Politecnico di Milano

School of Architecture Urban Planning Construction Engineering

MSc in Urban Planning and Policy Design

2020

THE CITY AS AN INFORMATION SYSTEM:

IMPLICATIONS FOR PLANNING

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ACKNOWLEDGEMENTS

CONTENTS

ABSTRACT

Cities are sources of information, which are composed by structural and social elements. The structures and patterns are material components of the city, which would give physical information about the structure itself, the city and its location. The actual meanings are given by the social elements, which are human beings, the citizens that the city has been built for. Human beings give personal and collective meanings to structures, and also urban environments. Every element of the city that composes its data are already complex as individuals. Human beings who identify the artifacts are also part of the system. The fact of citizens being social components of the system makes it more complex, combined with its physical information. The different perspectives of individuals that defines and organizes the city brings the discussion of the city as a complex system of information. To understand how the information is gathered in a city, the theories of cognition and self-organization systems are being discussed. Furthermore, some analysis of case studies and city models are taking place to understand the composition of existing and simulated cities under social and artificial topics, for the desire of reaching, and designing the ideal city model.

Le città sono fonti di informazione, che sono composte da elementi strutturali e sociali. Le strutture e i modelli sono componenti materiali della città, che fornirebbe informazioni fisiche sulla struttura stessa, sulla città e sulla sua posizione. I significati reali sono dati dagli elementi sociali, che sono esseri umani, i cittadini per i quali la città è stata costruita. Gli esseri umani danno significati personali e collettivi alle strutture e anche agli ambienti urbani. Ogni elemento della città che compone i suoi dati è già complesso come individuo. Anche gli esseri umani che identificano i manufatti fanno parte del sistema. Il fatto che i cittadini siano componenti sociali del sistema lo rende più complesso, combinato con le sue informazioni fisiche. Le diverse prospettive degli individui che definiscono e organizzano la città portano la discussione della città come un complesso sistema di informazioni. Per capire come vengono raccolte le informazioni in una città, si stanno discutendo le teorie della cognizione e dei sistemi di auto-organizzazione. Inoltre, sono in corso alcune analisi di casi studio e modelli di città per comprendere la composizione delle città esistenti e simulate su argomenti sociali e artificiali, per il desiderio di raggiungere e progettare il modello di città ideale.

1. INTRODUCTION

Cities are complex systems which contain infinite number of information in physical and social terms. The physical terms are gained by the built-up elements of the city, such as buildings, streets, plazas and every other urban area that composes the city physically. The information that city provides is not only limited with the physical conditions and qualities of the city, but also the cognitions are affecting the information and definition of the city. The social components of the city, which are the human beings, gives and gain personal and collective information in a specific urban area, as well as through it. Considering that the human beings are also complex systems of the environment, they are also making the system of the city and the information system itself more complex. Since the collection of variable information systems composes and defines the city, the planning implications should be adaptive to the information system. The implications of planning can be application of a new type of information and new definition, or an adaptive policy or design to the existing information and the dynamic of the city. To find the balance between the adaptive information of the parameters that designs the city, some studies are taking place to understand how the system of the city works as the physical, cognitive, social and many other types of information combined and adapt each other. Some models are being designed and analyzed to observe how adaptive a city can be. Not all the models are being successful to be a solution to urban problems, though, they are managing to define the problems and the failures of urban adaptations. The initial aim of the urban models to be able to predict the adaptability with the possibilities of spontaneous interactions in the urban environment.

The studies start with how the information is being received and processed in human mind. The physical information would be simply excepted as the physical description of the objects that has been observed without any additional cognitive perspectives. However, semantic information is included in the process of receiver's given personal and cognitive meaning to a physical pattern, which is defined as the pattern recognition, and stated as "Pattern recognition can be considered as a processing of incoming messages by a receiver, e.g. the brain or a machine. It is therefore an interesting task to discuss pattern recognition using the ideas just outlined" (Haken, 2006, p. 22). The pattern recognition is possible to be observed in any case a human being is involved. Since the city is the main habitat of the human beings, every urban area has a possibility to be involved in a pattern recognition process. The definition of place also occurs through this process of pattern recognition and cognition of urban places. When cognitive and structural image composed together, the urban spaces started to be identified as 'urban places'. The structural information would give an idea of the quantity, quality and physical description of an urban environment, which all of the measures can be identified mathematically and visually. The complexity of the source of information begins when the cognitions are being involved as the emotional, experimental, habitual, preference and many other parameters that effects people's decision of urban path and place in the built-up environment. As a product, which latter becomes a tool to analyze social flows and create solutions in the urban planning and design practices, self-organization systems appear. In cities, self-organized systems are based on human actions and bottom-up decisions. The human beings' choices of interactions combine with urban areas and create a social dynamic in the city, which defines the urban areas in a social manner. In planning, the room for spontaneity creates an opportunity for people to self-organized themselves.

The study is focusing on the impact of mutual adaptation of different kinds of information that creates the system of the city, and how major is the impact of social dynamics and flows in structural information of the urban environment. There is a mutual influence between the social and spatial element of the city. The cognitive science that concerned in city planning is focusing on how human beings are building their mental map and designing their path in the city accordingly. Analyzing the social flow that has been resulted by the collective path of the citizens inspire some policies and design practices through some urban models to understand how a city can work beneficially with the gathering of the urban flows and structures. The mutuality of the effects creates some discussions about the social dynamics and their effect, how to balance the policies and practices in the city

to respond the social needs.

2. DEFINITION OF INFORMATION

Information has been defined in several categories, such as structural, semantic, and pragmatic. The reason of these several perspectives and definitions of information is people perceive knowledge in a different way. Structural information depends on the physical information which is easily acceptable universally. The landmarks, their shape, quantity, material, location and many other physical specialties defines them in a structural way. Shannonian theory of information is mostly focusing on the quantity and the physical information, which can be considered as also a materialistic approach because the interest is not on the meaning of the structure that provides the information. Though, Shannonian theory is still being discussed because only in social meanings, there are many other meanings that provide information, and there are strong arguments that physical data is not enough, that brings the discussion of the deconstruction and analysis process, as Haken and Portugali discuss in two possibilities, "One is that the data in the correlations are not yet used, the corresponding part of Shannon information remains unaltered (i.e. not inflated) and reconstruction is implemented by means of the correlation of data that was ignored and not used in the deconstruction phase. A second possibility is that the process of deconstruction is also a learning process—learning the relations between the parts. As if the brain is a watchmaker that decomposes a clock and in the process reveals the specific correlations between the parts" (Haken & Portugali, 2015, p. 22). Cities are also sources of information which are composed by many types of it, and that one of the main reasons that cities are complex systems.

2.1. City as an Information System

As Shannon's theory of information is focusing on the quantity, there is also semantic information that focuses on the urban elements, which is also not considered different from pragmatic information, "we do not distinguish between semantic and pragmatic information. This implies that we adopt a strictly operational point of view. We leave it open, however, how to observe the effect on the receiver. (This effect could be a specific reaction of the receiver (person/machine) or the storage in memory.)" (Haken & Portugali, 2015, p. 16). The fact of leaving the reaction to the receiver brings up the discussion of information adaptation, which depends on the relation between cognitions. Human beings might

see the patterns in the same physical shape but they value the patterns in a differently. They tend to build a cognitive image depending on their own experiences and emotions and define the pattern accordingly, other than the patterns' own semantic information that has been designed. Cognitive images that are interpreted from the actual patterns makes the definition of information more complex. There is no correct or wrong way to develop a cognitive image since it depends on the perceptions, memories and emotions that reminds to individuals, "applications of Shannonian information to cognition thus demonstrate that several technical-syntactic properties of various cognitive phenomena can be quantified by means of Shannon's information bits. They do not discuss the relations between these syntactic properties of cognition and semantic cognitive processes and the implications thereof to the use of information theory in the context of cognition" (Haken & Portugali, 2015, p. 5).

The discussion between the Shannonian entropy theory of information and cognitive sciences opens up new topic as the face of the city is being its own information and Shannon's information theory focuses on the quantity, even though the structures are identical of one another, the quantity of information is depending on also the quantity of the structures, despite the fact that its variables. On the other hand, if some structures are being more significant for some reasons, than the cognitive images and meanings
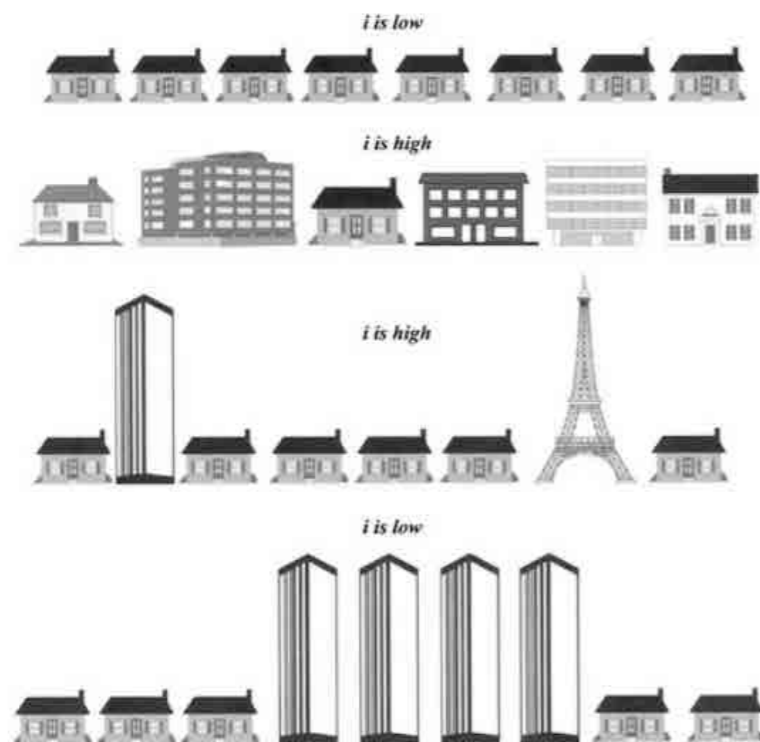
Figure 1: The different configuration of buildings and the difference between the information they provide (source: Haken & Portugali 2015)
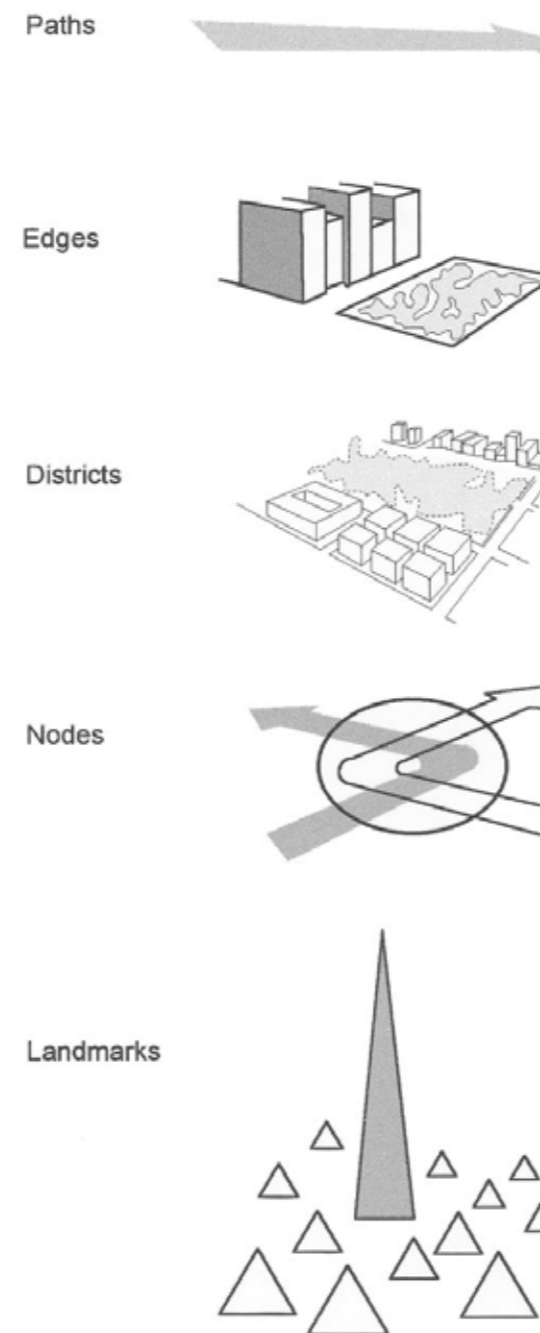
Figure 2: Five elements of Lynch's Image of the City (source: Haken, 2003)

take place to define them "when all buildings or roads of a city are identical to each other the Shannonian information they convey is very low; if they are all different, information is very high and so on. (…) From the latter follows the 'informational importance' of towers, piazzas, boulevards and other urban elements in making a city 'legible'—as has termed the 'ease with which parts of a city can be recognized'" (Haken & Portugali, 2015, p. 5). As the components of the built environment are containing some specific kinds of information, the city where all of the elements are combined is likely to be a system of information. This system can be defined by the elements, by the people, or all of the factor can merge and reveal some other kind of information which would define the urban environment. The study of cities being the systems of information includes the question of 'what is it the externally represented face of the city that makes it recognizable and imaginable?', so that the patterns of city and how they recognized was seek to be understood. In The Image of the City, Kevin Lynch divides the city into 5 elements to point out that the pattern recognition of the city would be easier with some divisions and groups in structural terms. These 5 elements (Figure 2) are making the city eligible as people process them in their minds. Lynch claims the legibility of the city as it should be easily recognizable and identifiable, as the elements of the cities are grouping and composing the city. (Haken & Portugali, 2003, p. 387). In this process, the categorization in the cognitive mind is being included and Shannonian Information of entropy follows as human beings, and their minds, self-organize themselves, physically and mentally.

2.2. Shannonian Information vs. MBB (mind-brain-body)

Shannon information is considered similar with the theory of entropy in statistical mechanics, such, the elements would be likely stay as they are; thus, the information is measurable in physical terms. Though it is being stressed that semantic aspects are irrelevant to the engineering issues, at the same time provides quantitative data for semantic information up to some significant level. Based on some experiments of basic images and different answers of people, the discussion of flexible and structureless patterns are likely to be defined differently for each individual. Figure 3 represents the example that has been given by Haken and Portugali that the orientations of two patterns differ for individuals. At first sight they see some specific orientations, afterwards they recognize some other possible orientations, also it depends on the geometric shapes that the patterns are structured from, "left is shown to people for the first time, there are three typical responses: for some the first impression is a structure-less image; others see all the triangles pointing to the right, while still others to NW (very few have observed in the first glance the SW direction). But then, when the attention of the people was drawn to the other possibilities, they easily recognize the three structures enfolded in this figure" (Haken & Portugali, 2015, p. 6). This is one of the abstract examples of how people's perception can be different even in the simplest patterns. As an outcome, it can be stated that in a designed urban environment, it is also normal to have different behavioral patterns due to different perceptions and routines. In this direction of studying the case of information adaptation, Haken and Portugali takes two levels, "firstly, that not only semantic considerations participate in the determination of Shannonian channel capacity (interpreted also as choice, uncertainty, lack of knowledge or entropy), but that several basic cognitive processes enable overcoming the limits on our capacity for processing information" (Haken & Portugali, 2015, p. 10). Because of its limitations, human mind steps in to overcome and invent some ways to arrange the data, in some methods like grouping and sequencing and
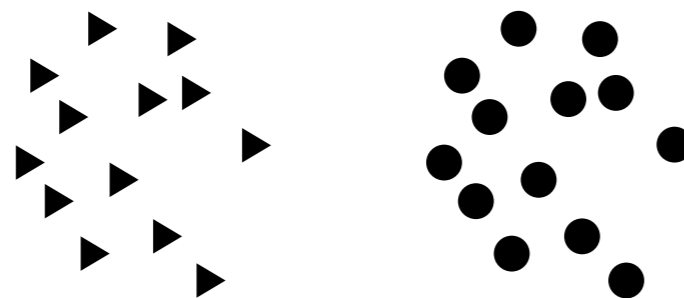
Figure 3: The patterns above can be perceived in different ways
(source: Haken & Portugali 2015)

such. Which bring the discussion about cognitive images in this stage, since every individual mind works in a different way.

The other level is more related to personal adaptation of information, is defined as mind-brain-body (MBB)[1]. Emotions, feelings, conscious and even imagination is being involved in this level which makes it more complex, though, explains the logic under different cognitions. "the mind-brain-body (MBB) adapts to changing environmental conditions and data by means of information inflation and or deflation (see definition below): Given a specific cognitive task in a specific environmental situation, if the incoming information is too low for the implementation of that task, the MBB adapts by inflating the information; if too high, it adapts by deflating the information" (Haken & Portugali, 2015, p. 10). Combining the rational and irrational information and completing them with one to another is what makes the urban system complex. Semantic information is focusing on the artifacts, which is the information that has been accepted and seen by everyone. This kind of information can define and measure physical but not enough for identifying and give meaning to the artificial environment. As it has been mentioned though Lynch's image theory, some identical elements would have some physical definition, and also would have define a physical space for the surrounding and the location that has been, but it does not mean they can be identified as a place or define a place. The phenomena of 'placelessness' has been created as the identification of space is being discussed. Space is the artifact that has defined physically, according to Shannonian information, though in meaning, it is abstract. Place is the form of space that has been identified by emotions, feelings, cognitions, experiences and many other parameters that might be defined collectively, and/or individually.

