Complex, adaptive and hetero-organized urban development: the paradigm of flexible city

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ABSTRACT

Considering the actual modifications in social, cultural and economic contexts and the speed related to these changings, the necessity to find a balance against the growing urban chaos could focus on thinking the city as a complex system.

In the complex city it is relevant the non-linearity of the links among the components and the effects of these links. When the city government has a top-down structure, planning and administrative schedule and citizens' participation have modest and delay results.

Keywords: complex city, flexibility, urban ethero-organization.

1. CITY AS A COMPLEX SYSTEM

Considering city as a complex system is not a new idea. Many scholars and authors already explained this kind of approach (above all: Michael Batty [1]).

"What do we mean for complexity?" is a question that may have not a precise answer. Ruelle [2] and with a different approach Meyers [3] underlined that complexity is a common character of many systems that are made by a large set of information that are difficult to obtain, and that are ruled by theorems that are difficult to be understood and demonstrated. Surprise that complex system create and self-organization are two of the main distinguishing elements of such systems.

Portugali analyzed different authors (i.e. Allen, Batty, Brillouin, Proigogine and Schrodinger) and stated that it is demonstrated "that cities are open and complex systems exhibit all the proprieties of natural complex systems: they are open, complex, bottom-up and are often chaotic. [...]. Many of the mathematical formalisms and models developed to study material and organic complex systems apply also to cities." [4]. Taking into consideration physics and mathematics formalism, a question similar to the previous one may emerge: which is the relationship between the physical (artificial) part of a city and a complex system? The artificial city is a set of objects that can be described by a simple system, because it is possible to define all the elements that compose the set and to describe the mutual functional relationships among them [5]. As it is well known, the physical part is not the whole city. In fact the city is composed by artificial parts and 'urban agents', and also by material and immaterial relations. It is a dually complex system. The urban agents are elements with interaction ability that are capable to transform the artificial city in a complex system. The complex nature itself of the whole possible relations among artificial parts and urban agents makes the comprehensive system extremely complex and difficult to be understood and represented.

The behavior of 'urban agents' is the hint that characterizes and identifies the city with its differences and quality. Moreover the city appears as result of relations among the different urban elements and, being an open system, as consequence of the interaction between urban elements and the external environment [6]. Urban elements can be approached at very different scales (from simple buildings units to districts), and for each of these scales there is a possible external environment to which it interacts creating new differently structured complex systems.

Urban planning is the science that studies the development of city, or rather the development of elements that compose a urban system; for what have been told so far it is easy to understand that this cannot be a deterministic-based science. A system is deterministic if the knowledge of initial state allows predicting the future for certain. The behavior of the city seems closer to a deterministic chaos than to a perfectly predictable scenario (it could be also defined as a dynamically complex system, but this definition does not carry to any tangible advance in knowledge).

Deterministic approach was the basis of the rationalist period: the functional city and the rational rule that overcomes individual will (that means: that controls urban agents) has been for decades an undisputed attitude. In example, the "zoning" is still widely used in city plans even it demonstrated its limits. On one hand, zoning is a very pragmatic approach, on the other one, none of the cities that were planned with this inflexible regulation evolved as predicted (in example, Brasilia and Chandigarh). Rigid rules do not allow changes and the results, when obtained, often do not respond to the needs that were initially stated. But all open systems, such as the city, to survive need to change and evolve.

Deterministic methods are helpful to reach partial and simplified results (useful to solve simple planning problems); so, if it is possible to define a "science of the city" [1] this science shall be not based on deterministic rationality.

Nowadays the impact of regulation on modern life has influenced every planning action on the city. They define: what can be built and transformed and where; what features should have and what standards must respect the buildings; what activities may occur in certain buildings or places and under what conditions; what community services must be guaranteed by private real estate developments; what forms of inclusion and exclusion to apply in public spaces and private spaces. [7]

2. ORGANIZATION AND FLEXIBILITY

A significant number of additional features are based on the interaction among the different elements (artificial and human) that belong to the city. In particular, the ability to organize becomes one of the fundamental properties of a complex system and it can be expressed as the evolution of relational interactions. Organization thus becomes the constituent property of a system [5].

