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Learning from Resilience: Cities towards a Self-Organizing System

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ABSTRACT

The study exploits development of a new field of research with the aim of reading uncertainty and transformation at cities by revealing resilience systems thinking theory for urban studies. The paper first generates understanding the resilience framework and its critical identities. Secondly the city is introduced as a complex living organicism. Here the complexity of cities is conducted in the context of a self-organizing organism while conserve their spatial structure, function and identity. At this juncture; cities and their built environment are proposed in the framework of 'being able to absorb uncertain perturbation and adapt itself through an adaptive cycle; of which key attributes of resilience is figured out a novel method for urban studies to be used to detain the taxonomies of uncertainty at identity of built environment. The study is concluded by impelling resilience as novel frontier thinking for postulating the ways of assessing a self-organizing city thinking towards uncertainty of change.

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1. Introduction

> *"We know that we can't design for every unpredictable event, but we can make sure our buildings and cities are better able to weather these disruptions." (Mehafyy and Salingaros, undated)*

Today, one of the reason why a range of scientific approaches of urban studies fail in pragmatism is because they endorse a rigid conceal for understanding city and its built environment in a stabilized equilibrium, and also a steadiness of relationships. Since, change occurs perpetually in life. The problem of adjusting built environment and cities in equilibrium disregards the monarchy of change, which continuously exits. Therefore, the complexity of relationships could not be understood, or may be difficult to be rationalized in a model. Therefore, the growing challenges of shocks, depletion and destruction of change must endorse a novel vision for understanding cities as a system in a resilient form, rather than in a stabilized equilibrium. However, the intense here should not admire designing each unpredictable and uncertain event; but allocating built environment and cities in a better capability of adaptation or a self –containing towards

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uncertainties of change. The question is to understand how the cities could detain the uncertainly of change as a self-organizing organism and how coherent contributions from other fields reveling resilience thinking could be embedded in mean of resilient self-organizing cities. Therefore, in the next sections, the study presents the resilience thinking framework and its critical identities regarding the relevance of those magnitudes to the cities. First, the study examines several definitions of resilience term for asserting a grounded understanding of its meaning. Then, a theoretical review is accomplished for defining its critical identities. In the third section, the city is examined as a living organism that asserts a self-organism system where a complex interaction between parts accomplishes multi-equilibrium to conserve whole of the system in a stabilized equilibrium. In the last session; the study introduces the city and architecture in mean of adaptive capability or the ability to bounce back to equilibrium, of which is the domain dimension of resilience in a self-organizing system dealing with multi-equilibrium.

