban transformation. The change in paradigms regarding urban space design leads to solve contemporary city's issues through "choral" processes rather than just "smart" systems.

Keywords**: open-source; smart city; new technologies; data-driven; architectural device**

I. INTRODUCTION

During the 60s a heterogeneous group of European architects and urban thinkers operated seeking alternatives to the modern attitude of those years. Their utopian works and thoughts focused on the constraints that characterized the emerging culture and shared the will to solve problems related to the savage urbanisation that was taking place that time all around Europe.
Many of them shared the certainty that flexible and adaptable mega-structures were the unique effective answer to the need of expansion of cities and the only solution to both society and profession wearing behaves – from consumerism to top-down approach.
The second wave of utopian architecture started with the works of Yona Friedman, Constant Nieuwenhuys, Archigram and starting from the mid 60s, by the work of the Florence-based groups Archizoom and Superstudio.
The heterogeneity of their utopian visions was guaranteed by a mixture of individual backgrounds, goals and beliefs: Archizoom's Non-Stop City focused on infinite and rather featureless grid, while Superstudio's Monumentum Continuous aimed to put order with a world-covering architectural grid.
Archigram's utopian vision on modern city, the 'Plug-in city', was the ultimate version of their research on the "expandable buildings" topic. They claimed that it was inevitable to "investigate what happens if the whole urban environment can be programmed and structured for change" [1].
Yona Friedman's works had the more complete approach for today's issues. He saw his utopia as an instrument of social change, allowing people to decide how their dwellings should look like and to succeed in self-planning. Thanks to two simple as well as radical concepts, Friedman aimed to achieve these goals by designing the so called 'Ville Spatiale'. It was a "spatial infrastructure made of a fixed element – a multi-storey space-frame grid lift form the city level by stilts – and mobile elements consisting of walls, base-surface and dividing walls, which represent "the filling for the infrastructure" [2].
But mainly, Friedman developed "a program of methods of choice to enable people to create and position the living space they wanted" which was published in 'Manuals' [2]. He then invented a "model for communication to get a balanced combination that would serve to avoid conflict" [2]. It was thought as a computer program, called 'Flatwriter' (see Fig.1), that integrates the Manuals and it is aimed "not only to explain how to build, how to decide, or organise, but it also explains, for instance, mechanisms in behaviour, economics and principles he sees fit for people to improve their lives" [2].
The works and studies of another utopian and visionary architects had followed the same way. In 1961, the unbuilt project for the Fun Palace of Cedric Price was based on the idea to construct a 'laboratory of fun' with facilities for dancing, music, drama and fireworks. "Central to Price's practice was the belief that through the correct use of new technology, the public could have unprecedented control over their environment, resulting in a building which could be responsive to visitors' needs and the many activities intended to take place there" [3].
Price pushed forth these concepts in the 1976's project "The Generator" (see Fig.2), an early investigation into artificially intelligent architecture, which was designed with no specific program, but only a desired end-effect, in mind.
"The project was meant to provide a facility to house dance, theatre, and visiting artists. Cedric Price explored a type of architecture that, like medicine, would operate less as a remedy for the ills of society and more as a preventive system, creating flexible conditions previously thought impossible within a socially beneficial environment. The computer would encourage the visitor to continually refine and improve his or her design" [4].

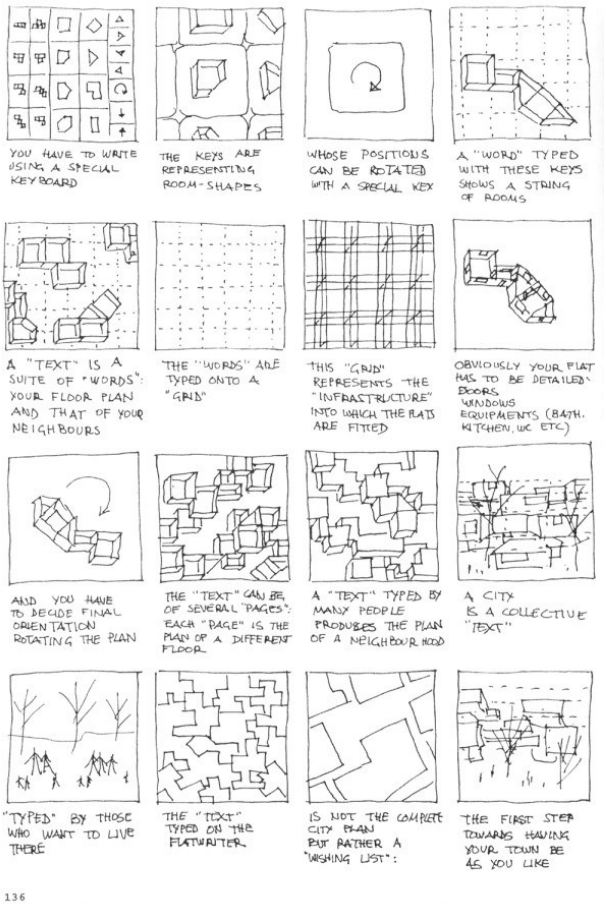

Fig. 1. Note of "The Flatwriter" by Yona Friedma. 1967 (source www.yonafriedman.nl).