Till the early 1980s, it emerged the difficulty to describe and forecast the development of socio-economic and cultural context (as scholars like Bauman, Sennett and Sassen stated). The planning theory transferred the core of urban planning from spatial planning to policy making, processual issues and social involvement.

Once the deterministic certainty is no more valid, and even the comprehensive knowledge of the social and economic context becomes more and more obscure, the role of urban planning should focus on adaptive scenario.

The adaptation is achieved through the constant redefinition of the relationship between the system and its environment (coevolution). The organisms not only evolve, but co-evolve with other bodies and with the surrounding environment [8].

Organizational capacity becomes fundamental characteristic of the system. The typology of organization is the characteristic that optimizes the interactions among its elements, not in an absolute sense, but in relation to particular pressures from the environment. Solicitations act essentially as an organizational suggestion.

The environment is not fixed, but changeable: these stresses can vary, and a predetermined organization cannot be adequate. The system will assume different forms, modifying the schema of interactions of the elements.

The organization structure, inside the system, is not fixed: it has a dynamical configuration; and self-organization is the way the system adapts to the environment, opposing the destructive actions and safeguarding its integrity [9].

The self-organization can be proposed as a sort of evolution capacity. Through this characteristic, the system can preserve a good adaptive ability to the environment.

So, the organizational skills become the main issues that planner have to deepen.

The idea of a system that naturally progresses is linked to evolution theories and interpretations.

Starting from different scales and different approaches to urban studies, the city can be considered as an organism, if the socioeconomic contest is the environment-study. In another approach, the city can be considered the environment, if the organisms are the citizens.

Considering evolution principles, in urban theory Geddes identify the cities like an organism. It is the place where men are able to evolve themselves, and in which they can address all the knowledge, as the heritage from the past. This heritage is the principle for evolution in the future city. In Geddes' urban theory evolution is based on shape and function not statically, but in movement [10].

If the city is in continuous movement, a planner can define only scenarios and general principles. In contemporary urban debate, the evolutionist approach expects that there are not fixed and constant functions for urban places [11]. Cities are in continuous evolution, and it means that even the things that appears more stable, as the settlement, continuously change. But the central point of the Geddes' theory is that this transformation does not respond to the unfolding of a linear and inevitable law. For Geddes evolution does not mean to transfer the laws of nature, from the field of nature to the field of society. Evolution is a story that waves together innovation and memory, transformation techniques, collective ideals and the preservation of traditions and most remote institutions, always differently [12].

Also the Italian planner and scholar Piccinato supported the organicist urban theory. He believed the city as an organism is the most important conquest of the modern urban thought. The city is a human fact, and for this reason the quick modification of the society needs to be reflected in the city. The organic urban theory tends to modify the bases of urban planning, in order to create a more flexible plan, with margins of flexibility.

Since Bauman stated the existence of a liquid society [13], the implications on urban studies of this kind of society have been developed in many fields and disciplines. It is true that modern society is "easy-fitting" with the context (socio-economic and urban); in evolutionist language it is a step forward and an improvement. In the same time the static nature of the physical part of the city presents many conflicts with such a dynamic society.

So that flexibility has been expressed in different dimensions, considering diverse characteristics of the city as a complex system (made of objects and their relations).

In example, the flexibility in relational systems carried to the so-called "variable geometry" (i.e. Borja 2001, Camagni 1999, Goldsmith, 2000) that overcomes the physical limits of the city thanks to the communication possibilities.

Considering the government systems, many authors in different periods (i.e. H.J.Gans 1993, Poli 2010, R.C.Wood 1958 and 1959) supported adaptive short-term policies connected to their capacity to be effective.

In connection with the environmental system and the related ecological planning, the concept of resilience has been deepened (i.e. Applegath 2010 and 2011, Beatley and Boyer 2009, Newman 2004).

Also the predictive capacity in urban simulation moved its target from the definition of a static and ideal picture of the city to the comparison among possible scenarios (i.e. Batty 1976 and 2013, Bertuglia 2001, Rabino 2008).