2. Understanding Resilience Framework and Critical Attributes

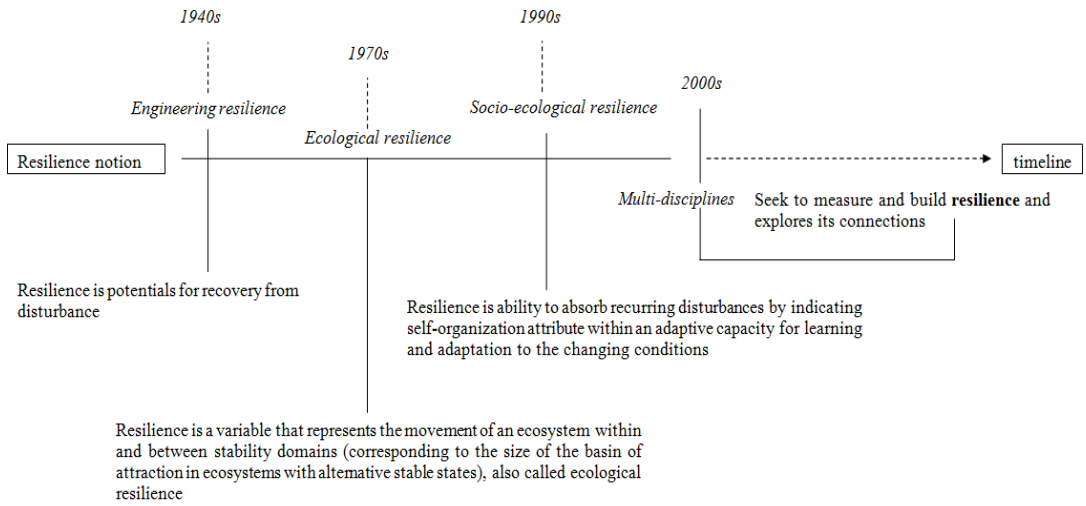
2.1 A Definition

Over time, the term resilience refers to the 'jump back, or 'flexibility quality of a substance (Klein, et.al., 2003; Ledesma , 2014; Greene, (ed.)., 2002). As opposed to its original use, resilience term is also utilized as a conceptual framework to evaluate the ability or capacity of a person, object, entity, or system to persist in the face of disruptions or difficulty (Laboy and Fannon, 2016). In core, resilience is primarily utilized to describe 'a thing's ability to deal with change by remaining or preserving the same state or condition, or adapting itself to the novel the state or condition.' (norrish, 2016).

In literature multiple approaches describe, discuss and explain the resilience notion through different meanings and methods. As examples from ecology, Holling (1973) provides a persistence system quadrant of the term resilience in multi-stability core drawing an ability to absorb change; Alexander (2013) from geography provides a detailed historical etymology of the term 'resilience'; Bruneau et al. (2003) identifies robustness, redundancy, resourcefulness and rapidity as properties of resilience term; Gallopin (2006) thoroughly analyses the conceptual relations of resilience to interrelated key terms such as vulnerability and adaptive capacity; Klein et al. (2003) explore the usefulness of the resilience concept to natural hazard reduction. Some of the scholars accumulate defining resilience through in ***thinking of system attribute towards the disturbance***; as 'before' and 'after disturbance'. On one hand; Walker et.al. (2004); Fiksel (2006); morris et al. (2016); Longstaff *et al*. 2010; provide a perspective to defining resilience regarding a system's attribute in response to after disturbance. Walker et.al. (2004) defines resilience as "the capacity of a system to absorb disturbance and re-organize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks" (Walker et.al. , 2004). Allenby and Fink (2005) define resilience as the capability of a system to maintain its functions and structure in the face of internal and external change and to degrade gracefully when it must. Fiksel (2006) operates the term resilience "the capacity of a system to survive, adapt and grow in the face of change and uncertainty". Norris *et al*. (2008) define it as "a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation *after* [emphasis added] a disturbance…. resilience emerges from a set of adaptive capacities". Longstaff *et al*. (2010) illuminate resilience "the capacity of a system to absorb disturbance, undergo change, and retain essentially the same function, structure, identity, and feedbacks. According to Carl Folke et al, *"resilience for social-ecological systems is often referred to as related to three different characteristics: (a) the magnitude of shock that the system can absorb and remain in within a given state; (b) the degree to which the system is capable of self-organization, and (c) the degree to which the system can build capacity for learning and adaptation.* " On the other hand; Tierney (2003); Kahan et. al. (2009); Gilbert (2010); describe a perspective resilience regarding a system's attribute before and after disturbance. Tierney (2003) describes "the term 'resilience implies both the ability to adjust to 'normal' or anticipated stresses and strains and to adapt to sudden shocks and extraordinary demands. In the context of hazards, the concept spans both pre-event measures that seek to prevent disaster-related damage and post-event strategies designed to cope with and minimize disaster impacts" (Tierney 2003). " (Kahan *et al.* 2009) "We see resilience as the aggregate result of achieving specific objectives in regard to critical systems and their key functions, following a set of principles that can guide the application of practical ways and means across the full spectrum of homeland security missions… The objectives (or

