

The Auto-Poesies of Urban Emergence

by Niki Xenia Alygizou
Urban Designer and Architect

Keywords: Urban Emergence, Socio-form Patterns, Adaptation, Christopher Alexander.

Abstract: This paper examines the notion of emergence as a dualism of the urban and social system. The intent is to facilitate a deeper understanding of urban and social theories that use emergence as a tool for the systematic formation of socio-spatial relations. The approach includes the definition of a socio-form component as the catalyst element of urban emergence. An analytical examination of Christopher Alexander's pattern theory is explored, and it is used as a parallelism of social and urban morphogenesis. The argument is that for urban emergence to occur, the process of social engagement is necessary. The analysis of this dialectical relation brings Niklas Luhmann Social Theory and Evolution to the foreground and highlights the role of communication as the main principle of change. The change, and therefore emergence, happens as the system gradually adapts to environmental dynamism. This process of adaptation and the structural flexibility of the system is the mechanism that incorporates the urban and social systems. The efficiency of the urban space to correspond to the social need as change occurs, is highlighted. Therefore, the importance of adaptable social and urban emergence is seen as a theoretical model that auto-generates and leads to urban autopoiesis.

1. Introduction

This paper attempts to unfold theories of urban emergence and urbanism, the creation of human settlements, as a parallel process to the creation of human societies. Urban emergence most often is described as the process of morphological change that is associated with computable or comparable definitions ("the city expanded", "the city densified", "the city shrunk", etc.). When referring to change, urbanism tends to perform as a pragmatic quantitative science that measures space as a definite, deliberate act of computation. Thus, urbanists when describing the urban morphology, follow a pragmatic analytical process. On the other hand, in urban sociology, urbanism tends to be presented as an environmental subject, a field of sociological, anthropological, and ethnographic elements.

When Italo Calvino wrote about the 55 Invisible Cities¹ he argued that there are two ways to describe a city; describe its appearance, structure, and form (as you would define an artifact) or explain what you feel and experience while approaching, walking, and exploring it.

1. Italo Calvino, *Invisible Cities*, Giulio Einaudi, 1972.

"There are two ways of describing the city of Dorothea: you can say that four aluminum towers rise from its walls flanking seven gates with spring operated drawbridges that span the moat whose water feeds four green canals which cross the city, dividing it into nine quarters, each with three hundred houses and seven hundred chimneys...Or else you can say: "I arrived here in my first youth, one morning, many people were hurrying along the streets toward the market, the women had fine teeth and looked you straight in the eye, three soldiers on a platform played the trumpet, and all around wheels turned and colored banners fluttered in the wind. Before then I had known only the desert and the caravan routes. In the years that followed, my eyes returned to contemplate the desert expanses and the caravan routes; but now I know this path is only one of the many that opened before me on that morning in Dorothea".²

Calvino's book was one of the few urban writings that intentionally brought places and experiences together. Therefore, this paper deliberately focuses on theories that talk about the importance of human communities, and the society in producing meaning and experience in the urban space. It is an opportunity to recall those urban theories that talk about an urban ordering deriving from social evolution. Emergence is seen as the self-generated process where experience and engagement occur and frame urban morphogenesis as a parallel process to social transformation.

2. Methodology

This paper uses a direct structure between practical observation and theoretical analysis and ultimately concludes by describing the urban and social *autopoiesis*. For this analysis, the urban is considered as a system and emergence its process of transformation. The main research question of how emergence can be urban and social gets highlighted throughout. The definition of *autopoiesis* brings the latter dualism closer and creates connections between practice and theory. In this way, the contemporary urbanist and analyst will be able to approach social problems through the urban course.