Few years earlier, in his book "The architecture machine" Nicholas Negroponte looked "to a future in which genuine man-machine dialogue is achieved, when man and machine will act together on something closer to equal terms toward a common goal, each contributing his-its own characteristic faculty" [5].

In those same years, architect and mathematician Christopher Alexander tried out a model of a participatory design process called "the timeless way of building" at the University of Oregon [6].

Alexander developed a shared and non-technical vocabulary of design principles useful to foster dialogs on bottom-up actions. Despite the campus' vibrant atmosphere, Alexander was not able to involve the interested stakeholders and the project ended up facing indifference. Italian architect Giancarlo de Carlo, a pioneer in the participatory process, a decade before Alexander's experiment, wrote: "Collective participation bring a multitude of objectives and actions, of which results are unpredictable". Sometimes "the results could take to the self-destruction of the project" [6].

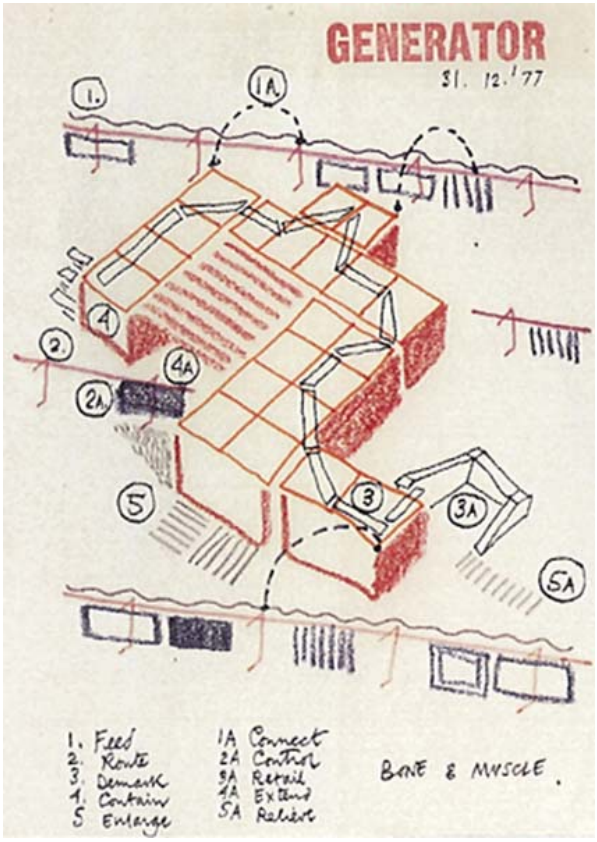

Fig. 2. "The generator" by Cedric Price. 1976 (source www.kiesler.org).

II. WHAT HAS CHANGED

Today we are resuming the theories of Price, Negroponte, Friedman and Alexander that are an essential heritage. Also, we are employing all the current tools provided by the modern technologies to better operate in the contemporary urban space. The paradigms embodied in their works - from Alexander's participation and bottom-up design process, thought Friedman's and Price's computer aided architecture-making visions, to Negroponte's first prototype of today's Computer Aided Design – are some of the most promising leading guidelines to start solving today's contemporary city's issues.

Since urbanism is struggling to answer to the needs of the contemporary city, new approaches are being developed; founded on the same paradigms of participation, open source and algorithm-aided, these approaches are supporting new theories and practices. As a result of this shifting, the traditional ways of dealing with the urban environment have started to be questioned.

In a certain way, the new approaches can be considered as an evolution of Friedman's principle of 'self-planning': temporary as well as tactical urbanism along with the principle of open-source urbanism bring in the front stage tools like short-term temporary actions and an open design process as well as authorities-free decision-making process. Today we are dealing with the chance to merge both bottom-up and proactive actions with computer intelligence to the aim of supporting

effectiveness and spreading while contrasting indifference and self-destruction.
According to Carlo Ratti and Matthew Claudel "urban interventions would mean nothing without the physical settings they engage and without public scrutiny" [7]. And yet, they introduce the mentality and approach of hacking to the physical world, affirming that "if hacking is about understanding a system, appropriating it, and using it for alternate purposes, then the core of a truly successful hack in urban space involves, first, what the site means; second, how the hack appropriates the site; and third, how the hack transforms the site to communicate a message to a broad public" [7].
Since the space we live in - either public or private - is the "result of the convergence of atoms and bits" [7], the theories enabling the change have to follow this trend as well. To avoid big ICT companies' biased vision of top-down approach and data-driven changes, the multidisciplinary team of actors that nowadays should be in charge of envisioning urban changes have to merge respectively know-hows, methods and tools.