end states) of resilience that underpin our approach are *resistance, absorption, and restoration*" (Kahan *et al.* 2009). Gilbert (2010) "*resilience* is defined as the ability to minimize the costs of a disaster, to return to a state as good as or better than the *status quo ante*, and to do so in the shortest feasible time… *Resistance* is used to mean the ability to withstand a hazard without suffering much harm. *Resilience* in this paper will include resistance but will also include the ability to recover after suffering harm from a hazard" (Gilbert, 2010). As the review of the literature presented here clearly demonstrates, there is considerable variation in how different authors from different fields have defined resilience (Carlson et.al., 2012). In consequence, diversity in definitions accumulates a danger for resilience becoming another buzzy concept in rhetoric theory and application (Davoudi, 2012). Perhaps the most fundamental divide lies in identifying which definitions of resilience indicate a system thinking in "ability of adaptation towards dwelling with change", and which are not. Three overarching frameworks of resilience are provoked; *engineering, ecological and socio-ecological resilience*; in which resilience is conceptualized as a quality, as a state or as a process (Weichselgartner and Kelman, 2015). Within engineering resilience, the resilience is modestly evolved in mean of bounce- back, which refers to the time it takes to return to a state of dynamic equilibrium after a disturbance hits a system. The resilience term is significantly envisioned as a condition that demonstrates the ability to return a particular situation of something to its original state after a disturbance/ crisis/shock. A stable state ideology is asserted as a resultant of dynamic interactions between system components that guide the system to return in time to a controlled equilibrium after an attractor-disturbance-shock. Therefore, a stable equilibrium in a system adjusts stability, robustness, rapidity and constancy, of which a system is efficient to return a stable equilibrium state after a perturbation. Different than engineering resilience perspective in ecology; the resilience is considered more as a capacity measure for absorbing disturbance. In this mean, ecological resilience regards to ability of anything to accord a disturbance (Folke, 2006). Therefore, ecological resilience fundamentally admits the amount of change and a system's absorbing ability which is preventing system's initial state to enter in other state. As a main attempt in this direction, resilience is suggested as an ability of absorbing change and remaining the system in persistence, in which same relationships between system's components are preserved (Holling, 1973). In contrast to single state equilibrium of engineering resilience, ecological resilience indicates multiple equilibrium states an understanding. Ever last, multiple equilibrium states promote characteristics of persistence, redundancy and resourcefulness in function, structure and identity of a system. In social sciences, the term is re-viewed in form of a novel revelation where resilience is approached within notion of adaptation-adaptability. Though in socio-ecological systems, the mean of resilience is critically distinguished from '*absorbing disturbance/stressor/threshold*' to '*moving disturbance/stressor/threshold away*' by promoting transformability with an adaptive self-organizing attribute (Walker et. al., 2004) (Table 1).

Table 1. Resilience framework development path



2.2 Critical Attributes

The resilience and change relation in a system is tended to be discovered within stability framework ignoring single equilibrium (Levin, 1998). In other words, a system's resilience is relied in having more than one stability state (Gunderson, C. Allen, & Holling, 2009; Holling, 1973). Bunse suggests understanding ecosystem dynamics by defining their attributes in a valley of stability framework (Bunse, undated). Yet, the character of change is dynamic, and it is not linear. Levin (1998) challenges implement of a single stability state thinking in a complex system. According to him, a complex system is coherently the amalgamation of other dynamic subsystems, of which forms an entire complex adaptability from non-linearity and uncertainty (Levin, 1998). And, into such a context; "*single stable framework*" could not be valid especially when inherent uncertainty and complex dynamism is the domain praxis (Schefferet al. (2001). Therefore, nature of complex systems discard to impel a single stable state, other than modestly move or fluctuate in between a set of interacting variables (Genkai-Kato, 2007). As Folke addresses, these systems impose multiple interrelationships in multiple-states to absorb or adapt the change at different scales (Folke et al., 2003). The system is more heterogonous by multiple states across scales create heterogeneity in system character, which remains the system stable. In other words; heterogeneity draws stability of resilience at a system. And this restrains the system state to shift in to a different stability state among the interrelation act of multiple states across scales. Such a condition poses regime shift/s in system structure/identity/function. Therefore, the stability is not a state appears as a contribution of linear interaction, but dynamic equilibrium formed by interaction among multiple states. In significant, resilience approach significantly distinguishes essentiality of multiple states as a significant path for system to absorb or adapt the change.