The paper begins with an examination of urban emergence as the catalyst of the produced urbanism. There, starting from utopian ideas about urban living, a critic of the current mechanism of space production is attempted. The writing continues with an analysis of Christopher Alexander's urban theory of *Pattern Language*³. His approach to a user-oriented pattern system creates a useful link to the notion of social emergence. For the latter, and the description of the social system, Niklas Luhmann *System Theory* is explained. Eventually, the argument of social change as an autopoietic urban transformation gets stated. Finally, the writer concludes with the importance of adaptable transformation as the theoretical model that contains those physical and social elements which can auto-generate through autopoietic mechanisms.

3. Analysis/Results

3.1. Utopian and Contemporary Approaches to Urban Emergence

Urbanism for theorists and visionaries of the 19th and 20th century was a romantic composition that would inhabit the individuals of the future society; it was the product of a visionary idea that felt liberating. Usually, in the ideological models, the ideal way of living and the spatial

2. Italo Calvino, *Invisible Cities*, Giulio Einaudi, 1972, p. 16.

3. Christopher Alexander, *A Pattern Language: Towns, Buildings, Construction*, Oxford University Press, 1977.

parts of the urban composition would be formed by the society. The opposite concept that the urban system can form social relations was represented through the architectural ideal of modernism; by organizing social behavior. Mainly, the modern city was illustrated as a system of functional hierarchies that indicated roles and structured mechanisms. Instead, historic utopians used as a defining factor and essential element of their utopian structure, an evolving replicable component capable of pursuing the individuals' decision, a structure complementing the social desire.

For a contemporary practitioner, that would be a challenge. Nowadays, the urban environment is often over-defined because of economic and political pressures. In most cases, change happens predictably as explicit meanings dominate. In the current system, urban emergence is a transition from one mode to another due to shifts in economics, politics, and demographics; it is a venue of economic, political, and international will. Thus, urban space is used primarily as a medium, an environment that defines those economic and demographic relations and, secondly, as an ideal and a sociological subject.

However, when sociology, anthropology, and urbanism need to be discussed, the subject of urban space needs to shift and become a place of encounter, assembly, and simultaneity. Indeed, David Harvey has asked us to relate more to a utopianism rather than the spatial form. He asked us to see the production of space as a spontaneous action where an endless possibility of phenomena can occur. He suggests an alternate social ordering "*an alternative way of doing things-reveals the process of social ordering to be just that, a process rather than a thing*"⁴. Recently, urban theory and urban sociology started focusing on processes in which urban space appears to occur naturally as a spontaneous human action. However, how is it possible for a planned artifact to arise spontaneously?

Spontaneous order is typically used to describe the emergence of various kinds of social orders from a combination of self-interested individuals who are not intentionally trying to create order through planning⁵. It arises when multiple actors spontaneously adopt a set of actions and behaviors that provide them with a competitive advantage. Specifically, when individuals act in pursuit of something, they create a spontaneous set of patterns and, through the development and evolution of their behaviors, turn into self-sustaining patterns. Interestingly, for Friedrich A. von Hayek, this takes place without any of the actors being conscious of this creation; instead, it is a spontaneous action and a process of self-organization of the social system.

3.2. Christopher Alexander's Pattern Theory

When referring to the description of urban space, the spontaneous formation of patterns is used to describe the process of emergence. Christopher Alexander used a spontaneously emergent pattern theory to enable urban morphogenesis through user engagement. The inspiration for his work was that the buildings of traditional societies are inherently more beautiful than contemporary architecture. This incontinence starts from radically different design approaches between traditional and modern architecture. Within his writings, he analyzed how traditional buildings are the product of a communally-shared value system. They contribute to a piecemeal adaptation under changing circumstances since they are always harmonious with their environmental conditions.