The human beings and cognitive images of human brain in the society are one of the major components that make the urban environment complex. MBB is considered as a complex system which has memory, and that is a specialty that makes the system adaptive. Later on, the adaptiveness and cognitive images leads to the discussions of hybrid images, as how people would also interpret the same, or similar, patterns differently in

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1   MBB is the one phenomenon especially includes individual's own perspectives and their impact on identifying an artificial component, that can be a structure, a public space or an urban environment and so on. The phenomenon can be considered as complex by itself, however, since it is about human brain and their cognition, it also explains how adaptive an information can be for social environment, which is cited as "The human brain and its associated cognitive capabilities and processes are often described as the ultimate known examples of complex systems. However, while in the domain of brain studies the view that the MBB is a complex system has become common place, in mainstream cognitive psychology and cognitive science this view is only recently starting to be recognized and appreciated" (Haken & Portugali, 2015, p. 36).

their own minds. The different interpretations of people depend on mostly their personal choices, routines, habits and interactions, which actually takes place in urban environments. Moreover, people start to develop their own cognitive maps and develop personal flows, interactions and so on, which concludes the whole scenario with the urban environment as developing a self-organized system.

Before reaching the level becoming a self-organized system, the nature of the human brain develops and recomposes the patterns, which is defined as 'deconstruction-reconstruction' by Kandel[2]. Similarly, one other discussion about the same meaning of notions is 'analysis-synthesis[3]', which is considered as information deflation for both local and global levels. To exemplify and understand, Haken and Portugali simplifies the process "action is similar to a geographer who analyses (and possibly rearranges, for reasons of clarity) fine details, but retains the topology of the map. This cartographer thus analyses (rather than deconstructs). Eventually, the brain has to draw its conclusions from the correlations starting from a somewhat larger scale up to the size of the original image. At this stage it synthesizes (but it does not reconstruct)" (Haken & Portugali, 2015, p. 21). Though, analysis and synthesis differ for simple systems and complex systems. For simple systems, it is easier to analyze, which is considered the same as deconstructing, and would be fully reconstructed by synthesis. In the case of complex systems, emergent properties are involved and changes the process of analysis and synthesis. The comparison between the Shannonian and semantic information becomes stronger and more important for the complex systems, and proves that they cannot be considered the same or apart from each other to complete the information of a specific complex system, "here the process of analysis/ deconstruction entails loss of properties (information) that exist only at the global system. It is here that the specific personal information accumulated in a person's memory has a role to play—to add the global properties that do not exist in the parts. In the case of the mind/brain this is implemented by the process of synthesis —Kandel's reconstruction—by an interaction between the (bottom-up) locally deconstructed parts and the (top-down) globally memorized elements." (Haken & Portugali, 2015, p. 21). Gathering the semantic and cognitive information together would provide a

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2   The bottom-up processes were defined as deconstruction which is assumed that the human brain's syntactic capabilities are implementing the existing image to give another or deeper meaning as a cognitive pattern. Kendel further suggests that the deconstruction process is a first stage of perception. Top-down process that follows up by the second process is reconstruction. This process is implemented by the brain's semantic capabilities (Haken & Portugali, 2015, pp. 19, 20).

3   As the human brain observes a pattern at the first sight, it starts to understand the proportions and physical qualities, which is the process of analyzing. In synthesis, the focus changes into the correlations that already exist in between elements of the system.

better perspective to understand the complex system. Since the cities are also considered complex, and people who constructs the cognitive information are also complex individually, the cities are sources of infinite information. Besides of the city system is being complex, it is also changing continuously. In further discussions, the phenomena of 'city is like a tree' starts replace itself with 'city is a big machine', which claims cities cannot be as simple growing systems as trees, but rather more complicated. The involvement of human beings makes the cities more adaptable and manipulative considering their own cognitive patterns on the same urban environment.

3. ADAPTATION OF INFORMATION

It has been discussed and confirmed that every individual tends to give different meanings to patterns, depending on their personal ideas, emotions, memories and many other factors that have been define their own personality. The phenomenon that have been used to understand and explain the fact of variation of the information is analysis-synthesis, which later followed by deconstruction-reconstruction. These methods would lead to understand information adaptation. They are connected with the subconscious of individuals and how they progress the patterns' physical information and give them cognitive meanings. Individuals' minds and the cognitive meanings are already complex by their own, and collectively, they make the system of urban environment complex as well. To reach the understanding and explanation of how the information become collectively adapted, Portugali and Haken continues to discuss the adaptation of information, which leads to hybrid images, cognitive maps, self-organization and how they all help to collect, or sometimes create, information and define the urban environment.

Connecting the complexity theory and information theory, Shannon's information is a tool, even though it is focused on thermodynamics' entropy, "In the latter entropy is a property of closed systems that tend to evolve from order to maximum entropy (disorder); as such Shannon information refers to nonadaptive communication systems. Complexity theories are about open systems in far from equilibrium conditions that tend to evolve from disorder to order" (Haken & Portugali, 2015, p. 32). At the end, the aim is to find the connection between the source and the receiver. Even though Shannon entropy theory of information explains this in a more mechanic way, human mind works more
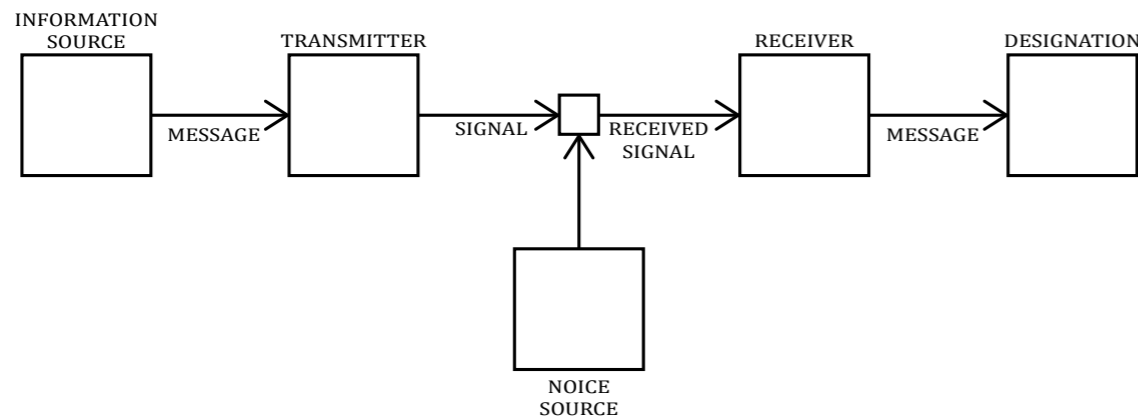
INFORMATION SOURCE — TRANSMITTER — RECEIVER — DESIGNATION

MESSAGE   SIGNAL   RECEIVED SIGNAL   MESSAGE

NOICE SOURCE

Figure 4: The communication process between the source and the receiver (source: Haken & Portugali 2015)

broadly and more complicated. Human brain is working in a broader way, limits are harder to define and the perception of every one of them is infinite. The fact of humans are also social creatures makes them more available to be exposed to every incident that takes place around them.
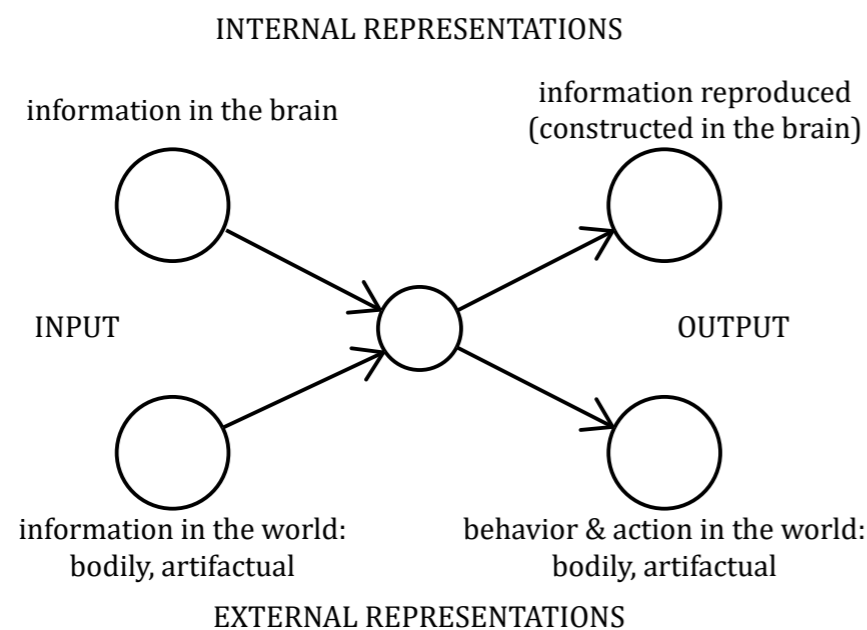
INTERNAL REPRESENTATIONS

information in the brain   information reproduced
                                   (constructed in the brain)

INPUT   OUTPUT

information in the world: behavior & action in the world:
bodily, artifactual   bodily, artifactual

EXTERNAL REPRESENTATIONS

Figure 5: Social outputs of information adaptation (source: Haken & Portugali 2015)

Urban environments are compositions of physical and social elements. In this case, separating the information into two, as internal and external would help to understand how the information would have outputs in human mind. The process of information adaptation effects behavior and routines of human beings, at the same time, the existing routines and social behaviors of people would filter the information and adapt it. To have a deeper understanding how complex the progress and how it is related with the information theory through its complexity, Portugali works on the complexity theory and how cities are complex systems.

3.1. Juval Portugali's Theory of Complex Systems

The acceptance of people being complex components of the soceity, leads to the understanding of urban environments are also complex because of them and their interactions. In complex systems, social interactions happen spontaneously. These spontaneous interactions might happen intentionally and unintentionally, which creates a variable possibilities of dynamisms in urban environment. By the time, these interactions become routines and social behaviors start to form to be syncronize in the cities, that is defined as collective behaviour by Juval Portugali. Because spontaneous interactions are happenning without any set of rules, other then cognitions and the need of unconsious harmony to move in through the city.[4] This network leads to Christopher Alexander's view and definition of the city, that Portugali supported as "'a city is not a tree' but rather a complex semi-lattice network, and, that beneath the apparent chaos and diversity of physical form that typify cities, there is a highly ordered pattern language (Alexander et al. 1977) that exists in humans' heads and in the world" (Portugali, 2012b, p. 48). The movements and behaviours they perform depends on the information they collect, combining with their own knowledge, experiences, emotions and many other personal and collective norm they have gained, so that the system and the elements of the system can have an identity.

The movements take place in the cities are physical orientations, that defined as simple changing places and reaching from one point to another. Nevertheless, citizens make it more complex depending on the places they prefer to reach, the paths they are taking to reach their destinations and many other necessary and prefential options occur. By the time citiezens adapt their necessecities and preferences, they create their own patterns in the city. Despite from the physcial design of the environment, their personal patterns create another layer to define that urban environment. According to Juval Portugali, the study of complex systems, cities included, has some sorts of achievements to understand the variety of perceptions. The first achievement is the inclusion of socio-economic, ethnic and cultural norms, while interpreting the land use patterns of the city. Alongside with the physical descriptions and functions of the land and urban structures, the social segregation of some norms is becoming significant to define the urban movements and patterns, "The pattern of land use in cities that in the past has been interpreted in terms of Thünen's economic theory, the spatial segregation of ethnic, cultural and socio-eco-

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4   The example of pedestrian movements in London Bridge, is the example of people's willingness to syncronize without interacting everyone they are crossing with, or crossing by. In the end, the set of individuals become set of entities and also one of the main elements that make the city, as a complex system, a network.

nomic social groups in the city that in the past has been interpreted in ecological terms, the size distribution of cities in a region, the economic and geographical spatio-hierarchical pattern of central places in cities, metropolitan regions and countries, the structure of road networks of cities as well as the structure of communication between cities, the perception of cities and more urban phenomena, today all have a single theoretical basis; all of these have already been interpreted as complex networks emerging out of local interactions between urban agents that give rise to the global structure of cities" (Portugali, 2012b, p. 49). Other then the seperation of social groups, the complexity theory of cities opened a window of new understanding of cities in forms and types of growth.

First of all, the complex systems are considered as non-linear systems. The scale of impact for many cities is different, such local actions might affect the dynamic of an urban system rather then the stronger agent's rule on for a bigger scale of urban system. Juval Portugali gives the example of Tel Aviv's balconies[5] to explain how one individual's decision can influence the other's decisions and create a certain act of dynamism in a urban area "the property of non-linearity by which the planned action of a single person might have a much stronger and significant impact on the urban landscape than the plans of architects and official planners" (Portugali, 2012a, p. 229). Second understanding that has been gained with the theory of complexity is the phenomenon of emergence. This includes being aware of the behavioral differences in the individual scale and collective scale. The implications of local interactions might not be strong enough in the global scaled city, to give an example. The phenomanon of emergence can be implied as an additional explanation to why and how complex systems are nonlinear. Third, which has a link with the property of emergence, some dynamics may grow stronger and give rise to new urban entities and identities. This leads to new kinds and forms of information to redefine an urban system. Considering the multicultural cities, every single cultural group might mean something in between their own community, but when they are combined in an urban area, the meanings and roles change and creates another pool of information for that place, which is identified by their collective cognition, despite of their different cultural values.

The fourth understanding, that there is an order in chaos, especially in complex systems as cities. Some studies still define the cities as a symbol of chaos, while others only

5 Because of the climatic factors of Tel Aviv, the balconies in the city becomes useless and one individual decides his own balcony to turn into a closed room for better use. Latter, this behaviour started to give an idea to others who witnessed and lead them to do same. By time, the buildings of Tel Aviv started to have no balconies, for the sake of keeping the harmony.

define as ordered systems. However, complexity theory shows that chaos and order does not have to be contradicted from each other. There can be an order found in chaos, and also the other way round, there can be chaos in order, "first, the tension between chaos and order often keeps cities on "the edge of chaos"—a situation that enables cities to be adaptive complex systems and with- stand environmental changes. Second, in some cases pockets of 'captive' urban chaos might be necessary in order to maintain the stability of the rest of the city. Third, chaos might be the precondition for new order to emerge. For example, pockets of captive urban chaos are areas of high potential for change" (Portugali, 2012b, p. 50). The inclusion of spontaneity brings some certain amount of chaos to the system of cities. Even though through the urban design principles and planning strategies there are some physical and hypothetical boundaries that people usually are expected to adapt, after the construction, there is an emergence of spontaneity which people has the opportunity to decide whether to adapt the design or create some other patterns which were not planned but the existing design might adapt to that social pattern.

As much the patterns of social movements have been analyzed, in order to seek some answers to citizen's needs, many urban models started to be developed. Those urban models focus on different approaches for such complex urban systems and mostly ending up not addressing the actual need by the time the models are turned into life. As the urban models being constructed, the needs are changing or answering some other needs that are not the actual problems of social life. As it becomes hard for urban models to predict the social dynamisms, their focus become the definition of the problem itself. However, only defining the problem is not enough to address and find solutions for the needs of social environments. To manage so, the social patterns should be analyzed and social behaviors should be observed. The combination of the social activities creates the discussion of social dynamics and how to provide better urban models and policies to support them.

The reason models are being the definition of the urban problem rather than being the solution to it is the outcome of variable information that cities have in their nature. Since their character changes because of their defined values, the problems would differ as well. So, the solution of urban problems unlikely to be defined and solved with only one specific type of model, rather there should be variables of urban models that can be adaptable to similar problems. The models and simulations that have been developed to understand the complexity and its causes and effects ended up being utopic since they

have been limited by the virtual quantities and data provided by computers. Portugali criticizes studies the reason behind the failure of such urban model solutions. Clarifying the facts and the outcomes of some simulations observed, "There is nothing wrong, of course, in sophisticated simulation models crunching huge quantities of data by means of fast computers. What's wrong is, first, that simulation models originally designed as media by which to study phenomena of complexity and self-organization become the message itself. Second, CTC tend to overlook the fact that complexity theories form a new science that is critical of the first culture of cities. Third, and as a consequence of the above, that most studies in the domain of CTC are silent about the qualitative message of complexity theories to cities. Fourth, that students of CTC have indiscriminately applied theories and models originally developed to deal with natural phenomena to cities, ignoring the implications of the fact that cities are not natural phenomena but rather artifacts" (Portugali, 2012b, p. 52).