However a system may not always ascertain adaptation and stability state may shift from one to another state. A regime shift is dependent on the characteristics of change, as continues or discontinues or degree of change as small or large (Scheffer et al. 2001). Specifically, it is possible to resemble crudity of non-linear relationships endorsing a dynamic regime or state shift transformation or shift appears from one state to another. In fact, regime shifts are the conceptual approach breaking the linearity and providing analytical explorations on casual spirit of change and systems dynamics. Thus, basically they are defined as the possibilities of change with small or large disturbance posing big effects, where characterizes a system state. Regime shifts are primarily characterized as large, abrupt, persistence changes in the function and structure of any particular system (Rocha, et. al. 2014). As if; regime shifts are the drastic large-scale changes that are interconnected with thresholds, step trends, critical thresholds, rapid transitions or tipping points (Simon et. al. 2009). Different set of processes reside a particular regimes at specific scales of space and time (Gunderson, L. H., (2002). As Scheffer and Carpenter (2003) have noted, it would seem that regime shifts should be largely driven by external perturbations to a system where uncommunicative set of processes reside across scales of system whole. In reality, both external and internal conditions can influence a system and pose system state to reach a critical threshold (Holling 1973). Regime shifts are result of the high level of thresholds in system where control the system behavior between system components (Scheffer and Carpenter 2001). More simply, they emphasize regime shifts as where feedbacks of system are changed. Walker and Meyers (2004) notify the regime shifts as the change in the nature of feedbacks that the controlled level of system components are cracked by the maximal zone of thresholds (Walker and Meyers, 2004). On the other hand Cumming and Collier (2005) define regime shifts as the phase of change, when systems experience new versions of current former function-structure-identity as a result of loss of resilience (Cumming and Collier, 2005). On this basis, it is notable to define the regime shifts as large, abrupt and persistence changes pushing the system to enter into a new state, when a system experiences the change in its internal feedback interactions operating self-organization. Since the amalgamation of various feedback loops aims for a common goal; they basically cooperates to keep the system character self organizing. Which means, a set of particular feedback loops over in time tend to come together to form a dominant feedback loop to provide self-organization in system structure. On this basis, the regime shifts appear while dominant feedback loops loss "*resilience*". Those with reduced resilience; a disturbance may pose to the system entering from one stability state into another.

To preserve resilience after a disturbance/catastrophe, resilience indicates a

system of progressive organization into the model of adaptive cycle. Adaptive cycle is the accumulation of a series of phases that fortify a metaphor of continues change (Scheffer, et. al. 2001). These series of phases regards adaptation in structure/function/identity of a system under uncertainty (Gunderson, 2009). The cycle describes a metaphorical sequence how an organizational order is experienced under change (Li, 2013). The adaptive cycle is a model of natural patterns of change in ecological and socio-ecological (Gunderson and Holling, 2002). It consists of four distinct phases; *growth* or *exploitation* (r), *conservation* (K), *collapse or release* (Ω) and *reorganization* (α) - (Figure X). *Growth* or *Exploitation* (r): is the process of rapidly initiating the exploitation of the resources through expanding new opportunities on the collapsed old systems. The (r) phase is transitory phase of the systems after collapse. Thus the system does not emphasize high stability. But system structure becomes more diverse due to accumulation and more new connections between networks are accomplished. Thus, the system has high resilience. *Conservation* (K): is the phase where the systems get mature. Therefore, the systems demonstrates slower growing, entities are entered the system. Thus, the system goes into maintaining process of existing matured structure. The networks in system are progressively connected. Thus, the system is in the locked-on condition and does not build a novel structure. It demonstrates less flexibility, more vulnerability and more stability. *Collapse or Release* (Ω): is the phase where external environment pose stress on system and enforces the systems to perturb. In this the connectivity between networks decreases due to release of accumulated-stored resources. The system enters to the level of creative destruction with the potential in short period of time. Thus, revolution can occur in system. *Reorganization* (α): is the phase after systems collapse due to perturbation. The system state enters to a new stability state through reorganization (beginning) process. The system in reorganization phase leads the system towards growing phase upon novel cycle.

The process in adaptive cycle is asserted on the three disguised types of change; incremental change in r and K phases, abrupt change in the transitional phase from K through Ω and α and meaning change through interaction between different scales (Gunderson. 2002). Therefore, it is probable to determine the first two phases are the phases of system maturation and they are called forward loop of cycle. They are in need of accumulation of capital, slow incremental growth predictability and stability (Garcia, 2013). Furthermore, the other two phases are called back loop of cycle that involves the rapid phases of reorganization leading the renewal. As a consequence, adaptive cycle mainstreams the empirical visualization of metaphoric change at a rich framework to understand the persistence and renewal of the complex dynamic systems.