4. David Harvey, *Spaces of Hope*, Berkeley: University of California Press, c2000, p. 54.

5. Friedrich A. von Hayek, *Spontaneous Order*, https://en.wikipedia.org/wiki/Spontaneous_order.

Eventually, Alexander developed the *Pattern Language*, where he redressed the subject of design and presented urban emergence as an occurrence of natural phenomena and the individual's action. His argument was that, for social communities to operate, space must enable multiple overlapping sets of human activities. Space, and therefore its main component, the pattern, should allow the emergence of *human situations* (typicalities) instead of the optical form and the architectural objects (typologies)⁶. Under this approach, the patterns come together and evolve naturally as an inductive approach to incremental morphogenesis. Eventually, they coexist in a semi-lattice environment, in a system that is open to change⁷. This urban system is a composition of intensities of socio-spatial patterns that can be found across different scales of urbanism. However, they are always in a transformable harmonic balance; *it is the structure of living things – of great paintings and symphonies*⁸.

Moreover, Alexander was interested in the process of transforming parts into wholes. He structured a relational theory, where he defined how to implement a part-whole synthesis. He talked about the formation of a complex socio-spatial system with a simple format, a code language. His new language involved an explicit reference between form and context and defined the importance of their coexistence⁹. In his book "*A Pattern Language: Towns, Building and Construction*", he identified 253 patterns as components in which humans can identify the space they live in, and therefore build that system that encourages interaction at multiple levels either among them or with their environment. Specifically, he wrote:

these patterns can never be "designed" or "built" in one fell swoop – but patient piece-meal growth, designed in such a way that every individual act is always helping to create or generate these larger global patterns, will, slowly and surely, over the years, make a community that has these global patterns in it...We do not believe that these large patterns, which give so much structure to a town or of a neighborhood, can be created by centralized authority, or by law, or by master plans. We believe instead that they can emerge gradually and organically, almost of their own accord, if every act of building, large or small, takes on the responsibility for gradually shaping its small corner of the world to make these larger patterns appears there¹⁰.

The above model suggests semi-ordered urbanism, where the design of patterns is an interlocked relation between the need and space. This relation that can be identified, re-combined, and re-used, in a language-like way, and be the catalyst of urban emergence.

To summarize, using the patterns as elements of a new design process was more than a design innovation. It was a responsible approach to generating spaces closely aligned to human need, a participatory design paradigm. However, through their application, Alexander expected that the "*central quality which is the root criterion of life and spirit in a man, a town, a building, or a wilder-*

6. Christopher Alexander, Sara Ishikawa, Murray Silverstein, *A pattern language which generates multi-service centers*, Berkeley, Center for Environmental Structure, 1968, p. 3.

7. "Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice", similar as footnote n. 6.

8. Christopher Alexander, *A Pattern Language: Towns, Buildings, Construction*, Oxford University Press, 1977.

9. "The form is a part of the world over which we have control, and which we decide to shape while leaving the rest of the world as it is. The context is that part of the world which puts demands on this form; anything in the world that makes demands of the form is context. Fitness is a relation of mutual acceptability between these two. In a problem of design we want to satisfy the mutual demands which the two make on one another. We want to put the context and the form into effortless contact or frictionless coexistence", Christopher Alexander, *Notes on the Synthesis of Form*, Harvard University Press, p. 28.

10. Christopher Alexander, Sara Ishikawa, Murray Silverstein, *A pattern language which generates multi-service centers*, Berkeley, Center for Environmental Structure, 1968, p. 3.

ness”, the ‘*quality without a name*’¹¹, as he defined it, would be inherited by the environment. The form, under this model, is not a mere collection of parts that are stamped out and gathered into a composition; rather, it emerges from a continuous transformation of elements, in an unfolding process; *the patterns are evolved solutions for accommodating human needs; they are the connective and configurational prescriptions of human activities rather than geometrical constraints*¹².

In conclusion, Alexander invented a socio-spatial system and used it as a relational system to link spatial and social components to accomplish three goals. Firstly, it has a moral achievement, as it includes the user in the design process and, secondly, it aims for a structural coherence between patterns and users. Thirdly, it is generative as it allows people to create the latter coherence by encouraging this process and emphasizing the assembled whole. It is a process of retaining the urban characteristics that trigger activity and enables the evolution through practical engagement. It is less of a preprogrammed language that alleviates the need to re-discover solutions for every problem. Instead, it justifies the need for a user-specific solution as it embraces both innovation and tradition in an attempt to “*ensemble capable of expressing a unitary description of the varied phenomena we encounter*”¹³.