City planners and designer's aim is to find a balance in the complexity of the urban system, which is a product of the structural complexity of the system itself and the fact of acts of freedom that is the actions of actors, in this case every living human being that contributes and/or take part on urban environment. Some urban models[6] are being studied, developed, analyzed and even sometimes enforced in order to find the balance between the complexity of social and spatial elements of the cities. Though the way these urban models have been developed and enforced may differ, they aim more or less the same beneficial goal for their city and citizens, "the objective of the analyst/modeller is to provide the actors involved in the planning process (and we have seen how numerous they are) with the ability to read, understand, represent, predict the different systems and domains of their actions" (Blecic, Cecchini, & Trunfio, 2008, p. 117). To reach the goal of producing a good urban model, the planners, designers, and in this case, modellers, should be aware of the complexity of a certain urban system to understand its limits, flexibility and social needs. The models and theories behind the models are created by assuming the urban systems are likely to be adaptive. Hence, complex systems are also defined as 'complex adaptive systems', including cities. This would simply mean that the complex system of cities is capable of adapting with their social and spatial structure to such theories and implications that they are being exposed to. The inclusion of citizens makes it more possible to assume the fact of adaptability because human beings are tended to adapt their

6   The urban models are being discussed and studied by the experts, which can be or not a planner or a designer. The key point of the urban models to find out most successful and suitable solution to benefit the social and structural context of an urban system by analyzing the needs, resources and many flexible factors depending on each systems' identity.

environments. In contrary, there are also non-adaptive systems that are not respective of the environment and the changes that are happening. This kind of systems are defined as simple, closed and mechanistic systems, which once cities were also defined as. Portugali adds to definition of non-adaptive systems as claiming they are situations of some theories or concepts are being forced to transfer from one specific form to another, but the result is the irrespective reaction of the system towards the transform, and to exemplify "most complexity theories have been applied to cities in a non-adaptive manner. Part of these applications were made by physicists whose main interest was not cities but the models they applied. This is evident from the fact that many such papers are published in journals such as Phisica A. For these physicists, as well as for the editors of the above journals, cities are nothing but another source of data by which one can feed and test the models. The important finding of such studies is that the size distribution of several systems of cities obeys the power law; that several cities, metropolitan regions, rail and road networks are fractals; that many cities and their road networks are small world and so on. Another part of the applications were made by students of cities and urbanism attracted by the opportunity to develop a science of cities that is based on the strong theoretical and methodological foundations of complexity theories" (Portugali, 2012b, p. 56). Even though social sciences are excepting cities as complex and adaptive systems, the information for each keep changing, because of that overlapping simulation solutions of urban and physical sciences are still considered as unrealistic and utopian. By the time studies become more analytical and the more involvement of human sciences, the results of the urban models will more likely become solutions, or part of the solution.

3.2. Self-Organization Systems

Systems of self-organization of human behavior in urban environments is being discussed and studied recently to find an answer how urban places are being shaped by social patterns by the human beings that live in the urban physical system, or the other way around, how the physical conditions effect the social patterns of the city. To understand and create a better understanding of urban phenomena and to produce more beneficial urban models, sociological and physical analysis are concerned to understand how society is being self-organized. As Juval Portugali mentioned in his book Self-Organization and the City, "Self-organization, as is well established today, has captured the forefront of the system approach in science and as such became a paradigm relevant to phenomena in a wide spectrum of domains in the life sciences, social sciences and humanities" (Portu-

gali, 2000, p. 1). As much the fact of self-organization is considered more as a sociological and humanist approach, it has a lot of relations with city systems and tends to offer many to urban sciences. While designing and planning urban environments, it is unescapable to consider such facts like 'how it can benefit the social life or citizens?', 'how the urban flow would shape through this urban system', 'in such a design, can people continue their routines or violate the policies of the authorities?' and so on. Briefly, it is cited as "self-organization has much more to offer to the study of cities, planning and urbanism than being regional science's sophisticated modeling approach" (Portugali, 2000, p. 2). The study is broader than being only limited to the socio-spatial systems, but more related to reasons coming from different cultures, economic and political background and regional sciences. Moreover, and an important fact, that is cities also should be considered time and space dependent stretching networks.

Self-organization has been defined as a formal theory, "a general umbrella for several theoretical approaches which, while agreeing on general principles, differ in their treatment of such systems, in the emphasis they give to the various processes and properties, and in the subject matters they refer to" (Portugali, 2000, p. 49). Instead of behaviors are being determined or caused by the external causes, in the theory of self-organization, the external facts trigger on internal and independent process, also through the spontaneity that comes from the self-organization itself. On the other hand, the energy flow that happens through the boundaries that has been defined physically, leads the system to organize itself spontaneously, as well as attaining a certain structure and maintain it, "'create' or 'invent' novel structures and new and novel modes of behavior. Self-organized systems are thus said to be 'creative'" (Portugali, 2000, p. 51). Alongside with self-organization is creative and leads to creativity, it is also a complex system. There is no certain way to establish casual relations, and parts and components are interconnected in a feedback loop. When all the physical and social facts are being considered, self-organizing cities tend to constrain also both physical and social phenomena, "self-organizing systems which are both physical and cognitive: individuals' cognitive maps determine their location and actions in the city, and thus the physical structure of the city, and the latter simultaneously affects individuals' cognitive maps of the city" (Portugali, 2000, p. 62).

Despite of planning strategies and policies are aiming to bring order in cities, self-organization can be considered a theory that contains both chaos and order in its system, in a way that chaotic systems self-organize themselves to attain order. Chaos also has

Pattern formation:
Material subsystems and actions

Material patterns → **Material structure of the city**

CITY: order parameters & attention parameters

Cognitive patterns → **Cognitive map of the city**

Pattern recognition:
Cognitive features and cognitive maps
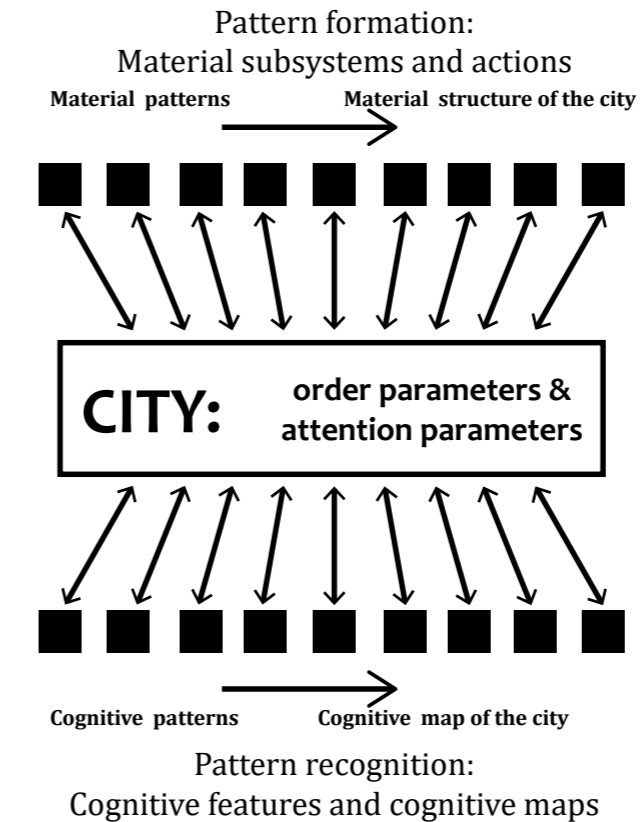
Figure 6: The city as a self-organizing system which is at the same time both physical and cognitive (source: Portugali 2000)

its own forms and scales "Local chaos sterns from the irregular motion or behavior of the very many individual parts of a complex system" (Portugali, 2000, p. 63), the small local scale observations oh chaotic systems is the typical starting point of self-organized urban places, which happens with the flow of human behavior patterns. "Deterministic chaos arises when as a consequence of self-organization, for example, the many individual parts are suddenly attracted by a few attractors, or enslaved by a few order parameters, and as a consequence exhibit a coordinated motion" (Portugali, 2000, p. 63), the larger scale of urban environment in city developments becomes the study area of deterministic chaos and self-organized cities. The attractors and parameters can be urban focal points, which attained by a different function to attract different types of behaviors.

To simplify the evolution of the self-organized actions in cities, local scale urban environments and behaviors might be a good starting point. Self-organized activities tend to be more accurate in local scale. The physical and social analyses are more likely to be observed and defined. Since the urban elements and human beings that pass through in a local scale urban environment is limited to larger scales, it is easier to understand the meanings of the behaviors and how they define the spatial structures. Therefore, the information of the urban environment is easier to collect; the analysis between the cognitive and physical patterns is clear and focused, and the relation between two is more straightforward. The process and development between the spatial and social components are more visible in local scale. After construction and physical definition of an urban space, the social composition of experiences, uses and appropriations that all attained by human beings are the un-planned and unpredicted phases of the design of a place, which leads to re-defining of an urban space. This process of re-definition of space

also depends on how adaptable and flexible is the urban space is. When the possibility of people to self-organize themselves and the environment's flexibility are combined, the phenomena of urban self-organization becomes real. To give a solid example, Altay studies one of Ankara's vibrant streets, Tunalı Hilmi Street, and analyses the human patterns of movement. The street already has a dominant character of nightlife dynamics of youth people. Out of need to come together with friends to have some decent and friendly chats before getting into privately managed bars and paying for the drinks, they started to buy some drink from a local market with a cheaper price. Since they are not allowed to enter to the bars with some other drinks, they prefer to stand outside and create own clusters of people until they finish their drinks and having some friendly conversations before entering the loud environment of the bars. This act later started to be defined as 'Minibar' and even led to manipulate the urban and social environment wherever it took place, since the boundaries of 'Minibar' was flexible throughout the surrounding neighborhood.

Through the timeline of the changing dynamic of the street, there has been changes in actions depending on the environment and also some redefined rules. So, the information flow between the people creates the unspoken activity of Minibar, which is a self-organized action in that specific neighborhood of a specific street of Tunalı Hilmi. Altay studies and comments on the formation of this self-organized experience in Tunalı Hilmi Street as "When the city inhabitants start to use the urban space in their own ways and through their own perspectives, they start to re-define it to produce their own space. This approach introduces the urban space as composed of those provided places, which are in perpetual re-formation within the daily practices of the inhabitants" (Altay, 2006, p. 60). This is only one example of re-definition of place by the inhabitants that continue happening for many years and created another social dynamic than has been planned to.

The impact of this re-definition was in a small scale and provided by the users and some other factors that has been constrained in the neighborhood. However, these kinds of impacts can be also designed by policies as analyzing the behaviors and be applied as bottom-up approaches with some supports to top-down decisions. The policies can be both against or for these bottom-up actions depending on many factors and seen or unseen issues that may cause or occur. Either way, the policies as solutions, or some occasions, reactions to the social behaviors should be designed accordingly to these patterns. Analyzing the facts of behaviors whether they are making the environment stronger and define most of the patterns, or whether they are violating the physical and social needs

and being of the environment would be facts that would affect policy approach. To do so studies of behaviors are taking place to offer beneficial concepts to reach better and new reflection of human and therefore urban systems. The urban models developed in this direction aims to "show how the dialogue between the individual and collective levels generate successive spatial structures, with characteristic patterns and flows" (Allen, Strathern, & Baldwin, 2008, p. 22).

As the physical and social boundaries were flexing and shrinking depending on some parameters, the phenomena of 'chaos and order' theory has been emerged. The balance between the chaos and order became another topic to discuss about. The study of urban planning approach is changing over time depending on the developments, newly discovered needs, innovations and behavioral adaptations of society. Because of these changes, urban planning field is still and most probably for many long times will remain as a necessity. The connection between chaos and order is usually concluded as the theory of self-organization becomes a key to explain how complex and chaotic systems are finding order in their self-system. Similar to understand the chaotic systems, there is a local scale which is focusing on the motions of individuals in small-scaled urban environments such as piazzas, streets and so on. As analyzing the behaviors whether if they are intentional or unintentional, planned or cognitive and many other contradicts to find a pattern and define the chaos, and accordingly the order in that chaos. On the other hand, deterministic chaos emerges with the inclusion of many attractors "the many individual parts are suddenly attracted by a few attractors, or enslaved by a few order parameters, and as a consequence exhibit a coordinated motion. On the face of it this new state is the exact opposite of chaos; yet, it is not. Quite often in these cases, the system is dominated by order parameter(s) which are macroscopically chaotic: for some time one order parameter dominates the system, then suddenly another; the point is that these jumps back and forth occur irregularly in a chaotic manner" (Portugali, 2000, pp. 63, 64).

Self-organizing cities are assumed chaotic in several reasons. The information flow between the spatial and social elements of the cities indefinitely changing in self-organized systems. Since cities considered as complex systems, adding the ability to self-organize makes the cities more complex than they have been accepted. This is how the theory of chaos emerged. Cities are considered as chaotic in some respects such, first, "like open and complex systems in general, the evolution of self-organizing cities exhibits a very distinct and routinized path: a long period of 'steady state', followed by a short period of

strong fluctuations or chaos, from which the system re-emerges to a new level of steady state and structural stability, and so on" (Portugali, 2000, p. 65). Second, for deterministic chaos phenomena's form of abrupt ends up dominating the city by transforming between the parameters of existing order. In this process, cities evolve in a stable progress, but in local scale, areas are being exhibited in an unstable or chaotic behavior, opposite to compared with the whole city. As the third respect, the daily routines are being discussed and studied, alongside with the long-term evolution of the city. Rush hours is the example to see the balance and the change between the chaos and order including self-organizing behaviors "the movement of cars on the freeway, from the randomly distributed speeds during nights to the almost uniformly distributed speeds during rush hours, in terms of self-organization and a shift from chaos to order; and then, during rush hours, to examine the abrupt changes of speed of almost solid bodies of thousands of cars, in terms of deterministic chaos" (Portugali, 2000, p. 65).

Self-organizing systems tend to be spontaneous, which the link between the chaos and order theory. As much cities are more adaptive for self-organization, which means in urban environments would be open for spontaneous dynamics, the chaos theory is likely to emerge routines of daily life patterns settled. The theory of chaos and the self-organization systems not contradicting each other but rather work together in an inevitable way, the order is found through or within chaos. The possibility of different patterns for self-organized systems is defined as the 'readiness' of the pattern information begins with the instability of it, which further stated as "Each pattern has a specific strength (amplitude) characterized by its order parameter. These order parameters compete among each other until one on them—the initially strongest order parameter—wins (at least in general) the competition. The winner then enslaves all the individual parts and forces the total system (here the liquid) into the ordered state" (Haken & Portugali, 2015, p. 48). The self-organization theory has been inspired form the entropy theory that applies to physics and how materials interact with each other. In social life, the interactions are likely happen depending on a pattern and routine, which would influence another, or either be influenced by the surroundings.

3.3. Social Oriented Theories

It is a common finding that space is composed by physical structures and objects, though, the social behaviors, routines and habits that take place in the space actually de-

fine and give identity to the space and make it a 'place'. Lehtovuori points out the production space through feelings, surprises, new points of views, sudden changes in perception, new usages and meaning and how these facts define or redefine the space. Most of the facts that redefine the spaces tend to have their own spatial patterns and locational logics to define the actions that aimed to take place. When the events are taking into consideration, the space is conceived of as something separate from the meaning that people would give to that place, instead, the actual use defined by the event uses and practices by taking place in that space. Lehtovuori defines this fact as "space is being objectified". He criticizes, "the objectification makes it impossible to grasp the classical idea of public space as a political constellation and a vehicle of a specific community. This aspect has become increasingly complex and contested with the rise of consumerism, electronic media and the horizon of a global community, so that it is possible to argue that urban space has fundamentally lost its role as a political arena" (Lehtovuori, 2010, p. 5). It is an unescapable truth that the events and the spaces of events influence the people attend the event defines the space, the dynamic is caused by the event itself[7]. It might be the true fact that non-places are replacing the needs of social life, but to do so they reduce the sociability and become lack of fiction, togetherness and any deeper reason to communicate in their system. This is clearly the result of changing lifestyles, preferences and rhythms through time, generation and mixture of culture, so that public urban spaces are getting segregated, simplified, sanitized, and most importantly, non-identified by social facts but forced by some physical facts alone. However, these urban places helping people to get used to this kind of a lifestyle even more and make it seem like its normal to be preferred to interact in this minimum sociability and make the real urban soul, which included real human reaction, fade away. The solution should have been making all these work in a healthy environment, to make places public and civil as much as possible regarding the recent needs of a place and a society.

By the time, social sciences started to be included in the definition of space, the urban space approaches also started to evolve and be criticized. Many concepts and discussions started to occur to understand the components of space and how it is only defined by physical elements but also social and living elements. As the creation of new spaces started to happen, the differentiation of dynamics started to become clearer. Some places have been designed without any contribution of citizens or users of aim, such as

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[7]   Bauman had a thesis about the need of rehearsing civility and the importance of interacting with other strangers, "many contemporary urban spaces, such as La Défense in Paris or Itäkeskus mall in Helsinki, are 'public but not civil'"(Lehtovuori, 2010, p. 1).