3. City as a Complex Living Organicism

An organism is *an autonomous individual form of life* considered as an *complex and organized system analogous* to a living being, where a composed of mutually interdependent parts functioning together (Random House Kernerman Webster's College Dictionary, 2010). Any organism has distinct physical and behavioral characteristics, a specific size and boundary of which contains differentiated parts, but form and function are always linked (Collins English Dictionary –2014). The physical morphologies of living organisms define the specific traits of organisms and they are generated by processes in which a given species evolves as the product of many small changes at the most elemental level (Darwin, 1859). These changes are embodied in an inherent code that dictates the way the organism mimic itself (Batty and Marshall, 2009). However, cities are the form of life. Likewise, as an organism they demonstrate a distinct physical and behavioral characteristic within a specific size and boundaries. Since the cities involve dynamics of social, economical and environmental impacts; they contain different, but interdependent parts processing together. The process between parts is complex and dynamic, but organizational. Therefore, it is possible to realize common analogies of living organisms into cities (Geddes ,1913; 1915; Le corbusier, 1933; 1964; Mumford, 1961) and many other scientists, scholars, professions etc. envision the city in analogy to ecological term-living organism and uses tools from the biology (Decker *et al.* 2007). In a broader sense; the "living organism" term is widely been used in diverse means (as a method or a methodology) to describe the cities and architecture in the context of dynamic changes (Mumford, 1961; Miller 1989; Samaniego & Moses, 2008;carrol,2008).

Ever since, the views related organicism conception in relation to cities and architecture have attempted to form an analogous to nature and its laws and

processes. In history; the conceptual enterprise of organisism in relation to cities and architecture arose from the growth of science in the eighteenth and nineteenth centuries. In the book of architectural historian Caroline van Eck, the organicism idea is defined as an intangible phenomenon that appeared from classical antiquity era. In classicistic tradition, the nature is functioned as a role model for perfect imitation to create the illusion of life. Into this, the architecture is seen as a part of living nature where the natural processes are convinced as a tool of imitating for divine uniformity in architecture. In classical organicism era, the architecture entitles a more philosophical character of the organicist interpretation of nature. For example, this intangible phenomenan more clearly emphasized in the gothic era and is suited to the religious connotations. However, with the impact of growing science between the period of in 18ht-19th centuries, the philosophical characterization of organism concept is resided more propelled and evolved with more radical shifts in approach. Also, with the impact of rapid industrialization in 19th century, a very fast interval increase in human population in cities affected the urban areas to growth. Moreover, the new implications of industrialization figured out a new role in the fast urbanizing civilizations. In sudden, the cities resided in space of growth in the context of dynamic changes. In significant, the urban planning in growing areas is facilitated by new mass production technologies (Bettencourt, 2013). Ever since, many theorists, researches professions, scholars, etc. have searched for understanding and defining the city and architecture in the context of dynamic changes of growth (Batty& Marshall, 2009). According to Bettencourt (2013), the industrial revolution- 19th century as a benchmark posed two splits in urban planning conceptions (Bettencourt, 2013). On one hand, the city is viewed as systems subject to optimization (Batty& Marshall, 2009). On the other hand, the city within growth parameter is seen subject to gradual evolution as an open-ended process. Those viewing the city as a gradual evolution embedded a note on organic features of the cities (Geddes, 1915) with/out implying a fixed relationship between the parts and the wholes (Batty& Marshall, 2009). In this era, the organisms phenomenon is more evolved with radical characterizations. We see that it is evolved with a profound synthesis of nature and technology (Gandy, 2004). Into this synthesis, the philosophical classicist notion of organicism- "as a source of uniformity" is redefined in terms of a metaphoric functionality. Biologist urban theorist Patrick Geddes initiated cities as evolutionary as an ecosystem in urban and town planning of - in mean of cities born, growth, and die (Geddes, 1913). That needed to subject the cities in mean of organisms interacting with their environments, in a similar way of a living being (Geddes, 1915). Here the city is a large of body as an organism that is accommodated through parts and architecture is the product of this functionalist organic entity, where it acts for structuring processes in the functional phases (born, growth, die) of a city. in the era of functionalist organsicism, we also see a profound coherence of other pragmatic conjunctions as well. For example ; Le Corbusier exploited the biological functionalism of a living organism to settlements with the purpose of improvement of living conditions Behne asserted a position in between nature and society with suggesting organic design; Alderman Adri Duivesteijn implemented the ideal of organic urban development. Especially at the early beginning of 20th century the tradition of functionalism the body of an 'organic entity' had been transformed into a fragmented body under the discourse of metabolic organcism (De Solà-Morales, 1995). The city is entitled in an organic form of high-tech self-retained machine, where the fragmented body (architectural units) accommodates a flexible adaptation as organs of living organism (Kurokawa, 1998).