Considering the physical systems in many contemporary urban and regional settlements they coexist phenomena like: functionalization and de-functionalization, densification and new sprawling, new territorial network structures, crossbreeding of urban shapes.

The shape of the city is not always unique or pre-determined and it needs continuous adjustments and changes.

A flexible city does not need a programmed shape; only the structural elements and the relation nets could be defined considering its changeability.

It is possible to define six principles that characterize the flexible city [14]:

- Temporal dimension: flexibility makes sense only if modifications are accepted in different temporal periods. Modifications of the physical part of the city should consider the changing of their anthropological meaning. Obviously the temporal dimension involves not only the city and its studies but also its regulation plans and the way planners understand their activity;

- Variable geography: the dimension and shape of the city are not pre-determined. They vary following the socio-economic context. Rem Koolhaas proposed interesting suggestions: any type of intervention on the city does not change its main structure. This approach entailed a functional open-endedness (Koolhaas 2001). These variations (in density, in functions and in the general urban load) need a strong backbone of infrastructures able to sustain modifications without compromise their effectiveness. That means a new efficiency understanding of the infrastructure nets;

- Reversibility: toward a sustainable world, expansion and contraction phases should be controlled by a comprehensive life cycle assessment that regards the whole city and not only the single buildings. In contemporary cities the contraction phase implies the disuse of places. It happened in Europe (from the seventies to the nineties) when big industries changed location and left huge voids in the cities; they needed decades to be renewed with enormous economic stresses. This could happen again, in a very close time, to many huge commercial malls or "edge cities" according to the reorganization of the commercial facilities after the economic crisis. A planner of a flexible city must be aware of this phenomenon and should consider that a city might also regress its dimension;

- Functional un-differentiation: according to the first principle, the city should adapt its functions to the contingent needs without a complete twisting of the entire structure. This means that all the "functional containers" must consider to host different functions in different times. Each urban function carries its urban requirements in terms of services, parking areas and in terms of infrastructures. The compatibility among different functions (and their possible twisting) involves also the forecast all the urban equipment for every possible functional configuration;

- Layers structure: the 3rd dimension is fundamental to organize different functional levels that should have different durability and adaptability. In particular the underground level must be exploited to host all the logistical functions together with the infrastructures and mobility net. In many megacities (such as Tokyo, Shanghai, New York) the underground levels close to metro-lines host commercial facilities, restaurants, sport facilities and all the indoor activities. From the functional point of view it is exemplary, but there are many other less qualifying urban and territorial functions that could occupy these spaces;

- Ethero-organization: a balance between the necessity to address the behavior of urban agents and to let them freely evolve together with the whole system is needed.

This last element is particularly significant and it will be deepened in the next chapter of the paper.

3. ETHERO-ORGANIZATION

In the urban context it is difficult to find some evident forms of self-organization because of the preponderance of the normative system. The affiliation between *urbs* and *polis* (administrative and political systems) is stronger than with the *civitas* (inhabitant system): in a general (and qualitative) overview of city management top-down government is still predominant in comparison to bottom-up one.

On the other hand, a kind of city management that involves citizens in all the governance steps (increasing the level of sharing and awareness of the limits and possibilities of the city), is difficult to pursue, for the implicit lack of a supervision that could manage the process and the conflicts. In fact, in many recent local policies practices, planners become more facilitators than a "future designers".

If the self-organization by itself is no longer effective, it is also true that the designer can see his efforts cancelled by the management of the city, if he does not take into account how the spontaneous processes, which take place on a microscopic level, may affect his interventions [9]. The 'urban agents' have a natural capacity to become planners and designers, and this capacity permeates the city life: it is the capacity that can transform the elements into artifacts. "A single urban agent (e.g. an inhabitant) often influences the city more than the action of the formal city planners (e.g. the city's planning team). Taken in conjunction with what has been said above – that urban agents are natural planner/ designers – each urban agent is seen as a planner at a certain scale, and, that due to the property of nonlinearity that characterizes the city as a complex system, it is often the case that the planning or design action of a single non-professional urban agent/ planner/ designer dominates the city much more that the plans and designs of the professional planners" [15].