Finally, besides the theory’s criticism about its applicability, when used to describe urban emergence, his approach retains the collective memory and identity as urbanism emerges; it is a living structure that has a capacity to absorb spontaneous additions, subtractions, transformations without disturbing its sense of order. It accepts and enhances such changes and turns the system into a system of urban and social composition. The evolution of the urban-social occurs naturally as the different components are designed with enough capacity to receive, recollect and extrapolate the inherited information. If we relate it to David Harvey’s ‘*right to the city*’¹⁴ argument, it is a democratic way by which end-users are involved in its formulation.

3.3. Social System and Evolution Theory

The socio-form process suggests a sociological approach to urban emergence and assumes that the production of the built environment is inseparable from larger social processes. Therefore, urban evolution is associated with social evolution as a parallel process. It is possible to see the urban as either a system of built elements or as a system of human activities linked by interaction. How social action gets reflected in the built environment is pointed out further. However, to make the two subsystems more open and explicit and study that reflection, a social systems theory is analyzed. Finally, how society and urban space link through the notion of autopoiesis (a process that links the urban system evolution to the urban system) is analyzed.

One systems theory that supposes the social as a system and describes process of evolution is Niklas Luhmann *Systems Theory*. Luhmann, a German sociologist himself, spent most of his academic time working on a threefold theory connecting societal theory, communication, and evolution. He, a student of Talcott Parsons, continued the tradition of sociological patterns and talked about social systems as systems of communication. *System Theory* is still one of the most influential paradigms of sociological thinking and research.

Luhmann’s System Theory is emphatically a system-environment theory specified by its self-referential character. The selectivity of the relations contains the boundary, the interior, and the undefined exterior. The system’s interior is a defined zone where communication can

11. Christopher Alexander, *The timeless way of building*, Oxford University Press, New York, 1979.

12. Nikos Salingaros A., *The Structure of Pattern Languages*, Architectural Research Quarterly, 2000.

13. Christopher Alexander, *Notes on the Synthesis of Form*, Harvard University Press, p. 29.

14. David Harvey, *The Right to the City*, <https://davidharvey.org/media/righttothecity.pdf>.

happen by selecting only a limited amount of all information. Any social system for Luhmann uses selectivity to produce meanings and specify its relation to its environment. When eventually all the selected information is processed, it can generate the *meaning*¹⁵. Therefore, a social system, according to Luhmann, consists only of communications, and there is no communication outside of social systems. In other words, there is a sharp boundary separating social systems from those environments that do not consist of communications. In this notion, communication is the primary catalyst of change as social systems only process meaning.

Therefore, Luhmann developed a theory describing the emergence of a system through the self-specification of the elements, which are constitutive of the system. That occurs when the system receives information about the environment through communication and determines how the system evolves. Luhmann looked at changes in social structures from a long-term perspective through an evolutionary paradigm. Instead of arguing 'modernization' or 'social change' as relevant theoretical paradigms for the evolution of the social system, he preferred a neo-Darwinist evolutionary approach. Under that, evolution happens in and through communication as a three-step process of variation, selection, and restabilization. Specifically, variation refers to all new communication that introduces change into a system state. Selection refers to the positive or negative selection of specific variations. Restabilization refers to the state of the evolving system after a selection has taken place. In other words, as the system transforms, the environment in which it operates also transforms, producing a spiraling process of change that functions in unity as the system processes itself. That process of transformation Luhmann called autopoiesis. Therefore, an autopoietic system defines itself as being in opposition to its environment; it constantly recreates itself in its elements and processes while maintaining separation. Finally, as it generates meanings, it recognizes its simplicities and redundancies as something it can change.