'non-places'[8]. People unconsciously prefer non-places just because of more recent solutions they offer. Nonetheless, the necessity of rehearsing civility occurs in these non-places. Furthermore, Lehtovouri describes a fact of 'weak place'[9] which is nothing more than a moment of signification. The idea under those places to redefine some notions of place but ends up hosting idiosyncratic experiences and being singular. "Weak places remain private, and not easily 'operationalize' them in the public realm, in planning debates, for example. Only the coming-together, juxtaposition and collision of many people and experiences – the resulting conflict – lends weak places a public form" (Lehtovuori, 2010, p. 2) which proves that social dynamics are faded or never even appeared in these places. The modern and globalized solutions lead to these kinds of 'non-places' or 'weak places' to escape from the conflict of social facts and force a dynamism, an identity, rather creating an opportunity of interaction they create motionless areas with more privatized and less interactive actions.

Some spatial definitions of space were cited as "ceased to be regarded simply as the environment of society marked by bounded territories and defined by the code of 'here' and 'there'; the turn takes space to be a relational category based in social interaction and interdependency"(Knoblauch & Löw, 2017, p. 2). Urban places tend to become vibrant and identify the environment of their surroundings. They mostly described as a whole with everything that composes them, and also later on, everything that has identified the space.[10] Those public spaces tend to be the attraction points of the cities. They become the places that people intentionally unintentionally meet or pass through. The openness and indefinite possibilities of reproduction of space makes it also socially flexible and available for self-organizations, as much as the physical design and policies allow. The definition of the city as a human settlement that strangers are likely meet suits the aim of the urban spaces that serve as souls.[11] The physical context would make it seem like fitting or working in some ways, but in social context, the failures tend to be faced in many cases

8 The realm of non-place is discussed by Marc Augé, considering the case of Europe, which includes some a-historic and identity-less realm of indoor malls and many others places. These non-places are seemed undefined and forced into a dynamism to have, as undesirable as it is to use but overcome the urban places because of their response of temporary need to the society.

9 Weak places are some urban places that are being concerned with some types of urban models which are mostly focused on spatial morphology and happen to be less problem-solving oriented and not policy-oriented models, are not answering the most of the social needs.

10 Martina Löw once describes space in three aspects, as "first, an expression of the possibility of pluralities; second, they point to the possibility of overlapping and reciprocal relations; and third, and for this very reason, they are always open and indefinite with respect to future formations" (Löw, 2008, p. 26).

11 Lehtovuori discusses the issue of definition of space and weaknesses of them in his book Experience and Conflict: The Production of Urban Space. As discussing, he emphasizes the fact of meeting people as strangers through the city. He cites "Public urban space is the key site of the coming-together of different actors and influences, thus becoming the 'soul' of the city and breeding ground of its urban character" (Lehtovuori, 2010, p. 1).

of the creation of such 'weak places'. Answering the needs and creating urban structures shouldn't be as being up to date in physical terms. It would be valuable if they answer the needs and provide easy access to them as well as feeding the social needs and make the society a part of the city, not some living elements only passing through.

Considering the social components of the city, the urban environments are designed by the citizens as well. The inclusion of this idea would prevent the creation of 'non-places'. The issue with public spaces being public but not civil would have been the ignorance of social dynamics of the urban environment, and the fact that human beings would be a part of the design, even would have design the environment as a result of spontaneity that they have been provided with. According to Portugali, in practice, the activity of planning is an institutional work, including all the technical and design process. Institutional planning provides the physical structure of the city which would be the physical information. He also thinks that there is a cognitive side of planning which would include the citizens and their participation, during and/or after the process of institutional design, because the act of urban planning and urban design should not be an intervention, but rather it should be an act of participation. In this case, human beings are also planners until some certain level, even though they don't practice urban planning nor urban design as a proficiency. The awareness of this need of participation brings some discussions with it, such as how different people would perceive the same patterns in different meanings. According to their own emotions and preferences, how they can redefine, and cognitively redesign the urban environment. The studies are defining the path of how the spatial and social information would clash or synchronize in order to complete the data of a certain environment.

3.3.1. Hybrid images and patterns

Through the analysis-synthesis, and deconstruction-reconstruction phenomenon the information of the same pattern has the ability to shift its form differently for different individuals. Human brain gives different meaning, as well as they can interpret the visual into different shapes. The concept of hybrid images emerged with the combination of different cognitions of individuals and also the changing cognitions of each individuals depending on different parameters, such as distance, experience, time and so on. Apart from deconstruction-reconstruction and analysis-synthesis, hybrid images are the third way that the human brain chooses to form patterns. There are some tools that have been ap-

plied to some images to analyze how people would observe the same images if they have been disoriented. The ones that can change for an individual depending on the size, color, distance or any other physical parameters is called 'double recognition', which means the visuals can be recognized in two different paths. There are two main questions that needs clarification while understanding the cause and the process of how hybrid images occur "Two interrelated questions arise here: First, where and how are these pathways realized by the neural substance? Clearly this question can be answered only by experiments that measure the correlations in spike patterns of many neurons. In our opinion this difficult task has hardly been accomplished" (Haken & Portugali, 2015, p. 24). The second question to rise would be about MBB, which depends on emotional cognition of a human mind, as if the MBB perceives the images or patterns parallelly to the double pathways.

Hybrid images are the outcome of a human mind's perception, depending on the composition of different social, material and personal information they have in the background. Patterns are human invented visuals, or physical materials, in the urban environment, it can apply to the urban tissue of a design. Urban tissues would host the urban flow which would lead the citizens to some or inspire them to invent other than it has been designed for. In this matter, patterns in the mind of humans go through the process of deflation information, "The mind/brain implements this task by adding data, deflating the Shannonian information and reducing uncertainty. The process implies adaptation because the MBB continues with this process (of adding data/deflating information) up to the stage where recognition/meaning is achieved" (Haken & Portugali, 2015, p. 54). There is a certain way of understanding some patterns that is defined as 'pattern recognition' and Portugali links this process of understanding the patterns with information adaptation, as people would automatically would understand what a pattern means physically. He gives the example of caricature drawings, such as the drawings are disoriented from their original form but still recognized as they meant, and states with the example of Figure 6, "Here the task might be 'what is this?' and an appropriate answer: 'A face!', that is, a category which is a construction of the mind" (Haken & Portugali, 2015, p. 56).

The adaptation of the image in human mind goes through a process of pattern recognition including all the parameters of the environment, familiarity of the pattern, the complexity of an individual's mind, which in this case includes experiences, preferences, emotions, and other psychological factors, and with the flow of time, the paradigm is being shapes in for an individual. The recognition pattern is likely to differ for every human
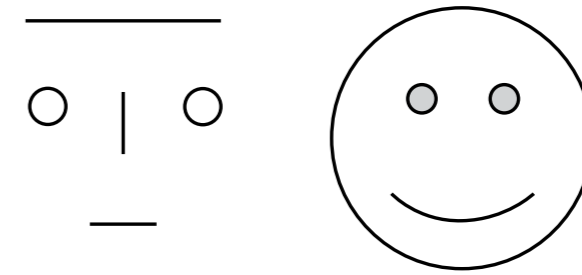
Figure 7: Information adaptation by means of deflation with respect to a caricature (source: Haken & Portugali 2015)

being, as above-mentioned parameters' values and dominances change. Though, the scenario of the recognition follows as Figure 7, "a complex agent with a complex mind full of patterns stored in memory, is offered a new pattern in a certain environment and is asked to recognize it. According to synergetics, the interaction between the patterns stored in the agent's memory and the offered one in the environment gives rise to an order parameter that enslaves the many parts of which the system is composed. When this is done, recognition is accomplished" (Portugali, 2008, p. 367). In the end, the result of this paradigm is likely to take the simple causes to complex effects, and complex causes to simple effects, which is related with the human beings' likelihood of self-organizing themselves.
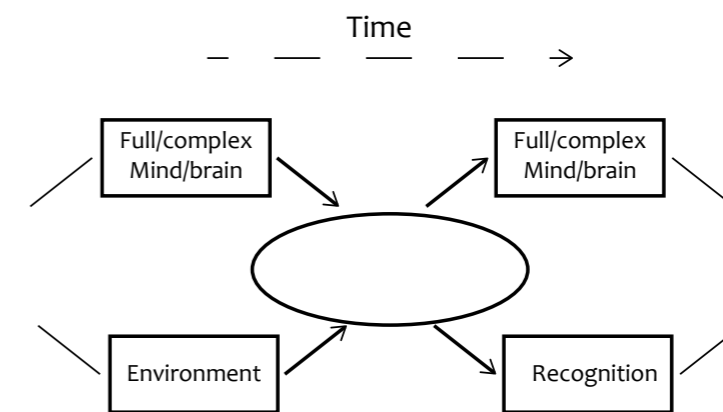
Figure 8: Pattern recognition paradigm (source: Portugali, 2008)

3.3.2. Cognitive images

The concept of cognitive images is another way to understand the social structure of the city. The challenge about the cognitive image of a city is that there is always a difference between the intention and the behavior. The difference grows as the individuals get together and clash in the urban area, or as another fact, synchronize. In urban areas, it is more likely to synchronize to be able to adapt the social circulation of the urban environment that supports also daily routines, "a cognitive gap or dissonance between an

individual's intentions and his/her actual behavior and action, is cognitively unbearable - it creates a cognitive tension which eventually will have to be resolved either by a change of behavior and action, or by a change of intentions and value system" (Portugali, 2000, p. 144). So that, cognitive images might be still differ from each individual, but people may not behave accordingly to their own images. People still might give the different value and the different meaning to an image or a place, but behave with respect to the surroundings and other individuals who they are interacting intentionally or unintentionally. The activities they do and the interaction they make develops the cognitive image since the meaning gets stronger or weaker as a place, for an individual. "Intuitively, one could say that the social person behaves 'like others' the more people behave in a certain way, more people will follow - up to a certain limit, with the implication that as a whole it takes a logistic form. People thus might change their behavior as a consequence of the various socio-spatial interactions in the system" (Portugali, 2000, p. 145). When the human relations are involved, then the action of massive self-organizing becomes available to be analyzed and observed. Both social and spatial structures would be considered together as the self-organizing systems are being explained. All the follow-ups of separation between the behavior and intentional organizations that are performed by the citizens, and also designed by the actors or authorities are the components of the whole urban system, though to define a situation, they should be considered in as a separate matter to be addressed, which is cited as "separating intention from behavior enables us to address one of the problems which stands at the center of social theory, social geography and the theory of self-organizing systems: the relations between the individual and the system" (Portugali, 2000, p. 145). The personal cognitions that represent a city image for individuals have a role in self-organized urban systems, though, one of the main reasons that the cognitive images differ, is having different routines to perform in different urban areas.

In any dimension of scale and time, the major fact that defines the place is basically the people's perceptions and actions. Involvement of people and letting them identify the space also makes the self-organization of urban places active. Martina Löw and Hubert Knoblauch point out the active feature of the space as "figurations are based both on the active practice as well as on the accomplishment of synthesizing. Spaces therefore are always structured in a dynamic way. This dynamic structure precedes action just as much as it is the result of action" (Knoblauch & Löw, 2017, p. 4). The combination of structural and social materials helps them to maintain each other and even create further references to analysist, designers and planners to make decisions accordingly. By time the subjects start having such collective memories along with the living bodies of the environment. If those collective memories are able to be mapped and subjected through the planning and designing tools, further planning and design strategies would follow the pattern and the non-place fact would be eliminated.

As another against contribution of space beings objectified, there are views that space is always a social as being part of a living societal system. Through the urban grid, it is possible to connect the social patterns, such as the citizens movements and interactions, as well as those social patterns might be an inspiration for the urban grid to connect. The analysis of the patterns can bring the reasons of the movements into light, which might be some locations that are being favored or disliked by people. Though, the effect is reciprocal; urban activities locate themselves as flexible or shrink as the urban grid allow or lead them. "the grid works as 'a mechanism for generating contacts' between the activities located in its areas, that's to say as a structure aimed at optimizing the movement and to maxi- mise the consequent interactions and contacts. Each part of the grid is hence provided with a specific vocation towards the contacts between activities; such vocation can be followed by the actual land use (as it happens in most cases), or otherwise it can clash with it" (Cutini, 2008, p. 166). The configuration of the urban grid aims to link the activities and patterns which appears through the actual land use of the urban environment. By the configuration of the urban patterns, the relations can be built between several places. Those relations of each urban space with another tend to define the whole urban grid. All the relations and adaptations in urban grid help the creation of a mental map as well as the structural settlement of the urban environment, "each movement within the urban grid follows the visual appraisal of the final destination, by means of the sequence of the intermediate destinations scattered along the shortest path" (Cutini, 2008, p. 168) through the short paths, the physical and social connections occur. The social connections create the cognitive map of human beings, which explains their approach as they flow in the spatial structure of the urban grid, "The mental map of a settlement appears hence as reducing the spatial impedance between places in visual connection, and, on the contrary, widening their distance if it results from a sequence of viewsheds: what one can see is nearer than what is actually near but not visible" (Cutini, 2008, p. 168). In this moment of individual perceptions start to differ and shape their own cognitive view of a particular city, people start to personalize the places and building their routines by giving social meaning and identities to the urban places other than their given function. Whenever the cognitive images of individuals collapse or synchronize with some others, intentionally

or unintentionally, the urban places are identified by a mass of social patterns and routines, that combined with same or different cognitions.

3.3.3. Behavioral patterns and routines

The routines define the places, also, specific urban places are physically available and capable of hosting such routines. The common defined capability and availability creates a place for groups of individuals to interact and meet, while they are actually going through their daily routines. Martina Löw finds similarities between spatial systems and biological systems and discusses in her book The Intrinsic Logic of Cities. The city actually works just like the human body. The structures in cities system need to collaborate with one another in order to be make a successful structure of city in both terms of spatiality and sociability. It's clear that in urban scale studies, which are urban planning and urban design, it is not reasonable to consider the spatiality and sociability apart from each other. Which means space is always tempted to be social, and is social by its nature. "I understand structures to be complexes of rules and resources, which materialize themselves in all social entities of whatever dimensions. In the human body, for example, as gestures and habitus, in the city as morphology, in the state, for instance, as the social distribution of property" (Löw, 2009, p. 1). In the same way, human body represents habits, routines, and behaviors so those can identify the person of a body as their character, the social morphologies of the cities also identify the characters of the cities. The phrase 'intrinsic logic' Martina Löw discusses meant to be understood as the logic of place or place logic. It points out the complexity, heterogeneity and urbanist characters of places that has been defined by the habitants. Even though most individuals define their places in the social context, only one of them cannot define an intrinsic logic of that environment. When they have combined habits and routines, common norms and behaviors, synchronized gestures and fitting local patterns, they define the dynamic and create the place logic. Though, these habitual patterns do not exit their own environment. When people change the location, different patterns are performed. In other words, the patterns and the location are connected and only works with each other in a certain dynamic. When the location change, different dynamics are performed by same people elsewhere. Also, the other way around, if people change in a specific location, the characteristic of the place temped to change.

The analysis of city under the concept of 'city as a pattern' is being discussed as how it has similarities with language. The language people communicate is always growing and never complete. Cities also grow, expand, change, generate and adapt to changes, people, time, innovations, crisis and so on. In language, individuals also have their own habits, or in this case patterns, of speaking, similar to the way they perform their routinized everyday day life patterns throughout the city, "As in spoken languages, every person has his/her own personal pattern language, which forms a personal variant of the language of a larger social and cultural collectivity. And the artificially built environment is the product of a conversation between a large number of individual pattern languages, which are the means with which people act on the environment" (Portugali, 2000, p. 13). The common language appears with the conclusion of individual groups and repetitiveness of same or similar speaking levels and patterns. Human behavior patterns and human flows in urban systems also appear in a similar way; people who enjoy the similar activities tend to interact, intentionally or unintentionally, in a common ground and become a part of a routine. In this way, human activities create variety of patterns throughout the urban system, depending on the identities the spatial environment also offer to citizens.

The fact about citizens personalize the urban spaces, the role of cognitive images of the cities comes up to discuss about. People usually define their paths and environments accordingly to their perception, routines, daily life patterns, personal links and memories and so on. The concept of cognitive map starts in this point. It is possible that every individual might have a different image of a city, or an urban space in any scale. The cognitive map that they would draw might be completely different from each other, which proves that there is no right or wrong way to define a cognitive image of a city; it depends on individuals' own perceptions, experiences and routines. Even though the cities are planned and designed, the patterns, the architecture, the connections and fragmentations of the components of a city gains meaning as people start to give meaning to them. Even in some specific images, people perceive differently, and therefore, define differently. The designed might be the outcome of a top-down decision, though it can be available for bottom-up decisions so that people can function differently and define differently. The possibility of the bottom-up actions to occur in a top-down planned or designed urban environment would be result of leaving room for spontaneous synchronization of human beings, so that a social dynamic can be defined with the collaboration of social and spatial structures of a city. Nevertheless, for the complex systems such as cities, depending on the variable components and their combinations, the roles are different then only conceiving them, "The situation is different when dealing with complex systems, which due to emergent properties, are not the sum of their parts: here the process of analysis/deconstruc-

tion entails loss of properties (information) that exist only at the global system. It is here that the specific personal information accumulated in a person's memory has a role to play—to add the global properties that do not exist in the parts. In the case of the mind/brain this is implemented by the process of synthesis —Kandel's reconstruction—by an interaction between the (bottom-up) locally deconstructed parts and the (top-down) globally memorized elements" (Haken & Portugali, 2015, p. 21). As the scale gets larger, such it becomes a global scale, the personal memory leaves its place to a common and collaborative synchronized memory or patterns. Though, Portugali and Haken support the idea of to create a bottom-up image in a mind, kind of a base, in this case top-down design, is needed to be followed.