In a flexible and adaptive approach to urban studies, it emerges how is desirable an ethero-organization system that balances the top-down planning with the self-organization (bottom-up planning). In this way the planning process becomes a real adaptive instruments for the development of the city. The results are not physically fixed, but the knowledge to reach a result (whatever it is) is clear to everyone. The *civitas* is an active actor, like *urbs* and *polis*. The elements that interest the living organism are coherence (self-organization), relationship with the environment (ethero-organization) and evolution.

4. ETHERO-ORGANIZATION IN THE USE OF THE CITY

The ethero-organization results in the urban context are currently uncertain, by their nature impossible to predict, and often linked to experiments or projects that remain often on paper. The maximum flexibility for the city can be a sort of paradigm for the future city. Some planning project in the past focused on the possibility to evolve the space continuously, adapting the city to the environmental changing: Tokyo Bay planning by Kenzo Tange (1960), Constant' New Babylon (1954 – 1969), Plug-In City by Archigram (1964). In these ideal cities citizens could organize their space quite freely. All these projects are a sort of experimentation.

Actually the most important study on the development of the future city comes from Delft University, "The why Factory?" research institute (T?F), with the collaboration of MVRDV group. The most interesting projects are AnarCity (Paris and Tabula-Rasa by T?F), and Freeland (by MVRDV). The last one, in particular, can be an example of ethero-organized city: there are some general rules, but the development of the city is totally free; the community is self-organized because of the necessity are common. The results of this experiment is that each citizens or neighborhoods wants to find a sort of balance for the necessity of each single 'urban agents'. "It is a next step in evolutionary urban development. It introduces a radical new model within the current urban planning, totally oriented in the user and totally flexible by which the area will be transformed into a differentiated, experimental and surprising urban areas" [16].

Ethero-organization in public space

The applicability become more practicable and more clearly demonstrable in spaces of small dimension, where the contribution of the *civitas* is definitely present and where they can contribute continuously: the organization and management of public space.

In the Charter of Public Space (Rome 2013, May), the active participation of the citizens in the planning process is underlined as an key point. Indeed public space are accessible and usable by all citizens freely, and can become a place of true democracy when people give an identity to the spaces, characterizing them and making them their own, renewing, recycling and keeping them, thanks to a new way of imagining the management (see in example the outputs of the Biennial of Public Space). Many experiments have been made in this field, particularly in parts of high density cities (like New York with the Pocket Parks of the 1980s), or in countries of northern Europe.

The use of the space according to these premises gives a number of alternatives, such as the creation of spaces for temporary events and traveling. If public space is the place where most it is possible to organize forms of participatory management, the results are highly differentiated from each other.

The temporary use of the public space is the most common example of ethero-organized use of the space. In dependence of the time (daily, seasonable, monthly) the results are totally different. In example it can be cited the Burning-man camp, a camp that is formed every year for a temporary event, as a sort of city around a big square with the Burning-man as a monument; the recovering of vacant lands in the center of Zaragoza (Spain), where an active group of citizens collaborate with the architects (garvalosdimonte arquitectos) to plan and transform some empty area in collective spaces; the Collectif group collaborates with some groups of citizens to transform some open space with recycled materials, in a new public space adapt to all the category of citizens (i.e. Défrichez-là in Saint-Etienne, France, 2011).

5. CONCLUSIONS

The study the city as a complex system, is a key point that nowadays many scholars demonstrated to be the best way to approach every planning action.

In a European or Italian contest, but also in the other part of the world, the role of the planner is changing. From a *demiurgo*, a guardian of the best future for a community, he became a sort of lawn-maker, able to imagine the flexible rules for the development of the city.

Moreover, in a context in which flexibility, resilience and adaptability are paradigms that proved their validity, the deterministic approach is no longer acceptable.

Planners may be able to define the limits of their action, knowing they can describe a direction that will enable the *polis* to manage the land, and the *civitas* to draw the territory.

Further steps in the research will be the check of the successful realizations of ethero-organization in public spaces, and the comparison between ethero-organization events and rigidity of normative order in the specific context in which they occur.

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