III. GUIDE LINES

In their book "The temporary city" [8], Bishop and Williams explore on case studies and enquiry – as they say – on the topic of temporary urbanism. The temporariness contrasts with "the dream of permanence" [8] which have led humanity belief in its history and it is becoming an out-of-date vision when today we talk about it as a perpetual problem-solver, in particular if it deals with urban dynamics.
Since economic resources - the main driver for urban redevelopment in the last decades – are today lacking, "some are beginning to experiment with looser planning visions and design frameworks, linked to phased packages of smaller, often temporary initiatives, designed to unlock the potential of the site now, rather than in 10 years' time" [9] (see Fig.3).
Temporary strategies run in parallel with or ends in the open-source principle "open-source = many ideas" [9]. Open-source urbanism basically starts "by involving a broad range of social initiatives in the genesis of the city, by allowing citizens, not just to inspect plans, but to design the urban landscape themselves" [9]. As listed out in the book "Urban Catalyst" [9], *dynamism*, *shared control*, and *sampling* are the key aspects that differs open source city planning from classical planning models.
Respectively, Urban catalyst says that "*dynamic* planning only defines rough objectives at the outset; this is done on the basis of possible use programs, built and unbuilt spaces, and webs of spatial relations and densities. The "source code of the existing structures of a disused site represents the principal foundation for open source urbanism; the latter's goal is to define as little as possible and as much as necessary" [9]. Yet, by *shared control* Urban catalyst refers to "a method that involves surrendering a fair amount of the control, design, and utilization of the site to its active users" [9].
While *sampling* refers to a strategy in which "a site design and use concepts do not come about as the results of architectural competitions and approval planning efforts. Instead, they come about as the results of actions. (…) In the same way that sampling is used in music to create carpets of sound with distinctive sonic patterns, city planning seeks to expand the latitude for action" [9].

Fig.3. Image of temporary use of public space (source: "Temporary City" Bishop, Williams. 2012).

Even if temporary as well as open-source urbanism reverse classic planning "formulate-an-end-result" approach by "asking how dynamics can be engendered, without defining an ideal final state" [9], it does not totally substitute it. Indeed, it is more like a matter of coexistence of the opposites: "one term is based on small, short term steps without a long-term goal, the other from the top down" [9]. The result of the fusion in the planning urban changes, led to a "variety of hybrids" since open-source urbanism "will exhibit the "one true face" of an alternative city planning". [9]
Temporary and open-source urbanism are based on the actions of willing city-user determined to improve the urban space by making a change they thought and designed. Furthermore, this process usually does not set clear duration and entity, embodying a strong resilience.
The ways to have new technologies helping and fostering this kind of urban transformation are clear: from gathering and sharing people, information and experience, to built-up a temporary market, smart devices are already playing a crucial role in supporting temporary and open-source strategies and actions; basically, to make them work.
Of course, the network of sensors that generates the sensing infrastructure of the Internet of Things is a precious tool for the assessment of the performed actions. By analysing these bottom-up solutions in specific urban space, we would be able to learn and potentially replicate them in a more inclusive urban transformation process.

The application of the research carried by the London based Centric Lab would potentially enhance even more the effectiveness of merging open-source approaches with new technologies capabilities.
Josh Artus, Director of real estate of the Centric Lab claims that "by integrating aspects of cognitive neuroscience into the design process, we can build cities that are primed for their residents' health and happiness" [10]. It is nothing but a ready-to-test vision since today we can make machines "translate decades of neuroscience and psychological research form the lab to the city" - says neuroscientist Dr. Hugo Spiers of University College London (see Fig. 4).

Fig. 4. Stages to work with the Centric Lab (Source thecentriclab.com/services).

The application of this research run in parallel with a temporary and open-source approach because it focuses on people rather than monitoring traffic, parking spot, noise, pollution, etc.
"While ICT companies like Google, Cisco and Uber answer the question of *what* is happening within a city, - continues Artus - they are not providing the biometric feedback to explain *why* it is happening and *how* the city is impacting its residents. If we were going to have a truly "smart" city, it would measure impact, not just action, and then use that data to improve the lives of its residents" [10].
The approach of the Centric Lab links to a broader point of view about the city which lays on the concept that "Cities are highly complex, yet we are not thinking about them that way" [11]. Cities begin to be considered not as the composition of self-standing and isolated dynamics but rather as "complex, adaptive, self-organizing systems" [12]. This basically means that a city – as well as a region – is described by its land use, dynamics of population and economic activities that are "integrated with models in other domains such as economics, demography, and transportation" [12].