In late nineteenth-early twentieth-century, the organicism traditions (biological and physiological connotations of organicism) also largely employed a living phenomenon to urban development. In order to eliminate the chaos between city and the loss of natural landscapes due to rapid urban development, the organic metaphor of the city is resembled through concerning the nature as the major fact revealing urban uniformity, not only for visual uniformity (organic city), also a new integrity of human life based on spiritual, psychological and material needs (social organicism) (Schilders, et.al 2001).Urban planning theorist Howard motivated the modern planning era by conceptualizing garden city; a living cluster/system of settlements optimizing a healthy living environment by decentralizing the settlements from city center (Sdoutz, 2013). Following the Howard, in 1904, Raymond Unwin and Richard Barry Parker (1904) progressed the Howard's organism notion into planning method with

assuming suburbs a practical for greenbelt surrounding the town as living organisms (Unwin and Parker, 1904). However, with the publication of Zevi, Towards Organic Arhitecrture; the organisicim conception is removed from its traditional provokes that nature and its processes/laws are perfect tool for imitation. Zevi induced the notion of organic into a social conception, where city embody an organic spatial organization for social contentment (Zevi,1950).The humanized urbanity of organicism is also recognized by Mumford. Mumford a difference from Zevi utilizes the functional, physical and social molds of organicism notion in organic form. According to him, the city in an organic form is a symbolic image of an organism, which can stand in natural environment as an interconnected and of itself as a symbol of organic form and function (Mumford 1961).
However, with the alert of 21th century crises of rapid population and urban development and unsustainable nature of modern cities; organicism notion in planning is reintroduced with ecological footprints (Owiti A. K'Akumu, 2007). The contemporary organicism following this 'sustainable concept' is developed for assessing balance with nature. To model the fast changing environmental, social and economical conditions; the new era of planning embodied the discourse of thinking city as a living organism; that also appealed in the context of many movements such as new urbanism, intelligent urbanism, smart growth, biomimicry etc. The living organ is paradigm to indicate potential relationships of city with entire metabolism of the development with ecosystem based, that concerns the long-term social, economical and ecological wellbeing of cities, town, villages etc. (Wheeler, 2004). Thus, sustainable development phenomena intended to put the dogma of ecosystem based relations between living organism-living environment- nature in cities etc.. However, the eco-centric planning approaches of sustainable development has resided into a chaotic transition, and attained an ordinary meaning - from a popular form to darkness of failure/fuzziness. Thus, ecological organicisist metaphors of sustainable era remained rhetoric and partial. The organic analogies to city and architecture have been unspoken and unexploited. Many suggestions also left fragile. Their consequences have not been fully worked through. They are blurred in many impacts, and bounded to uncertainty (Batty & Marshall, 2009), where dynamic interactions in structuring processes at different spatio-temporal scales are pulsed in. In this case, many scholars argued the lack of understanding the dynamic interactions in actual development within a zoned area posed a shift in thinking organicism not a source to balance nature, but a self-sufficient process evolved organism (Bogunovich, 2014) (Table 2).