To summarize, the theory presented above is the most general theory that assumes the social and society as a system. Several other theorists mention that the process of meaning in Luhmann's theory critically distinguishes Luhmann's system theory from Parsons structural functionalism. His functional-structural theory suggests that theorizing does not start with given social structures are subsequently analyzed per their functionality. Instead, for Luhmann, the analyst must begin with social problems, which are understood as functional references. Fundamental social structures should then be analyzed in their capacity to contribute to the resolution of these problems. What becomes visible here is Luhmann's preference for historical and comparative functionalism, which constantly compares alternative structural patterns in their ability to contribute to the solution of relevant social problems.

3.4. *Urban and Social Emergence*

The connection of urban and social establishes a socio-form relationship in the process of emergence. This relationship focuses on social desire and built form and its transversal character. It outlines the meaning of urban emergence, describing the urban space as a shared subject of interest, activity, and production of knowledge. Every city, piece of the urban fabric, and building is a product of emergence identified with information. Urban space, on all its scales, is the pragmatic expression on which the emergent information is encoded. The organization of this information produces meanings, and it results in a network of socio-form communications. Therefore, by reflecting the morphological subject, its creation, and the generation of

15. It is described as *reduction of system's complexity* according to Luhmann.

sociological meaning, the approach can develop transverses of spatiality, and trigger emergence and knowledge.

Looking back at Alexander's and Luhmann's theories, we realize that emergence cannot be understood in terms of its components alone, just as a sentence's meaning cannot be communicated just by knowing all the letters used. In Alexander's theory, structures are twofold; morphological and sociological, sites, and situations and emergence are invariably the product of the evolution of a code-based communication. In Luhmann's approach, evolution is inherited with meanings and achieved through communication. The connection of both seems important when the urban emergence needs to be discussed as a morphological and social change. As with any human-made system, the urban system and the society have an autonomy that allows them to evolve. However, they eventually reach a complexity threshold, in which it becomes difficult to understand how they work as a whole. That should not prevent us from using them. Whether we have a complex modern system, a traditional mixed-use urban fabric, or socio-spatial patterns, such analogies represent an evolved exploration of urban and social emergence.

3.5. Socio-form Adaptation

When urban and social emergence is considered as product of autopoiesis, the question of the system's adaptation takes importance since the change creates a much richer and more complex result. In general, adaptation as a term resembles stability in each part of the system's transformation. An example of an adaptation that shows the importance of the system structure and explains the transformation is the following. Imagine a plant growing around obstacles. Without obstacles, the plant would grow according to its natural pattern. However, its growth will change if there are obstacles around it, as the plant will most likely change its formation¹⁶. However, it will change depending on the arrangement of the obstacles. Eventually, the plant will adapt to its environment.

In more relevant terms, the process of adaptation, primarily when referring to urban adaptation, involves the structure of the system and the system's actor's (or individual's) response to change. An adaptive emergence resembles a process where patterns can pop-up from individual actions by simply engaging local conditions. In Alexander's theory, emergence can develop local increments/patterns that result in unintended long-term effects. The pattern inherits an adaptive design quality that allows evolving according to the reason that triggered the change and continuously satisfied its use requirements. Thus, the social adaptation gets achieved through the interpretation of traditional urbanism into those user-design solutions. A series of patterns make up a rule of creating things as much as the things themselves that get replicated. Therefore, the design-pattern can adapt to changing conditions, replicate and define its relation to internal and external forces. For example, a building's design has the capacity to evolve to satisfy the needs of future occupants. However, a building may also evolve through adaptive structural changes to its fabric driven by the current needs of new occupants.

Under that process, the design suggests a socio-form adaptation to achieve an incremental urban ordering. The wholeness of this order is a sum of all the interactions of the individual actors, or group of actors, with each other and with the environment. Eventually, the socio-urban system can absorb any change as emergence occurs.