To understand the daily self-organizations and to understand how routines lead to shape the social environment, the study of individuals' patterns gains importance. Studying single individuals as samples is the first step to understand the statistical representatives. Then, mapping the movement patterns of individuals in urban environment would help to understand the socio-spatial compensation, "can be done by mapping the movement of individuals not only in space, as is usual in studies of the ecocity, but in space and time simultaneously - hence, time-geography" (Portugali, 2000, p. 36). Afterwards, the time sensitivity should be involved, since people's routines are time-dependent, or, even though they remain in the same location, time keeps moving, which brings the space-time relation in urban places. During the observation of space-time movement of citizens, the routinized behaviors are being recognized, which Juval Portugali defines this notion of 'dance' in urban contexts. In the end, by observing space-time movements, learning the notions of 'dance' and focusing on the movements of routines, the operating of social patterns in urban environment becomes understandable, which is being defined as self-organized systems. Cognitive image of the city, comes after the routinized behavior of individuals. Through the habits and routines, they start to develop meanings and perspectives of spaces, later become personal images about that urban environment, "when they migrate, shop, and commute, they participate in shaping and constructing the city and its patterns of activity, which they then perceive, imagine, cognize as their own subjective cognitive city, according to which they once again migrate, shop, commute and so on" (Portugali, 2000, p. 37). The city images of daily routines and cognitive image of the head makes the citizens individually, and collectively, the main actors of urban dynamics, as they give a meaning to a place through their both personal and impersonal interests. To put these images and the fact of human beings are the main focus and the main creator

of the urban environment, the concept of humanistic city occurs, supporting that "the real city as experienced by the people who actually create and construct the city. It tries to capture not only the sense of place - those portions of the city which were created by people and thus directly transmit individuality, human scale and 'peopleness'; but also the sense of placelessness" (Portugali, 2000, pp. 37, 38). The role of urbanists and designers is to understand, learn and be aware of the placelessness of the cities to be able to lead through the planning decisions. Taking into consideration of the people's adaptability and individual images and routines, the questions of limits and intentions becomes another fact to be studied and analyzed, "to what extent, and where in the city, people behave in line with, or counter to, their intentions. In other words, 'how many and what proportion of the city's population live in a state of socio-spatial cognitive dissonance?'" (Portugali, 2000, p. 109).

3.4. Capacities of Adaptation

Adaptation capacities of urban environments has some trajectories as, planning and design actions, that define the rules, ownership that would set some the private and public rules and set some boundaries between them, and the time dependency that would define the flexibility and innovational capacities of the environment. All of these trajectories become a part of cities' information system. The set of rules and ownerships would give a clue about how adaptive an urban environment can be through a timeline. There are some factors that considered crucial that built environments to be adaptive. One of them is persistency in the long run, so that the environment can be adapted by their users and continue to exist while users are keeping themselves satisfied depending on their change of needs and compatibility of the social and spatial environment. Second factor is the identity, which means spaces are defined uniquely from one to another depending on their own emergence of places. Finally, the third factor is that adaptability welcoming the innovation, "In this way, people have the possibility of renovating, over time, the urban fabric in ways that none could predict in advance, giving the system the opportunity to efficiently react to various contextual needs. This is relevant because in continuous processes of trial and error, society as a whole can benefit, achieving innovations otherwise unachievable" (Cozzolino, 2019, p. 4). The challenge of the adaptation process in built environment is the modern idea of planning, which includes standardized planning principles such as the minimum road width, distances between building plots, measurements of parking lots and so on. However, the structures and urban spaces have multiple uses so

that the information they provide would differ and create availability for improvements and changes.

3.4.1. Time dependency

Place making and placelessness theory also formed by the time which can apply to the time of a day, or the changes throughout years, decades, even centuries. As it has been discussed, daily routines take place whenever it is adaptable of a day or night time. The example of Minibar takes place at night time, because of the commercial activities of the district becomes more adaptive to such activity in those hours of a day. At day time, the activity is different depending on the dynamism and usage of the district, such as shopping, meeting at cafés and restaurants, and many others until the night bars becoming active. To consider a bigger scale of a timeline, as some innovations happen, needs change and relations or expectations differ depending on the technology and changing life styles over generations, urban places evolve to adapt the changes in time as well.

Planners' and designers' role in time adaptation is to be able to predict the future for urban places. This prediction is also interpreted by Portugali as 'mental time travelling', as learning from the past of the traditional cities and analyzing the data that has been gained from how they worked or failed in the past, also as to predict the future cities' condition by analyzing the present and understanding the cognitions of citizens, which is so called 'thinking forward'. The process of learning and becoming able to predict has been supported by Batty and Marshall as they discuss about the complexity of planning theories, as "through planning support systems in conventional and often traditional practice, which is still the norm in many places, there are no obvious examples of where complexity in the form of modelling and prediction has been used to inform collaborative planning. In fact, the practice of planning has diverged massively during the last 30 years from the sorts of understanding of cities that we now have from many perspectives, not just from complexity theory. Much of this relates to the role of prediction" (Batty & Marshall, 2012, p. 43).

In comparison, the theories of planning are becoming also time dependent as the understanding and information of the cities evolve and the desire to answer cognitive needs change. The comparison of top-down and bottom-up decisions in urban planning distinguished as the importance of time grow in theory and practice. In top-down plan-

ning rules, cities are considered as simple and mechanistic, tree-structures. Meanwhile, bottom-up planning decisions are more flexible, due to the capability to adapt time and changes, and able to self-organize. Portugali discusses the two facts as "just-in-case planning versus just-in-time planning. The first refers to the traditional mode of planning as currently practiced in most (if not all) urban and regional planning agencies, whereas the second, to what planning in a self-organizing system might be. On the basis of this discussion we suggest preliminary principles for a self-organizing planning system and elaborate them in light of studies which are already existing in the field. We then turn to studies of self-organizing cities. Most of these studies simply do not concern themselves with the above planning dilemmas. Some, however, do suggest how the self-organization interpretation can provide a guide to planners and policy makers" (Portugali, 2000, p. 231). The city transformation from Fordism to Toyotism is the process that can be analyzed as the inclusion of the trajectory of time. The theory of Fordism (just-in-case) has been criticized by Christopher Alexander as the structure of the city is interpreted as a tree-structure, rather than a complex machine, as it has been strongly discussed and mostly agreed with the complexity theory of cities. On the other hand, Toyotism is considered as time sensitive (just-in-time) and flexible to bottom-up decisions, which Castells supports the idea of the theory is tempting the transformation of the society with a recent and larger scale. Overall, time is considered as one of the important trajectories in planning and makes the adaptation possible for cities "urban factors that are crucial to understand neighborhoods' adaptive capacities: (i) action (as the main source of urban change), (ii) ownership (as the legal title that effectively distributes 'design control' in the built environment), and (iii) time (as the essential condition in incremental processes of adaptation)" (Cozzolino, 2019, p. 4). The shift from traditional planning to 21st century cities has faced some ironic twists in applications, though the theories and the amount of accessible data and information has an effect on the adaptation of the recent city planning theories and practices, besides the fact of time dependency and growing awareness of the fact.

3.4.2. Local and global scale circulations

Two different scales of self-organization would leave different result, "self-organization at the local level of the individual, and self-organization at the global level of the city: to see how the city dynamics might create a self-organization process at the individual level, and how the latter might entail self-organization at the city level" (Portugali,

2000, pp. 71, 72), thus, these two different approaches of the same study might cause some ignorance of another or misleads of details to be able to understand the reason of self-organization that has been under beneath of all the human patterns.

The identification of space and dynamisms not only differ from spatial structures but also differ from different cultures and ethnicities. Even though globalization tries to force a mono-functionality of developments throughout the whole world, the usages differ in the same functional places depending on their cultural routines and habits. Local practices shape according to cities, or environments history, period of developmental innovations, and many other factors that define same functions to structure a place in from the beginning to finding out its own harmony or disharmony. To go in deep with this sociological fact, Martina Löw analysis two cities' processes of development; Manchester and Sheffield. Even though they were cities located in north England, the approaches they took to cope the post-industrial period were different. Manchester manages to adapt a cultural change and provides new prospects, reorganizes some new jobs and projects. On the other hand, Sheffield was keeping the legacy of glorious industrial past of the city, which creates a nostalgia as the authors referred to the historical social patterns as routinized and habitual practices. Later on, different clusters and different regulation appear within these two cities, and also in their own urban system, having completely different norms, labels, limitations and exclusions. Overall, by the study of these two different cities' two different approaches, Löw cites "If gestures, habits, actions, or judgments are understood as expressing practical meaning, the development and unfolding of precisely these gestures, habits, actions, and judgements depend on the societalization context of the city"(Löw, 2009, p. 3). Every individual takes their own place in the society, and therefore, in public spaces. They tend to have their own role to fit or misfit in a space. Those fits and misfits dominate each other and create the dynamic of public spaces.

The domination of dynamics is another topic to discuss and has been conceptualized to understand the space itself. There is an idea of dialectics of space, influenced by Henri Lefebvre's The Production of Space (1991). The most important roles of the space through their production are; space always appearing dynamic and processual, space would not to be conceived generally so the conceptualization of space being always specific through the physical and social components of its environment, the conceptualization being able to deal with the radical qualitative difference between the various element or moment of social space without simplifying all of them in one single representation of

plane, and finally space providing the opportunity to think the not-yet-existing and yet to become important as well as the existing. In overall, the place is defined by the social behaviors and habits of the society itself. Therefore, the people, the society is space's dynamists. People's acts, routines and day-to-day patterns define the identities of spaces as they take their actions though some specific places. Furthermore, they create the social identities, in other words, the social dynamics within the urban dynamics of the spatial environment. Nevertheless, the term social dynamic is not easy to be defined clearly and specifically, because the norms, the habits, the routines and everyday life patterns differ in many factors in the same and different societies. The search for the creation of place identification brings up so many questions and researches about the social dynamics as well as so many different definitions and methods to analyze the dynamics to create a cognitive map of the city as well as the technical ones. There is a common fact of absence of definition of space in social sciences, but its absence in architectural studies are quite noticeable and need to be considered to be developed. Lehtovuori also refers to Lefebvre's theory of production of space and points out the loss of space definition in literature. "The structure, syntax or morphology of space relation in social structure have only recently been paid sufficiently paid attention. Even though much used in education and criticism, the notion of space is far from clear. The logic of its complex constituents in urban situations, in particular, should be clarified" (Lehtovuori, 2010, p. 6). As it has been mentioned and supported by Löw's discussions, spatial systems and social systems of the city tend to work together and not to be considered separately. The urban public spaces are meant to be designed and planned for social life, for people, and they become their spaces to get interacted, design their own social routines and personalize as 'places'.

4. IMPLICATIONS IN PLANNING PRACTICES

The limitations and changing dilemmas of planning theories are also create discussions about the definitions and information about identities and flows of the cities. As the needs and people change, perceptions change and the way planning can adapt or affect the daily life changes. To start with the most concrete dilemma of planning, 'rational comprehensive planning' is supposed to be the most favorable theory depending on its focus on how to shape and enable to implement the city planning in a most effective way. The limitation is the fact of being focused on only the technicality of planning and not the

social theories of urban environment, "At the basis of both was the positivist mechanistic logical- deductive scientific method - first, during the 1950s and early 1960s, its verification approach, and later its Popperian falsification version" (Portugali, 2000, p. 226). One other dilemma includes the humanistic approach to the cities. The concern is to consideration and the possibility of failure and how to think of alternative with the inclusion of the societal transformations of the cities, finally leads to awareness in planning "The cumulative effect of this discourse about the qualitative aspects of cities and landscapes will eventually enter the awareness of planners and architects when they are practically working in and on cities" (Portugali, 2000, p. 226). The focus is mostly on how city is transforming by its society.

Then, the third dilemma is about the unpredictability and how the post-modern cities are becoming uncontrollable, unpredictable and unplannable. By time passes, cities become more spontaneous and predicting the spontaneity becomes harder, "Indeed the postmodern city started with free and creative quotations from the ancient past and from futurist visions, but very quickly it turned into a uniform style - into a kind of neo-conservatism - into the very opposite of what postmodernism was an about. This dissonance between the decided intentions and the daily praxis forms the deadlock of the post- modernist city of the 1990s and the first aspect of what we call here as the third planning dilemma" (Portugali, 2000, p. 228). As the self-organization theories are being discussed, the question of whether there can be a meaning to planning has occurred, as the absence of predictability and control is becoming an awareness in planning. There are two proposals that has been offered; eliminating or minimizing planning, or developing new forms of urban and regional planning. Both offers openings for self-organization and leaves room for spontaneity. The irony about the dilemma that planning is facing today is, the old humanistic cities were trying to refer to the 21st century, which were thought to be more innovative for the time they have been developed. Though, todays cities, which are considered the actual 21st century's cities and supposed to be developed under the theory of 'The New Science of Cities' are based on traditional planning theories. The reason behind is the data and knowledge that has been reached since the development of traditional cities until today. As much as the 21st century cities are defined by glocalization, as age of cities, and even megacities, because of the data and information that has been gained from the past cities' planning theories, complexity theory of cities also focuses on the traditional cities, which is somehow leading the phenomena of planning to learn from its pasts, as knowing the limitations of planning "a future city cannot simply be the built-out

product of a creator's imagination, in the way a building can be. Nor is a city growing like an organism: there is no knowable optimal form of target organism to be steered towards. The idea of the planned city as a knowable utopia is a chimera. Nevertheless, we continue to try to plan in the belief that the world will be a better place if we intervene to identify and solve issues that are widely regarded as problematic. But this must be tempered with an awareness of the limitations of planning" (Batty & Marshall, 2012, p. 44).

4.1. Models and Real-Life Analysis

The city planning in late 19th century was based on producing order with some policies from authorities "those who were concerned with the city assumed that their organization, which was regarded as producing disorder from the bottom–up, must be manufactured and managed using some form of top–down control–planning" (Batty & Marshall, 2012, p. 23). During time, as scientific theories has become more favorable, top-down city planning approach has been weakened and more citizen behavior focused approaches started be applied to city models, "at a time when the centralized models of science, particularly in biology, were beginning to slowly weaken in favor of much richer bottom–up approaches, society itself, particularly city planning, was embarking on a quest to establish structures that would control the city from the top–down, in the somewhat misguided notion that it was only the intellectuals and professionals that knew how cities should work and were able to make them work to the benefit of all" (Batty & Marshall, 2012, pp. 23, 24). Portugali has an approach of Inter-Representation Networks (IRNs), which he supports as "cities are at the very same time an interactive network of internal (cognitive) representations of the external environment, and external (material) representations of internally represented concepts, categories and images. The implied city will be called below 'the IRN city'"[12] (Portugali, 2000, p. 10). This concept would also offer some prototypes and models to answer the question of what is needed in an urban system through the analysis of each element, "As the concept/physical entity 'city' diffuses in space and time in this sequential interplay between its internal and external representations, more and more instances of 'a city' come under its conceptual umbrella, more and more properties are assembled to the family resemblance network of cities, and with them the prototype or ideal type city at the core of the family resemblance network is also changing and moving in space and time" (Portugali, 2000, pp. 15, 16). Each time

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12   The urban simulation approach leads to the conceptual and material categories of cities and how they become self-organizing systems, or networks. With the simulation of all the elements that composes the city, such as time, space, social and spatial structures and so on, are able to be simulated with the approach of IRNs.

and space will compose their own urban network and depending on the time period and space context and many other variables, the core of the city will be created. This approach can even prove in a way that the standard image and the model of the city, which is mostly based on 'location theory', but also proves that the location alone is not enough to understand the whole image of the city.

Afterall, the city is not only composed by some built structures located in some environment, but also a composition of natural and social structures, and together they mean to host a community of living creatures, that includes human beings. "As in biological ecology, where morphological analyses provide the basis to theorize about underlying mechanisms, here too, the formulation of general principles of urban ecology was associated with several detailed studies of urban morphology" (Portugali, 2000, p. 25), so considering the physical morphology as a base is necessary and unescapable when the growth of the city is taken into account. In order to include the studies of human actions to the IRN model, synergetics also have been formulated and SIRN model emerged[13]. IRN models are highly related with information that has been collected as memories and has its limitations to reach its complexity, which SIRN is designed to overcome it, "the process might start with a preliminary internal idea (or external cue that entails an internal idea) that the person then externalizes. After a few internal-external iterations, an order parameter (in the sense of synergetics) emerges and enslaves subsequent iterations" (Portugali, 2011, p. 140). To understand the relations of the cognitions and the morphological properties of the city, SIRN model studies the cognitive images and the urban places together. In order to describe the model, there are seven propositions; (1) Human beings naturally have the capability of two forms of representation, that are internal and external, (2) this capability leads to many cognitive tasks to evolve as a sequential interaction between internal and external representation, (3) these representations latter contain and cover Shannonian and semantic information, (4) these information theories coexist in implicate and explicate systems, (5) meanwhile, it links with the information of the memory in mind so the genotype and phenotype can be relatable in a same common ground, (6) all together creates the cognitive system and defines the boundaries of the cognitive system, (7) finally, they become a network of self-organizing system. (Portugali, 2011, p. 141). Self-organization becomes a tool to analyze the human behavior in the city, and how it is adaptable with the existing morphology of the environment. Human beings are likely to be accepted as the adaptable component as the social element of the city, however, they

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13   SIRN model studies are integrated with the cognitions, therefore adaptable to construction process of the cognitive maps of human minds. Portugali describes the model's system by its seven propositions.

would reflect their adaptation by behaving through the interactions in the physical organization in the city, by following the intentions of the design or rejecting and developing new dynamic flows through the design.