Table 2. Organicism Conceptions in relation to architecture and urbanism

Century	Connotation	Vision
Classicist Era 17th century	Classical Organicism	Architecture Imitating Nature
Modernism Era 18-19th century	Functional Organicism	Form Follows Function
	Metabolic Organicism	Architecture as an Extension of the Body
	Formalistic	Organic Architecture'
	The Organic City	Unification of City and Nature
	Social Organicism	Planning for Human Happiness
Contemporary Era 20-21st century	Process Organicism	Flexible Planning for Gradually Growing Cities

4. Revealing two Scale in Adaptive Cycle: city and architecture

Cities are complex and heterogonous living systems. Cities impel a stream of inter-reliant duality between its subsystems. However, many invalid paths have been projected on how cities grow and develop as a system in linkage of dynamic processes and interlinked variables. Such misinterpretations challenged admiring social, built environment, economical flows and the other inputs making a city as a system that progresses inter-reliant duality for resilience. Several questions arise from here to understand in theory and practice cities as self-organizing resilient systems at the stipulation of possible (Chelleri, 2012). In thinking of 'city as a system of organism'; all social, economical and environmental variables append the process of operating the transition of cities toward more resilient and self-organizing paths (Holling and Goldberg 1971). Yet, uncertainty and discontinuities are inherent characterization of cities. With the potentiality of diverse and inter-reliant variables at subsystems; a city easily could process an internal resilience by assorting multiple stabilities, which are organized at different scales and time (Batty, 2009). As Zhao et.al (2013) defines 'city as a whole is far from equilibrium and is more than the sum of its subsystems.' (Zhao et.al , 2013). A complex system mode of interconnected networks is coherent and patent. Into this, a certain development is interconnected to historical experiences of the system and nonlinear events of ongoing change. A system when begins to get mature; it becomes over connected fixed and rigid through ordered patterns of interactions increases, where a system could be more sensitive to a breakpoint to a disturbance (Wahl, 2017). Indeed, the matured old patterns in case of a disturbance get affected more and impose the system to the chaos. In fact, the cities as complex and living systems becomes more creative while a chaos hits inter-reliant stability of the city. It should be notified that cities are drastically in episodic correlation between persistence and growth; order and chaos; between stability and transformation as the fundamental stream of self-organizing character (Wahl, 2017).

To think, cities as a self-organizing living organism conferring resilience at urban systems, understanding how a city starts to grow and acts more creative during a chaos could be a causal obstacle. This aspect endorses a scale tenet in thinking. Yet, cities fundamentally grow from the bottom to up through an organizational order between interconnected parts (Batty, 2009). They accomplish a large-scale complex artifact. The integrity of bottom-up is not controlling, or stopping the growth towards uncertainty of change; but predicting the behavior of development or transformation by focusing smaller scales. In fact; the bottom- up thinking infers the processes of cities that are organized at the bottom scales and reached to the whole. However, 'organicsim conceptions up till now would seem to suggest a comprehensive urban development is crucial of top-down planning. The top-down planning vision stayed limited in its unified form and did not allow meeting with processes at smaller scales. As Batty (2009) mentions "the city is not conceived of as a unified whole following a developmental programme, but is more usefully seen as a collection of interdependent, co-evolving parts (Batty, 2009). The parts of city must be seen in the role of which operate organizational structuring processes for a self-sufficient whole. A self-sufficient city reveals ability of persistency in its function/identity/ structure through fast changes of urban growth. In order to attain persistency; the processes infer the interdependent scale-relations. That means, in a city as a self-sufficient organism is not scale-free. It is in the high level of multilevel hierarchical interactions, where high–degree of connectivity interplay between scales of parts. In fact, that implies the holistic systems thinking utilized the two-way interactional connectivity between different spatio-temporal scales- from bottom-up and top-down: cross scale interaction (Levin 1999.). Into this, small scale observations provide an important route to explore dynamics interactions across-scales. The observation in smaller scales is critical to understand the patterns and processes operated at larger scale. Likewise, it is important to understand how the processes at large-scales communicate with smaller scales (Nash et. al, 2014). In the sequence of this two-way interactions, the smaller scales of parts are in the role of determining the data about the generated processes for self-sufficiency/ or the shift from a persistent to non-persistent structure. Hence, the abrupt changes at smaller scales ensue frequently in a short time period, due to fast variables are dominant then the slow variables in the system structure. That means at smaller scale the change is faster than larger scales. At large scales the slow variables are dominant towards fast variables. Therefore, change appears more slow in a long

time period. In the structure of a city top-down planning control emerges when several bottom-up fragile occurs- smaller variables appear to control the system for periods of time (Gunderson 2009). Thus at large scale disturbance is the result of cascading phenomenon of the fast changes (non-persistence structuring processes) in smaller scales (Holling, 1973). Therefore, small-scale observations provide an important route to explore urban growth and development dynamics.