If the result of a collective decision made by a group of city-user is motivated by a common will of acting, seeking the whys generic citizen behave in a specific way in response to an urban environment is a precious information to start offering more reliable and context-aware solutions.
Although user-based analyses are essential to explore the social aspects that characterise the built environment, they need to be supported, guided and finally merged together to avoid incomplete solutions.

IV. A MERGING PARADIGMS RELATED ARCHITECTURE DEVICE

Nowadays, no architectural device has yet been tested in the urban space with the specification of embodying paradigms of participation, open source and computer aided architecture merged together. Many examples were designed as a single-paradigm related architectural device: for instance, HWKN project's "Wendy" merges art and environment care since she "cleans the air with a skin that is capable of taking the equivalent of 260 cars off the road. With all that clean air, Wendy's spiky arms reach out with micro-programs like blasts of cool air, music, water cannons and mists to create social zones throughout the courtyard" [13]. The project Luftschloss is a temporary art installation that oscillates between permanence and volatility during its phases. Of course, both of them unintentionally are public space catalyser.

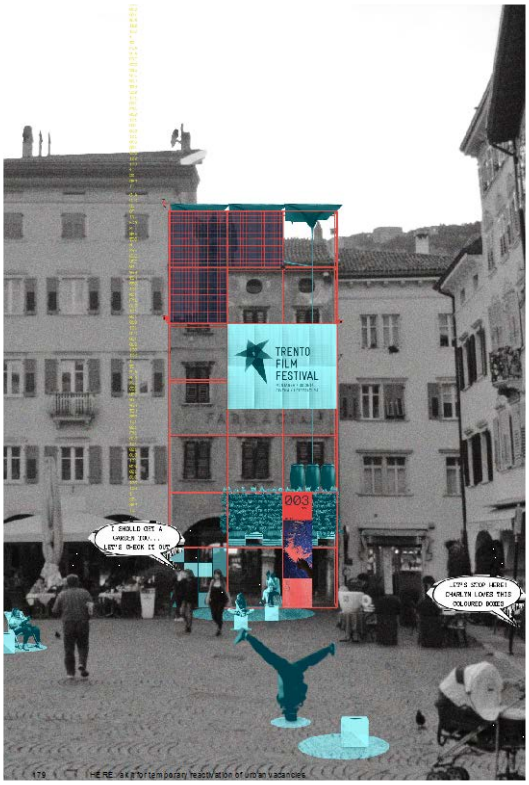

Fig. 5. Vision of HE.RE. interacting in Piazza Duomo urban environment (Trento, Italy) [14].

With Yona Friedman's concepts as references, a prototype of an architectural device that merges all the paradigms is HE.RE., that stays for Heritage Reactivation: a low cost, temporary, sensing and AI-managed urban space device that merges architecture and new technologies with a unique digital and physical interface to sense the surrounding and displaying the data it acquires to raise consciousness on the topic (see Fig. 5) [14].
All of this is set itself as a geared framework for bottom up activities and public space catalyser.

It was originally designed to reactivate idle buildings or vacant lot for an undefined period but it can work as stand-alone device as well – i.e. in a square or beside a highly crowed street. By gathering people's feedback, HE.RE. enhances new vitality by carrying on a shared design process for the public space.
Envisioning a piece of modular architecture like HE.RE. – which merge architecture and cyber-physical systems' models - is now made possible by the diffusion of 3D printing technologies. Digital fabrication has seen a huge push in investments and also diffusion: places like FabLabs are present in every major city around the world offering a creative environment where to construct and share whatever people imagination desire.
Naturally, HE.RE. is just a prototype so far, but it offers a quite reliable vision on what our city's public space might be hosting to be more sustainable and understood.

V. CONCLUSION

Inevitably, open-source approaches will spread as common urban practice, supported by what new technologies do best for us: track, create, analyse and make meet each other's, either physically or virtually. "From software to the Fab Labs, open source is outlined as a new and powerful methods of engagement" [15] to avoid indifference in the participatory process. As this bottom-up revolution will be embraced by the municipalities and stakeholders, hopefully regulations will start supporting an open-source attitude as well.
The visions and the experiences of Price, Friedman, Alexander and Negroponte, enriched by today's theories and tools, will be assisted by the capabilities of new technologies toward a more effective and more inclusive methodology to lead urban transformations.
We should update cities' adjective "smart" with the concept of "choral" to solve more comprehensively urban spaces' issues.

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