The morphological studies are the physical proof of how the city expansions and shrinkages taking place through time and how they are shaping the overall city within the urban system. The fact to go in deep in this point is to study and analyze the reasons of those changes happening in the urban system, which are highly and strongly related with the self-organization of human beings. To get to the point of how urban models are being defined, the physical morphology is the first to consider, and the reason behind how the land use is created is the next to observe accordingly to the morphological changes through time and space. Portugali supports the relation between morphological conditions and other economical, ecological and sociological facts of the cities as citing "the process by which people as individuals and collectivities compete over the urban land(use), either by means of an interplay of spatio-economic rbc's (real business cycle), or by means of ecological invasion and succession processes identified by means of Chicago type factorial ecologies" (Portugali, 2000, p. 27).

4.1.1. Urban morphology and location theory

Architectural structures give shape and form to our material world. That material world has a direct connection with the social life more than having only a symbolic meaning. The structures of urban environment provide material preconditions for the patterns of movement, encounter and avoidance, which can be concluded as a whole of human behavior patterns. The whole of materiality in urban environment is being defined as "urban grid" by Valerio Cutini. It is cited as "What matters is the urban space or, better, the whole set of streets and squares which are actually available for movement and constitute the urban grid. The grid will then assumed as the primary element of urban phenomena, that's to say the distribution of movement and the location of activities along the urban paths (or, what's better saying, their vocation for housing them)" (Cutini, 2008, p. 164). As the contrary to the traditional urban modelling, which keeps the space in the background and let it barely contribute with social activities which are actually taking place in those urban spaces, some analysis to new urban model approaches are being discussed. To fill the gap between the traditional modelling of urban phenomena, some effects should be taken into consideration, such as "the capability of working at a smaller scale, when

applied to analyze limited portion of the urban settlement" (Cutini, 2008, p. 164), and also, "a fresh attention over the morphological aspects" … "which were widely neglected or even ignored in interaction modelling" (Cutini, 2008, p. 164), where the actual urban planning and design approaches are stepping in, both in physical and social aspects.

Location theory adopted the positivist human geography, which claims space was perceived as an independent system that independent individuals set themselves through existence and some activities. Through the time, as the complexity theory of cities has been emerged, space and place started to be defined apart from each other and the location theory also evolved, "complex reality is reduced to a large container in which the spatial interaction between such bodies/entities as settlements, central places, and demand is governed by spatial forces" (Portugali, 2006, p. 653). The space has started to the considered as artifacts, especially according to social oriented theories, that people are able to compose their social interactions on it. As they perform their interactions and creating social flows through the space, the space has another definition as 'place' depending on new social information that has been added to the artificial component of space. Even though 'place' is defined in human's mind, it is defined with the respect of artificial spaces. To clarify the difference between the notions of space and place, the emergence of the definition of place appeared with the discussions of cognitive geography, "Cognitive behavioral geography joined the positivistic culture, concentrating on quantitative scientific notions such as 'space' and 'spatial behavior'" (Portugali, 2006, p. 654). Moreover, the theory of self-organization has a part of the definition of place, since the actions of self-organizing systems are depending on the behavioral interactions, and place includes the behavioral geography as an addition to space. Under the explanation of location theory, stating that inclusion of social norms, behaviors, flows, interactions, emotions and many other facts that produced in human mind, defines the 'space' as 'place'. Accordingly, space and place are two different forms of information compression. As the differentiation between two is being defined, Portugali is inspired from Vico's description of poetic geography[14], and how human beings give meanings to places and defined them through their own pattern recognition process, "Through this process each city acquires a name (Jerusalem, Paris, NewYork) which immediately makes it singular, connected to specific memories, history, geography, and mythologies. Each city is further subdivided into a hierarchy of unique singular places (Soho and Harlem in New York, Montparnasse

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14   Vico describes the poetic geography in process of grouping, through the memories and sensations of a human's mind. Through the process, a cognitive task in of a mind is being solved and the geography gains a mental meaning for the one

and Quartier Latin in Paris), each with its own name, character, image, specific history or historical association, specific memory, and identity" (Portugali, 2006, p. 659). Furthermore, the meaning and identities of the places that has been gained by people, effect the movement throughout the urban texture. It influences the interaction patterns with the others and the choices of places to interact. These interactions would appear individually or collectively, intentionally or unintentionally. However, the common ground of these interactions is they have been processed by a cognitive pattern recognition of 'spaces' to define them as 'places', and finally, giving identities, meanings and social functions to the places to be able to interact in an urban flow.

4.1.2. Social interactions and cognitions

The discussion of the fact that, a city can be both something organic and yet artificial at the same time, brings the theory of complexity. The built environment can be seen and defined as completely artificial, though, they have been designed and built by and for citizens. Moreover, even though they have been built and constructed in mostly materialistic meanings, citizens give meanings and they start to have different identities, even depending on different perceptions of individuals, the identities might differ for some specific urban elements or environments. As the list of parameters grow, the complexity grows and becomes more difficult to define from a single perspective, since there are many cognitions exist and compose the urban environments as well as its complexity. The inclusion of human beings makes the social flow of the city harder to predict and forces it to be flexible, which is supported as "One key criterion of human systems is that they are innovative and creative, and in this sense unpredictable, at least in terms of their details. Such unpredictability can be represented by models based on nonlinear feedbacks, phase transitions and tipping points, and it is for reasons such as these that our ability to predict the future state of systems such as cities has been so problematic" (Batty & Marshall, 2012, p. 35). Thus, a city is defined as not an organism but rather an ecosystem since its complexity is composed by many artificial and living elements that interact with another and finally function as a whole.

Admitting that citizens are also part of the urban planning and design process leads the inclusion of cognition and habits that take part in urban areas. Spatial and social structures together, the social structures themselves would be considered as a whole to be able to identify the places by all means of social dynamics, which composed by the ac-

tual habits of people, as groups or as individuals. The urban flow becomes a massive component of cities as citizens interact with each other. This interaction can be intentional or unintentional. The main idea of the interactions' outcome is that citizens end up having some similar habits and routines in some specific time schedules in some specific urban public spaces. The density of the interaction and the similarity between the actions of routines makes it easier to define the space, providing the social information, that would make the space 'place'. Löw supports the fact of space identification through a description inspired from Laura Vaughan as "an intrinsic aspect of everything human beings do" which any action that people do in an urban space is likely become a part of that place's social dynamism. The way the space orients the actions, there might be some major ones or varieties depending on facts of the environment, such as occurs during time by years, or even depending on different time periods of a day, such as the given example or 'Minibar' that showed during night-time. The people who were part of the Minibar pattern were locating themselves accordingly to the times conditions such as uncomforting the householders, being threatened or warned by some authorities. Altay refers to transgressions, defined by Foucault, to study how such temporary social patterns spread or shrink with such factors. Transgressions, as being temporary actions that sometimes being limited and sometimes being opened with some new and broader boundaries, that is sort of an activity of shapeshifting. "The concept of transgression opens up new possibilities for the discussion of marginal practices like Minibar by introducing an un-defined zone within which these practices can be exercised" (Altay 2006, 66). As to avoid some disturbances and to be able to continue doing the activity of Minibar, groups of people take actions themselves, accordingly to some warnings and rivalry policies of authorities, such as leaving to garbage behind or making less noise and so on, which means they tend to shrink the boundaries, and if being tolerated enough, extend the boundaries, as well. "The flexible spatiality of Minibar becomes a device in maintaining the continuation of Minibar. To summarize, the investigation of these rivalry relations reveals important issues. One is related to the tensions emerging within the act of creating Minibar. The act is not in conformity with every inhabitant's wishes; it transgresses the space of other inhabitants as it transgresses the established space; consequently, it meets up with adverse reactions and interruptions" (Altay, 2006, p. 68). Every rivalry challenge and supporting policy push the pattern to change itself. Yet, even with the changes, spaces are shaped by such routines and resilience of such routines.

4.2. Self-Organizing Cities

Self-organization is a tool to analyze and explain the urban dynamics in cities. System of cities are claimed to be unpredictable, bottom-up decision based, far-from-equilibrium, socially and time dependently dynamic and self-organizing, interlinked and transscalar, so that the studies of self-organization explains urban dynamics to understand its impact on the cultural, social, and economic components of the built environment. The cities that are able to self-organize are capable of forming an internal order autonomously without an external force, "self-organization emerges from interplay between bottom-up processes and multiple-scale feedback forming a complex, nested system of networks. Its dynamics may be promoted or prevented, or the system may lock in. In a city, the border conditions (eg, built, natural, social, and economic environment, and regulations and laws) provide a certain frame for generative processes" (Partanen, 2015, p. 953). Self-organizing cities tend to be more innovative and evolve successfully. The fact of self-organization is depending on bottom-up decisions, so the citizens would find an opportunity to design the urban places as they desire and identify the places. Nonetheless, in modern planning strategies still depend on top-down rules. The historical planned cities are designed by top-down rules, though in local scaled urban areas within cities bottom-up decisions are applicable, thus, easier to observe the causes and elements that creates the self-organization systems and analyze the outcome of the actions. Though, there are some criticalities of self-organizing cities since they might cause a mass of information depending on people's individual freedom of developing their own flow though the built environment, "Self-organizing criticality is a concept indicating that the system operates on or near the threshold of instability, implying complex, 'edge-of-chaos' behavior. The system evolves to this critical state from the bottom up, without external guidance by self-organization" (Partanen, 2015, p. 954). Self-organized cities' system is an example to complex systems of cities. Besides, self-organizing actions are one reason that cities are complex and source of massive and infinite information. Shannon's theory of entropy is the scientific reference and how molecules might self-organize and inner order increases at the same time. In urban scale, self-organizing molecules are the citizens, as they self-organize to define their urban flow, they interact with the environment and other citizens which are doing the same. Finally, the actions are becoming simultaneously synchronized and a social dynamic would be provided, which defines the socio-structure of the city.

4.2.1. Forms of self-organization systems and actors

Even though the intention of decision is in the way of hoping to be beneficial, with these days complex systems they may not really overlap with the public interest, which is cited by Blecic "a public administration in principle expresses the interests of users (of citizens, and their electorate), but never actually coincides exactly with them. (...) Some users might not share the opinions of the public administration; and in political systems such as a representative democracy, with representatives not being their proxies, these users could even be the majority. Or users might not share their representatives' opinion for other reasons, for example maintaining that a problem is no longer important or preferring other solutions instead of those proffered at the moment they cast their vote. Relations are numerous, complicated and difficult" (Blecic et al., 2008, p. 113). To overcome the complexity that top-down decisions become limited in a way, the approach of bottom-up decisions started to take place in urban models. As Blecic and Cecchini discuss their study of how an urban model might be a good model, they point out that proposing a bounded reality is one of the concepts that proposed by Simon, and continues "the entire discussion on complexity, the substantial outcome of which was to propose models based on a bottom-up rather than on a top-down paradigm, we believe the concept of ecological rationality should also be included" (Blecic et al., 2008, p. 116) which support the idea of compatibility of the urban structures and social behavior on a city context. The models that would follow the idea relational concepts depending on each context of a system would also create a flexibility and freedom of acting for people, which allows them to perform self-organizing patterns in social dynamism. To analyze and understand the actors and institutions are involved in a self-organized system, the researchers also divided the concept of self-organization into some other categories. Each category affects different levels of the urban environment and start the process of their own self-organization in such specific categories. These categories are considered by Moroni, Cozzolino and Raws in their research as 'self-building', 'self-governance' and 'self-coordination' according to their own complexities, and the actors are being involved depending on the area or level of contribution.

Self-building is focusing on the active role of residences, especially on how they take action on the building process of their lands. This is the case where the households are getting involved for the development of the space. The households, who are the future residence of the building process of the urban environment, have a right to be involved and cite their desires, needs and so on, to be able to get what is more beneficial for them. In the self-building process, the initiator and the user collaborate. There are some governmental projects on self-provided homes in Europe such as, "The Housing Strategy for England, published in November 2011 by the UK government, includes, for instance, the objective to encourage and support individuals and groups taking the initiative to build their own homes. In the Netherlands, an adjustment of the National Spatial Planning Act in 2005 introduced subsidy schemes for similar reasons" (Moroni, Rauws, & Cozzolino, 2019, p. 3). These governmental projects allow individuals to be a part of the construction and enterprising process of their future dwellings, rather than being only passive consumers.

Self-governance is mainly about the independence of decision-making, without being under control or support of any authority to guide through. There are some sets of rules for the members to be accepted and followed voluntarily so the system can work, which mostly concerns the common grounds for the members they everyone should respect by the rules. The sizes of these kind of self-governing communities are variable, though, "members of these groups act and plan their activities voluntarily, while governmental actors remain at a certain distance. In other words, while governments may provide favorable conditions for starting a collective initiative or promoting their long-term existence, members of these groups act and plan their moves deliberately in order to achieve a shared goal. Because these organizations have specific, purposeful ends, their members are guided by some form of internal, explicit coordination"(Moroni et al., 2019, p. 4). For this kind of operational system of self-organization, self-governance is also considered as decision-making independence or self-ruling and self-managing systems as well.

Alongside these two categories, self-coordination is more focused on the social patterns, which are interactions, routines, place-based actions, spontaneity and so on, "The variety of actions at the local level and their potential to generate new spontaneous patterns (i.e., self-synchronizing sovra-individual structures) imply that processes of self-coordination are highly difficult to predict, if not impossible. Individuals interact and respond subjectively to their immediate environment in trying to achieve a better fit" (Moroni et al., 2019, p. 4). Individuals in urban places hardly evet meet but interact with intentionally or unintentionally, which creates the phenomena of self-coordination under self-organization. Some levels of expectations occur depending on the compatibility of individuals' plans or routines throughout a moment of gathering or interacting.

Self-organization, thus self-coordination, is considered as a challenge in urban planning. It has been stated that the theory of self-organization as even the main challenge for the study of urban planning and design, "is a challenge because its spontaneous form of coordination does not coincide with forms of top-down coordination. Furthermore, its spontaneous nature prevents planners from fully understanding and anticipating the potential consequences" (Moroni et al., 2019, p. 7). Since the traditional urban planning principles are mostly based on top-down decisions, planning for the benefit of self-organizing human patterns is a challenge. The existing patterns have the potential of inspiring some planning and design policies in urban places, though, simplification of the implication is more complicated and is hard to predict. Today, planning still has its limits about the studies of self-organization and how they can be triggered of be benefited, "Planning can only reduce or enlarge the space for the expression of self-coordinating phenomena in cities" (Moroni et al., 2019, p. 8). Depending on this, there are some areas attained that urban planners are able to intervene, which are, setting framework rules, installing carrying structures, encouraging certain piecemeal experiments. In this way, planners would be able to allow spontaneous patterns to form, filter urban devices, broaden the capacity for self-synchronization, enabling new forms of lifestyles as variables, and make align with bottom-up nature which would highly benefit the spontaneous character of self-organizing urban systems. Overall, "self-coordination requires planners to be humble about their capacity to manage urban change, they have an important role in providing those constraining, enabling, or triggering conditions under which self-coordinating systems can emerge and evolve toward socially desirable directions" (Moroni et al., 2019, p. 12).

4.2.2. Self-coordinating cities and social flow

Self-coordination form of self-organization is the one which involved the social components of the city. Since human beings are considered as the part of the complex city system, which are already complex individually, the studies of behavioral patterns of citizens take crucial role to understand the existing result of city that have been analyzed, and the possible outcome of a model that is intended to be simulated. Self-coordination phenomena is a tool to understand the social flow of the city and to analyze it into different patterns of information, "A common feature of spatial modelling approaches at the individual level, whether implemented through microsimulation or agents, is that they are concerned with 'fast dynamics', that is to say patterns of response to a fixed backcloth or infrastructure. A typical example of this might be a traffic simulation, which represents congestion on a road network, and possible adjustments to this in terms of changed signaling or the reconfiguration of junctions. In this example, the most important 'slow dynamic' would be the development of the road network itself" (Birkin, 2008, p. 95) that proves the structured scale and the paths of flows leads and affects the patterns that occur in the city. Many of the city simulation games lead to some practices of models of planning some complex and harmonious urban systems. In those games, such databases are created and given in other to be designed in a nearly perfect way. The question of 'why not possible yet in real world?' rises because of so many other complexities such as the inclusion of human behavior and decisions of authorities.