16. Stephen Marshall, *Cities Design and Evolution*, Routledge, 2008.

3.6. *The Autopoiesis*

Autopoiesis is the self-referential activity in which an entity, a collection of things, a mechanism, a system, etc., can produce itself. In recent literature, the concept of autopoiesis is cited the biologists Maturana and Varela, which was borrowed to other fields to describe self-creation. The biologists used an analogy of a living organism to the production process of a machine in order to describe the auto-production of a living system. Back in 1972, they argued that living organisms are like machines that consist of a set of symmetries. Therefore, they communicate meaning in a structured way. Specifically, the term describes when the poiesis (creation) is triggering an eternal auto-creation of living systems; “*Living systems are molecular systems that produce themselves, namely, they are molecular autopoietic systems*”¹⁷. The term has been used to describe a system, a structure, or a conformation that it is self-created. The definition in detail is:

An autopoietic system is organized (defined as a unity) as a network of processes of production (transformation and destruction) of components that produces the components that; through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them and constitute it (the machine) as a concrete unity in the space in which they exist by specifying the topological domain of its realization as such a network¹⁸.

Luhmann borrowed the term to talk about the dialectical relationship between the system and the environment in the social systems. He claimed that autopoiesis and self-reference are the essential components of the *Theory of Social Systems* to retain their identity and functionality when in relation to their environments. In his theory, the system and its environment operate continuously through self-reference (*autopoiesis*) as their components keep evolving. This supplementary relation defines the system’s structure and function and determines its stability/instability but occurs only as the system evolves in relation to its environment. Within that, communication and meaning can occur as long as the system remains open and transformations get processed through the codes that operate in the system.

In Alexander’s theory, communication (although communication is not clearly defined) takes a principle function as it allows through the user/spatial engagement to generate patterns and create *human situations*. Individuals are prompted to experience and change the structure of the pattern and add codes that will enable communication to happen. The autopoiesis in this scenario gets described through the continuous invention of those rules that self-refer to the user. It carefully inverts those rules through incremental changes to adaptive patterns¹⁹. That happens by choice in a great number of situations with consistency. Eventually, combining the two approaches visualizes the correspondence of the built form to the social usage, and isolates the condition that makes it successful. In this sense, urban emergence is seen not only in terms of a long-term urban transformation of components and forms but in terms of a social sustainably change through time.

4. Discussion/Conclusion

Nowadays, the physical environment is embedded by continuous pressure of change. This paper was motivated by this pressure and its consequences and attempted to describe change as a pro-

17. Francisco Varela, *Principles of biological autonomy*, North Holland/Elsevier, 1979.

18. Francisco Varela, *Principles of biological autonomy*, North Holland/Elsevier, 1979.

19. Peter Bosselmann, *Urban Transformations: understanding city design and form*, Washington, D.C: Island Press, 2008, p. 223.

cess of devolution for democratic accountability and empowerment. Motivated by Alexander's and Luhmann's theory, we can put a new understanding urban space production and make the social decision one of the most important environmental change principles. Individuals are urged to try their initiatives. Patterns can range in scale from regional planning to interior design, and adapting solutions to local circumstances can synthesize larger designs. The process can ensure that all forces are balanced and that emergence happens incrementally. Finally, the process follows a pedagogical methodology in which the theoretical starting point is an educational development around the urban emergence.

For architects and planners, it is of utmost importance to identify the built environment as a balanced collective system and explore any active processes as spontaneous sequences of relational rules.

As suggested, urban ordering can start from these small increments of active motivation and, through a complete approach to emergence, connect the morphological outcome with the social activity; an integrated autopoietic activity between the scale of the city, the scale of the neighborhood, the scale of the street, the scale of buildings, and the scale of fine details. It is a process of the assemblage of those socio-form components that can respond to immediate needs. Finally, for there to be any understanding, there must be recognition-loaded by experience, education, patterns, and so on to find citiness. For there to be an engagement or to achieve experience, place or locality needs to be identifiable-place, that is recognizably unique and local but also in continual change, capable of diversity, absorption, and migration.

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