Yet, cities are artificial environments composed of smaller scale artifacts as a result of human interactions with their environment However, considering the city as an organizational progress does not only questions space and time together with the human spirit and metaphor of change into new tools, terms and images; it also raised varied questions such as re-thinking the landscape and city expansion relations, unplanned urban sprawl though the essence and power of architecture which is endorsing essential flexibility to cope with interference/disturbance. Here, the self-organizing thinking infuses to conduct with the architecture as the smaller scale artifact of the biggest artifact which is the city. And the urban space is seen at the larger scale domain. The organizational order is polarized through declaring urban spaces as larger-macro scale and architecture as smaller-micro scale elements of a city. in fact; the first trial of the idealization of urban and its architectural extension in an adaptive cycle is adjusted in architectural studio of Kenzo Tange, in 1960. In the studio project of Tange (1960) at MIT, the growth and change aspects are amalgamated to external growth- internal regeneration affiliation. Here, the main goal of Tange is to formulate a new relationship between the part (architecture) and whole (city). Two particular quadrants are maintained for parts- *transient elements and* for whole -*permanent* element (Lin, 2010).The shorter cycles are the fast changes appearing at the smaller scales of urban clusters. They are the parts forming the whole. And, the long cycles are the slow changes structured at larger scales (urban clusters) to be inherent in long-life duration (Tange, 1960). In '*Emerging Complexities*' symposium which held at Colombia, Asada (1997) ensures the complexity of a city as a living organism has been demarcated as a simple system of hierarchical cycle between transient and permanent elements. In the detail, the hierarchical inclusion between parts and whole have been demarcated as a narration between the function and structure into a cycling model. This thinking provides potential to estimate cities as a creative self-organizing organisms responding to disruptions and change whereas resilience theory reveals upon same core. At this point, the architecture could be linked as the domain part of the urban design. Only when architecture is diagnosed to as part of the urban space, the city as a system of multi-layers could be defined within the metaphoric sequence of self-organization. Such a correlation does not only combine the architecture and urban towards to understand the city with architectural concerns, also makes a critical criticism towards relationships contextual essences and physical aspects of architecture in the traces of urban space. While this relationship is transmitted to the view of adaptive cycle; architecture endorses internal regeneration in the system and leads urban spaces to exploit external growth within a certain domain of stability. During graining internal regeneration; transiently acting an architectural system is crucial in thinking. In fact, architecture could be thought as a regenerative magnet to convey an internal resilience. Transient characterization accomplishes a nested set of hierarchal interaction and a higher level of adaptation by defeating flexibility. This allies a bond for city to adaptively polarize a permanent urban clustering. Into this, urban spaces demonstrate a slower growing. The urban space is mature and all other networks are connected, conserved and locked-on mode. The system stability is significantly infused by permanent urban clustering.

Conclusion

Approaching to a city should be intensive for identifying change- transformation-adaptability through varied interfaces of urban space. This devises an integrative design understanding between architecture and urban design critically essential. Here, the fundamental contradiction is to re-think the nature of growth-transformation-city relation adaptive, rather than a new episode of destruction. Since, current cities came into a parallel catastrophic trunk; the study infuses to adjust (re)thinking the urbanism and architecture as an integrated whole, a restrained coordination resiliently coping with collision of urban growth. Thus, the study opens a new argument that consolidate cities as a self–organizing system; in which change is dependent on, and human-environment

relation is operated towards change in an adaptive cycling path. However, the main point is to understand the city and architecture more specifically in terms of a resilience framework. Moreover, the study reveals cultivating cities in the context of adaptive cycle of resilience thinking. By this way; the study accumulates a novel way of thinking on how a city acts as a complex but self-organizing system that indicates a stable stability at macro-scale by integrated multiple-stability configuration at micro-scale. In general, the argument admires bringing the domain notions of resilience thinking as an integrative elucidation for analyzing the cities as a self-organizing and adaptive organism towards urban transformation, growth and change.

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