There is a strong connection with everyday life routines and cognitive images of individuals with self-organization patterns. The places they are present, the routes they take, the types of people they interact depends on the routines and their repetitiveness. Because people are involved in urban life not only by composing and designing them in the process of construction, but also, they play role with the behaviors and interaction they are being involved in everyday life. They emerge the pattern of placements of goods and actions, as well the synthesis of them accordingly their variety of interactions. Therefore, there are two other definitions that has to be considered with self-organization, which are spacing and operation of synthesis. Spacing can be defined as generating, spreading and placing. Martina Löw supports as "In the case of moveable goods and people, spacing means both the aspect of placing and the movement to the next placement" (Löw, 2016, p. 134) which is sort of the hypothesis of infinite circulation of a place depending on the changing environmental factors and human patterns. The positioning of individuals and groups of people depending on the surroundings and also the replacement and reshaping of the urban environment as a result of human flows are the examples of the concept of spacing. On the other hand, the definition of operational synthesis supports the constitution of space, which is actually when goods and people are merged in spaces with the inclusion of processes of variety of perception, imagination and memories, that are again depend on social patterns, as well as created by social patterns. The example in the city scale could be linking the constructed buildings by the movement, which ends up being an understanding of a space through the perceptual as well as analytical synthesis of a physical space.

The facts of global cities data transfer and space processing are involved in this approach which is more related with political and economic factors and less with social

factors. Nevertheless, in the sake of social life, the case of operational synthesis can be considered as an abstract operation, "the operation of synthesis is also possible as an operation of abstracting without associated spacings, that is, spacings directly subsequent to it; examples can be found in scientific work, but also in art, planning, and architecture. In these fields, objects are linked to spaces on the drawing board, in computer simulation, or on paper. Though these links can guide further action, they do not directly lead to resultant spacings" (Löw, 2016, p. 135). Once the emerge of space linking, placing, building, storing and all are understood, the understanding of how everyday life patterns happens becomes more clear and able to be discussed on. Finally, the institutions have a role to help people arrange their everyday life and develop a pattern as a habit or preference. Institutions lead them how and where to move, how they would select the type the interactions and in which circumstances they should do it, "Institutionalized spaces are accordingly those in which the arrangement has effect beyond one's own action and results in conventional operations of synthesis and spacing" (Löw, 2016, p. 139). As long as the institutions are well organized and their policies are able to support the urban daily life to be a dynamic being with all its components, spatial and social goods tend to merge and work in a harmony, as well as being flexible to people to organize their lives within the urban structures.

The role of the institution would have been to protect the order and create a hierarchy of power, and finally, leads people to the way and whom they are able to interact.[15] The desire and right of self-organization would emerge in so much variable conditions because of the scale, the number and variety of people to interact and the role of institution either supporting or challenging the social flow.

4.2.3. Bottom-up decisions and top-down rules

In planning history, many of the decisions, and models, on city policies have been made as top-down decisions. The reason and excuse to that were citizens were not highly aware and educated enough to be aware and take part in the construction and policy design of a city. However, in years this assumption has eliminated itself as the technological developments take place, the public issues and facts started to be mentioned out

15   Martina Löw gives the example of a courtroom to explain how people choose to synthesize in certain conditions of a trail "It is clearly stipulated how judges, lawyers, prosecutors, the accused, and the public take place, and not only for one certain court; rather the relational arrangement can be encountered in the same or similar manner for all comparable courts of a country. The various groups of persons synthesize the space of court in routines and take the accepted position (...) Space is constituted differently from the position of the accused than from the position of the judge. But as a rule, both accept the institutionalized arrangement"(Löw, 2016, p. 139).

loud more than before, and resources increased so that the citizenship awareness and education have also increased. Despite of the fact that people started to get more educated and got aware of their own issues and facts, the top-down decisions continued to be performed in the city. Planners are in collaboration with the public authorities while the decisions are made, so that top-down decisions are being applied assuming by the public administration that will be beneficial for the society.

The discussion of self-organization is highly focused on contemporary city practices and complex urban models to understand the relation between active citizenship and government policies in urban decisions. Rather than collaborative decision making, self-organization refer to area of opportunities that emphasizes bottom-up policies that are focusing on relating local communities and the governments also widening the knowledge of institutions (Ostanel & Attili, 2018, p. 7). The actions that has been driven from citizens' behaviors, routines, habits and redefinitions of spaces create opportunities for varieties of urban dynamics and different urban models as solutions to people's social needs. Accordingly, the search for obtaining new public values and transparent solutions to urban places, and beneficial urban transformation and social innovation policies are given rise create a better understanding of spatial and social relations of complex urban environments. To do so, public institutions are challenged for new approached especially in local scales, although the practice of active participations of citizens is also being avoided to not turn the practices into a decreasing role for governmental decisions or to put a position of reclaiming public space theirs as it was not as it has been designed for.

The strategies of making spaces, refiguration and new metaphors on space making theories create a new perception of space and their systems' dynamics. Since the complexity and social conflicts are unescapable facts of urban reality, there are some challenges accordingly to understand and face the issues for the futures of cities. To start with, larger cities have always been more attractive and had much more dynamics in their system to be defined and also define the different places, also thanks to their own diversified characteristics. The concept of urban dynamics embraces the theory of city is being a whole and allows to study the effects of its different elements, which have been mentioned as spatial, natural and social elements. To see the urban attractiveness and observe the dynamics in the large scale is being related to the population growth, which in short term has seen as uneven flows of people to specific spots of cities and in the long run how tend to be equally attractive to potential and variety of migrant flows to make

city expand, "anything but the simplest building benefits from design, while something as large and complex as a region or society is perhaps beyond attempting to plan. But towns and cities lie somewhere in between. This settlement scale is still a battleground, bearing the brunt of the clash between top down and bottom up" (Batty & Marshall, 2012, p. 44), the focus on the large-scale leads to top-down planning decisions which excludes many of the social behavioral patterns and citizens' need in order to be applied.

As the discussion between bottom-up decisions and top-down rules of planning continues, European countries developed emphasis on active participation of citizens, a new localism and the mobilization of communities. The attempt is to include citizens in the planning progress more actively and leaving room for spontaneity, so the social environment can be self-organized. These social developments where incentives to find the positive aspects of urban diversity. However, the exact role of the urban diversity remained unclear even during these searched of aspects, though the main aim was to find a way to diminish the negative aspect as much as possible, as redefining or restructuring such roles, "urban diversity may contribute to more social cohesion, enhanced economic performance and competitiveness, and greater social mobility for individuals and groups. To be convincing, we need to provide evidence that is lacking for the outcomes of greater urban diversity, and to document and highlight the significant role that urban policy – in the sense of urban governance – can play in developing and stimulating those positive outcomes" (Vranken, 2007, p. 3). In total aspect, it has been observed that social cohesions, economic performances and social mobility have positive effects on tolerance and builds respect between social groups. Mobility is defined as a social instinct of human behavior by urban sociologists (Bazzani et al., 2008, p. 59). It is related with the desire of inclusion to social activities and the idea of freedom. Moreover, it is also linked with the improvement of quality of lifestyle, meanwhile living in a context of such a metropolis, which is highly related with polycentric cities connection with multiple centers that have provided throughout their system. Depending on the different social classes and their own social patterns, variety of models in urban mobility are created. The relation between geographical locations these mobility patterns are linking, and different socio-spatial clusters appear throughout the large cities. The unpredictability of the patterns of urban mobility is defined as 'asystematic mobility' which the relevance with recent developments of cities is increasing and gaining importance. Accordingly, new models are being developed to "stress the dynamical non-equilibrium characters and the self-organizing properties of urban mobility and use a holistic approach to the problem" (Bazzani

et al., 2008, p. 60). They basically aim to reproduce the reality and also to make users explore the possibilities of states within the variety of different knowledge of realities to be provided for and by citizens. Through the linkages of inclusion of citizens participation, the idea of cognitive planning occurs to support the institutional planning. Institutional planning has the potential to create a base in the environment so that the human beings would redesign or re-imagine in their minds. Bottom-up decisions happen to be the supportive decisions for the cognitive planning of the citizens, with respect to the image they have in their individual and collective minds. The characteristic of the city that has been built by the bottom-up decisions would let people to define more spontaneous and let the social components of the city to be a stronger source of information.

4.2.4. Adaptability's role in self-organized cities

All of the examples of self-organization strategies and spacing, synthesizing facts conclude as constitution of space. From repetitiveness to being interrupted, from limitations to flexibilities and many others applies to constitution and reproduction of space, "Spaces are repeatedly produced in routines in the same way. Many routines are learned from childhood so that people have a practical consciousness of the possibilities and necessities of constitution" (Löw, 2016, p. 140). The elements of this repetitive production of space, there are, again, spatial and social practices, and structures. Interactions of many different social structures become another whole form of social structure. Moreover, as the example of Minibar, some social structures can be temporary, which gives a spatial structure another dimension of flexibility, or to be called duality. Spatial structures need to be recognized in the urban environment to be able to for people to be able to form their action, but also the limits and changes of the spatial structures form the actions as well. "in addition to political, economic, legal structures and the like, there are also spatial (and temporal) structures. Together, they constitute social structure. Spatial structures, like every form of structure, have to be realized in action, but they also structure action. The duality of action and structure thus proves to be the duality of space. That means that spatial structures produce a form of action that reproduces precisely these spatial structures in the constitution of spaces" (Löw, 2016, p. 145). So, there is an unescapable dual reflection between the built and social elements. They both limit and shape each other in infinite ways. Those infinite possibilities of interactions create, or challenge, compositions of self-organizations. The adaptation of one to other leads to the existence of urban places and the dynamics in their system, even leads to weather they would be changed or

be disappeared.

As it has been mentioned, Cozzolino supports the idea of action, ownership and time are the essentials that effect the adaptation capabilities of the cities. Moreover, he discusses the anti-adaptive-neighborhoods (AANs), whether they are not changing in social, economic or physical terms, or how flexible they are to change. There are three main reasons that have been discussed that take crucial roles for the adaptability of built environment; persistency, identity, and innovation. The persistency refers how adaptive an urban environment is capable of in the long run, "The capacity of the built environment to be adapted by their users (for instance, to include new technologies, different uses, and lifestyles) represents the key to its survival. This allows users to maintain their satisfaction by changing the physical characteristics of their built environment according to their evolving needs" (Cozzolino, 2019, p. 4). The identity is the emergence of spaces having a character, a meaning so they can be defined as a place. This can be referred to the comparison between the Shannonian theory of information and the pragmatic definition of information that has been discussed by Portugali. In this case, again the information is not the function, existence, or the quantity of any simulation or structure, but rather what it means. Once again, the cognitions of individuals play role, because human brain add information that does no physically exist to give meaning, "in some information adaptation cases the brain adds data that doesn't exist in the row data/ information, while in other cases the brain implements adaptation by the exact opposite—by ignoring data/information that exists in the row information. These two cases can be illustrated by reference to some well-known visual illusions" (Haken & Portugali, 2015, pp. 38, 39). The possible outcome of the effect is the tendency of rejecting that would cause the failure of adaptation of urban environments. Because, human mind has the power to manipulate the existing environment, in terms of identifying the space and making it a place, or leaving it abstract even though it has been designed for a certain function or purpose. So that, the external environment and social beings, in this case citizens' cognitions, should be considered together. In the third phase of adaptation, innovation should be welcomed so that the urban environment would be more efficient, in other words, the usage of dispersed local knowledge would be one of the focuses, "In this way, people have the possibility of renovating, over time, the urban fabric in ways that none could predict in advance, giving the system the opportunity to efficiently react to various contextual needs" (Cozzolino, 2019, p. 4). By keeping up with the innovations and answering the socials need of the time would create a base for the adaptation of urban environment, as the information

would have been updating itself as well.

4.3. Identification of the Urban Environment

Cities should be analyzed as a complete system of physical, natural and social elements. The natural and structural elements are the ones create the spaces of living, which should provide for the living people, that are the social elements of the urban environments, "The city as an open complex system exchanges with its environment not only matter and energy, but also human population, that is to say, individuals that act and interact intentionally, perceive and interpret the urban scene in their own specific way, and so on. The movement of these free agents, between and within cities, creates interregional (or inter-cities) migration, which forms the interactive links between a city and its environment, and intraregional migration, which plays an important role in the internal dynamics of cities. Immigrants are indeed free human agents, but their activities take place on an infrastructure which is a cell space of houses, parcels of land, network of streets and so on" (Portugali, 2000, pp. 85, 86). As much the influence the citizens have on the city that is been designed for, the design of the city should also answer the need of their social needs following the social dynamics they have and perform during their daily routines through urban places. As the scale of impact changes, the influence also changes depending on their mobility range. In the small scales like neighborhoods, open spaces, streets and so on, the pedestrian movement defines the dominancy of an urban area and reflects the function of urban places. In a larger scale such as the cities themselves, the functions may fuse with the citizens as the creation of polycentric clusters. In this way, centers and CBDs (central business districts) are being created as dominant urban places and people turn them into places of urban souls with the social dynamisms they perform. By the time, citizens start to give identity and function to urban places, the theories of urban systems have been also changed and developed, "cities inevitably represent the spatial and physical signatures of human behavior as manifest in space and time, and the logic of the way cities organize human activities at different scales using similar patterns began to reassert itself. Moreover, the notion that physical form could reveal underlying spatial regularities and functions had always been an obvious force for better understanding" (Batty & Marshall, 2012, p. 40).

All of the elements that the city contains make its system quite complex and problematic. It is defined as "The city is nothing more than a big machine, they said; complex,

problematic, full of 'noise' - yes, but at the same time controllable, socially- engineerable" (Portugali, 2000, p. 31), the fact of 'being socially engineerable includes the social patterns that are created in the urban system. Those patterns can develop themselves by the help of the structural environment and also engaging with the social needs and routines of the citizens and make the machine-like urban system a whole. An interesting phenomena of urban system, that is defined as 'plan the beast', seeks for ways to analyze and search for a solution for the complexity of cities, which is initially projected as "First, identify the problems, then describe the system and formulate goals and objectives, then build models and use them to predict alternative futures, now evaluate the alternatives, choose the best one, implement it and send the outcome as a feedback to the starting point. All was prepared and ready to move and the taming of the shrew city was only a small step ahead. But the project failed. The beast refused to be planned and tamed" (Portugali, 2000, p. 32). The fact of possible failures are the reason why urban simulation models are created, though, the inclusion of real social life makes the model more complicated and make the outcome harder to predict. Human beings are tempted to self-organize themselves, in any case of an urban system. Both the failure and the success of the urban model proposals are causing by their self-organizational behaviors, which is whether adapt or refuse it. The variety of outcomes of failure and success brings up the discussion about the urban models are being the definition of the problem most of the time, rather than being the solution. To reduce the fact of being the definition and creating solutions to the urban problems, social studies are being done, such as the flow analysis and daily life routines, habits and so on. In this study, Hagerstrand proposes some innovative ideas, which are listed as "First, that in addition to the study of cities by means of representative statistical samples, we might as well benefit from studying single individuals. Second, that this can be done by mapping the movement of individuals not only in space, as is usual in studies of the ecocity, but in space and time simultaneously - hence, time- geography. Third, when observing an individual's trajectories in space- time, one realizes that the individual is always in movement: when staying in a single location s/he is moving in time; when moving between locations, the individual is moving in space-time. Fourth, when observing the space- time movement of individuals in the city, one realizes that much of it is routinized - hence the notion of 'dance' in this context. Fifth, that by observing individuals' space-time movement, or 'dance', in the city, and by focusing mainly on their routinized movement, one can learn about the nature of the urban environment within which people are operating" (Portugali, 2000, pp. 36, 37). At the end, there is an outcome of a new perception that is defined as 'weak force', which is composed by individuals' ordinary, personal daily and

habitual pattern that people construct themselves unintentionally, and make the urban system a social, humane system, not only a built-up development of constructions.

The fact that cities are composed by not only structural elements but also by social elements, that are the human beings themselves, make cities more complex since every human being is already a complex system. Apart from architects, designers, and planners, each citizen is a natural planner by birth and their own desire to plan and design their own lives leads them create some paths. These paths may or may not interact with others' paths. Either way, each path influence or is being influenced by the other intentionally or unintentionally. Therefore, the definition of complex system differs to each and depends on their own components and their own capability to adapt or limit such complexities. It has been supported as "complex systems are systems where there is no unambiguous optimality, where it is not possible to define the 'optimum'. This certainly accords with the development of a complexity theory of cities that puts all the emphasis on process and little on product. In the same way, systems that do not admit any equilibrium might be another definition of complexity, in that systems that are forever changing never have time to stabilize to any optimum, even if such an optimum might exist in theory" (Batty & Marshall, 2012, p. 42).

4.3.1. Coding, decoding and recoding urban environments

The complex cities always identified by the variety of their components, which all together would create a code of that urban environment, 'urban code'. In traditional cities, the components fit and work just like a huge machine. As the social and spatial components are part of the complex system, they are also the elements are tended to adapt or reject each other and create the urban code. In today's complex cities that are more contemporary and flexible, the urban codes are likely to adapt and change accordingly. The citizens' desire of defining the place and designing the urban environments spontaneously creates a diversity for the urban codes, which they would decode or recode themselves, or some of their components to be able to adapt. This adaptation capacity is becoming available with self-organized societies, that is being studied in different scales, "'placemaking' as an urban mechanism whose function is not only to allow different local voices to express themselves, but also to assist in updating and adapting the 'urban DNA' to the city constituents and their diversity" (Rosner-Manor, Borghini, Boonstra, & Silva, 2019, p. 1). Planning is one of the activities that creates the physical components of the

DNA, and the social components are being the human beings that would have the will to connect with the physical components, so that they can make a whole system that is able to work together. Though the example of biological DNA is more stable than the urban DNA, they both are created by some elements. Cities have their rules, objects that includes buildings, streets, squares and so on, and human beings, "What makes assemblages specifically interesting in relation to the tension between existing formal rules and diversified urban dynamics are the notions of 'codes' and 'coding'. Within assemblages, codes are specialized and rigidly programmed entities that play an important role in the production and maintenance of identity and stability, such as genes in biology" (Rosner-Manor et al., 2019, p. 2). However, social components of the urban DNA are more flexible and adaptive. In contrary, the study of epigenetics explains how the rapid changes can take place though a life time of an organism. The similar changes happen in urban environments as well, and human beings adapt. In this progress, the identity of an urban environment changes, so that the information that it has provided earlier transforms into another.

Decoding and recoding process of urban codes are the way complex urban systems manifest themselves. Through some instabilities, the existing urban codes are being challenges and the system tries to find a way to work and change directions accordingly. The way to adapt would be trough some changes in policies, or changes of urban dynamics which would change the social activities and paths though the environment (Rosner-Manor et al., 2019, p. 4). In social studies recoding is mostly defined as re-figuration, since it has been a new definition of an existing information happens and the contribution of citizens is the main fact "Mediatization seems to us to be a dynamic driving force of the re-figuration of space by way of digitalization. It is one of the reasons for another new spatial development that could be called translocalization. By translocal we mean that social units such as families or religious communities have different locations that are connected by the circulation of knowledge, representations and things. Thirdly, we shall consider the changing relations of spaces as social contexts of different activities, forms of communication and societal functions; we call this polycontexturalization" (Knoblauch & Löw, 2017, p. 3). The main aim of the re-figuration in their theory is not only to address societal changes but also to continuation of reflection of the meaning of space and how the sociality of space is conceived. In practice of daily life, redefining the urban places is done by citizens themselves. The citizens as users of urban places are the most that gives meaning, function and identify a dynamic in those urban places. The development of an urban place starts with is spatial design and construction. After the construction is fin-

ished and the morphology is adapted to the urban context, the biggest part of what to do with that urban place is up to citizens' decisions. This fact is likely to include routines and habits, practices, identification of focal points and passage ways and whichever temporary or permanent social activity an individual or a group of individuals are able plan on their own. Deniz Altay explains the identification and redefinition of spaces citing "Spaces get restricted in the budgets, manipulated by the objectives of investors, and consequently spaces are constructed and provided to the use of the inhabitants. Then, as it is asserted in this study, spaces are re-defined in the daily lives, practices and acts, in the imagination and creativity of the urban dwellers and visitors" (Altay, 2006, p. 60). Where it can be the beginning of discussing about that, the re-definition of urban places by social dynamics also starts the self-organization of people through the urban environment. The experiences of individuals and groups complete the definition of urban space and emphasizes the importance of the social elements of urban system. Because the outcome of these time and space depended practices also produce the urban environment, in a way people are using and giving identity to it.

As the components of the urban environments are adapting each other, they are evolving and flexing to do so. As in the example of Minibar, the environment already had an urban code before the activity, that includes the location, function, stores, bars, people and groups that would use the street, and so on. After the urban activity of Minibar started to happen, the urban code started to change. As the example of Minibar, if an urban environment, or a city, is capable of adapting an urban transformation of a time, it adapts by creating a new context and clear the mismatches between the existing context and the requirements of the transformation. In the contrary case, the city is does not adapt to the transformations that has been developed, its system gets in a lock-in situation, that means losing its connections, relevance with the environment and fails to be innovative for the daily needs of the human beings (Rauws & De Roo, 2016, pp. 1054, 1055). To prevent the failure of adaptations happening in the future contemporary cities, the planners are being challenged to develop some alternative ways and models to guide and adapt the urban transformations. In this process, the information system of the city and the identity of the is also being reformed. The actual challenge here to avoid urban places transform into urban spaces, which would be the incident be vacant and becoming a 'nonplace'. To avoid the creation of nonplaces, or vacant places that were dynamic before some transformations, planners and designers should be aware of the limitations and dilemmas of the urban planning, "an adaptive approach to planning first requires a focus on the conditions

under which urban developments can unfold. These conditions are end-state independent and are concerned with strengthening the capacity of a city undergoing transitions and building towards new vital configurations, while remaining a liveable and robust system over time" (Rauws & De Roo, 2016, p. 1055).

4.3.2. Awareness of planning limitaions

The dominancy of places over themselves create the flow of dynamics and patterns through urban systems. The creation of non-places or 'weak places' shows that even if an urban model proposal is so scattered from its necessary components and not really addressing the real needs, still possible to be under use because of some other factors such as economical or socio-spatial and many others. Lehtovouri limits this discussion of space dominancy describes it with a metaphor of 'paper, stone, and scissors'[16]. The whole metaphor gets connected with Lefebvre's theory, as stone stands for his 'spatial practices', paper for his 'representations of space' and scissors for 'spaces of representation'. In real urban structural developments, some dominant representations of space might have been swallowed, just like weak-places overcome the public urban spaces. In the structure of a city, it is clear that some dominant functions are already located in some central places or central business districts (CBD). Especially in large cities, it is normal to have more than one centers, which tend to become souls of their surroundings. Regardless of still monocentral cities presence, many of the cities increasingly becoming polycentric, considering also the hierarchy of the centers. The historic centers are not disappearing but the desire and necessity of 'going to the city center' in daily life is disappearing as the cities grow. Michael Batty describes this process of how the cities are being understood as growing and developing systems though needs and development citing as "cities were seen as being rather stable structures where the dominant functions were located in some central place, or central business district (CBD) as it came to be known in North America. Growth occurred around the periphery and developments in transportation technologies based on energy in the form of the train and automobile reinforced what had been the mono-centric pattern established in ancient and medieval cities around the market place. Some cities did fuse together forming polycentric clusters, conurbations or 'megalopolis' as coined by Gottman (1957) but the dominant model was that based on

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16   The metaphorical element of a metaphorical game describes the theory and how the norms of the theory attract with the other. "Paper beats stone because paper can wrap it; scissors beat paper because they can cut it in two, and stone beats scissors because scissors become blunt if one tries to cut stone with them. The micrologies are the 'stones', the representations of facts are 'paper' and the theoretical diagram provides the 'scissors'. These three elements constitute a 'game', process or dialectic, which is the eventual text, the non-objectified theory and the specific process of producing a public urban space somewhere, sometime" (Lehtovuori, 2010, pp. 7, 8).

the mono-centre" (Batty, 2007, p.4). The expansion of the city and the desire of answering social needs of citizens lead to new theories of and approaches in city planning. This has been the start-up point to include bottom-up policies which support the decentralization of the city. The logic of 'cities around cities, and cities within cities' started be considered and appeared which Batty again describes this for the 21st centuries cities objection as "polarized the crisis as to what a city 'actually' was" (Batty, 2007, p.5).

4.3.3. Planning the human behavior as well as the built environment

Self-organizational practices in urban places allow the creation of relational public goods between social groups, which are built up by interpersonal relationships "they cannot be produced or consumed solely by individuals and they can only be appreciated when shared in reciprocity" (Ostanel & Attili, 2018, p. 11). The majority of these practices are informal and offer significant social and environmental laboratories to experience individuals own definition or re-definition of space activities. All of these practices are referring to the theories of reproduction of urban environments and social life. However, these practices have the potentiality to succeed in producing public services, goods and spaces and open a gate to implement urban models to launch a city transformation in multiple scales. In this level, the questions of conditions and circumstances to achieve this goal start to rise. To achieve the goals, Ostanel and Atilli conclude that avoidance of simplification in self-organization is needed in order to "possibly overcome the risk of depoliticizing self-organization practices as actions divorced from principles of social and economic justice" (Ostanel & Attili, 2018, p. 14). Which it can be understood as the fact of self-organization wouldn't appear when it forced or either with the ignorance of needs. It happens as a result of seeking some principles and happens if the environment is adaptable to it. In order for self-organization to appear or work in urban environments, the bodies of urban environment should collaborate.

As going in deep with the compositions of the bodies, the fact of social goods appears to be discussed, to reach the definition of how material goods and symbolic goods creating a common sense in social life. Martina Löw, discusses these material and symbolic goods to understand the logic of social space. "Primarily material goods are, for example, tables, chairs, and houses, primarily symbolic goods, by contrast, are, for example, songs, values, and regulations. The designation 'primarily' indicates that social goods are never only material or symbolic, but rather exhibit both components, though according

to the action being performed, one component will come more strongly to the fore. The activity of arranging in the sense of placing entails that primarily material goods and not primarily symbolic goods are meant. Hence, goods are arranged in accordance with their property as material goods, but these arrangements can only be understood when the symbolic properties of social goods are deciphered" (Löw, 2016, p. 130). The harmony of these materials, which are ending up the whole of social goods, are products of physical design and social needs. Since self-organization it also a composition of human actions and behaviors that is leaded by the design of the urban environment, the symbolic goods are also created and given value by people, which also can be result or cause of self-organization. Such as the street musicians are created and given value by the musicians and people passing through and living by them, and happens by themselves, not by any other or design but the design of the environment and policies are adaptable for such activities. Many other social behaviors and routines also affect the patterns of the social dynamics in places. The self-positioning of people also depends on where and how they feel comfortable and safe with, also with who and what types of people. All of the factors that might have been thought of composes the whole of social goods, and to compose them in social places arranges the environment, "Space is a relational arrangement of living beings and social goods" (Löw, 2016, p. 131). Inclusion of human beings in the understanding of space is not usual since it is considered two different fields of study. However, sociology of space is another field that has been studied lately, which makes it necessary to put them together, relate and question about how all of the components can benefit each other in social life and even being a part, which supported as "in the few relational concepts of space that sociology has developed up to now, it has become normal to conceive space as a configuration of things. People, whether seeing or placing, then appear as opposed to things. However, it is in reality necessary to include in the processes of theory construction the fact that people do not only create spaces, but can also be elements of what is integrated in spaces" (Löw, 2016, p. 131) The part of social life that takes place in urban environment should be consideration of definition and space and human sociology to understand the patterns and give clarity to the concept of self-organization patterns. In this case, the separation of social good and people should be made, as people are more active than everything that it is considered as social goods. However, social goods are not entirely passive since they have been given value, shaped, reshaped, placed, replaced and influenced by people. Thus, it is reasonable to support the idea of space being the result of some arrangements by those all possibly social and spatial components and goods, including people themselves.

4.4. The Search for the Ideal City

The adaptation between the social and spatial components of the urban areas is the aim that planners are challenged to perform for today's contemporary cities. The influence between the two is mutual, and components should be considered equally strong and effective to as planners and designers seek for the ideal urban designs. Towards the idea of being able to adapt socio and spatial qualities of an urban area, studies of behavioral cognitions rose by psychologists and behavioral geographers, "Looking at the domain of cognition from this perspective it can be observed that, although environmental psychologists and behavioral geographers intensively study behavior and cognition in cities, they refrain from studying the dynamic of cities. On the other hand, looking at the domains of urban theory and urban simulation models, it can be said that both are by and large `noncognitive'" (Portugali, 2004, p. 589). The process was leaving out the human mind's way of recognition of the city, though including the principles of society, economy, culture and politics. Cognitive approach was not a part of urban dynamics, which latter had to be included with recognition of the strong impact cognitive images on the collective information that is provided and influenced by the other factors that creates the dynamics, as well as creating many other types of dynamics in the city.

Towards the process, the city has been defined in some physical ideologies. The Image of the City of Kevin Lynch is the starting point of the studies, related with the behavioral patterns of people. Though, the study is large but missing the effect of the human cognition and how it changes the dynamic, and causes the evolution of the city. Also, the studies of the cognitive sciences are not relating the spatial behaviors with the spatial components, which is the urban environment itself. The fact of mutual effect on elements were accepted, but the power of how cognitions can evolve the urban structure was not included "For the majority of environmental psychologists and behavioral geographers the city is essentially an arena full of landmarks, paths, and other `elements' that affect people's image of the city, that function as cues for spatial behavior, decision-making, and the like, but not dynamic entities that evolve and change, among other things, as a result of agents' perception, decision-making, and spatial behavior" (Portugali, 2004, p. 589).

Another perspective is city is being a representation of what it contains, mostly society related and their interpretations of politics, economics and many other factors. The location theory and urban ecology is highly related with the city is being a representation

of its resources and reflecting in social and spatial components. The two scales, that include the time scale of the city and its dynamics, are highly observing on the urban growth and the comparison between the old and new, "The suggestion is that the phenomenon of the city as a representation of itself should be seen as an outcome of a conjunction between some structural properties of the city and basic cognitive processes that are active in the evolution and dynamics of cities, prior to and beyond economic, social, or cultural considerations" (Portugali, 2004, p. 590). Time dependent and structural analysis of the behavioral patterns has been highly considered, until the emergence of cognitions. The cognitive images have been discussed and studied, focusing on how human brain could recognize a specific pattern differently, depending on individual capacity and path of perceiving and image in their own mind. To find the relation and plan accordingly, the inclusion of cognitive approach into planning lead to develop some models and analysis of the relation would be processed between the components. The desire of reaching the adapted and ideal city is considered to be finding the balance between the cognitions and design, and how influenced they are form one to another.

4.4.1. Cognitive cities

Similarly, cognitive cities have the approach of pattern recognition of a human mind. Since the scale of a city is too large and complex, citizens tend to develop some cognitive maps in their minds as they navigate and locate themselves in an urban area. Cognitive maps of every individual would help to understand how people see and construct the city in their heads; how they locate the built-up object of the city in their mental maps, and accordingly, how they connect them, how they relate them, and finally how they create their daily patterns depending on their own relations and interactions of the elements of the urban environment, "The city in the head was first designed to give urbanists a more realistic and refined basis for modeling human behavior in the city" ... "an individual who takes decisions in the city according to what s/he thinks, imagines, perceives ... , the city is, or the distances and directions between locations are" (Portugali, 2000, p. 37). Basically, cognitive versions of the cities are the versions which individuals imagine, perceive, locate, direct and so on. Poeple usually take their action based on the map they have in their had rather than the objective map which still is the concrete base of their cognitive maps. The movements, migrations, interactions of people, participations and the repetitions of these activities and more happens in their cognitive map and creates the patterns of social activities. The practice of understanding and analyzing cognitive maps as individual's

patterns in their minds demonstrates the information about their social behaviors and how they adapt to the existing physical patterns. The variety of the cognitive images of a certain pattern can give many ideas about how many possible dynamics would appear, depending on their daily flows that become a part of personal routines, preferences, interactions and experiences that gained individually and collectively.

Cognition has already defined as the execution of a pattern's algorithm on human's mind, which is processed by the environment's ecology, the actions taking place in the environment and the pragmatism of all. As the cognitive approach to a city is emerged, the cognitive science started to be categorized. The first categorization was aiming to define the city and the differentiation of cities from another, "some cities in the family-resemblance network city, or some land uses in the category CBD, are more typical or prototypical of their category than others" (Portugali, 2004, p. 591), that has been followed by the some new prototypes of cities, such as the self-organizing cities as some new urban structures and social norms or cultures has been born and clustered. Second category is based on the individual images of an individual's personal actions, 'image schemata' which are "are not only the means by which we construct our language, as suggested in cognitive science, but also the means by which we perceive, act on, and thus construct, our artificial environment spatially, economically, culturally, and politically" (Portugali, 2004, p. 592). Third category is the one that assumed to overcome the limitation of human brain's limitations of memorizing a large-scale pattern such as the city. Therefore, the pattern of the city is being divided into some sub-scales such as the center like CBDs, neighborhoods, peripheries, and so on. This division of the city is based on two basic factors according to Portugali, as classical cognitivism[17] and embodied cognition[18]. Finally, the fourth category is city being an artifact. The cities are practicing to be categorized and are products of categorization rather than being objects to be recognized by human brain, and accepts the cities as genuine self-organized systems, which has two effecting sides "the agents participate in the self-organization process of the city as a whole, which in its turn participates in the specific self-organization process of each individual agent" (Portugali, 2004, p. 593).

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17   Classical cognitivism recognizes the cognitive mapping as a information-processing, as the patterns of the city is been manipulated and stored in human minds, such as computer hardware "the brain encodes information from the environment, processes it, constructs a cognitive map out of it, and stores it in long-term memory as one, among its many, internal representations" (Portugali, 2004, p. 594).

18   Embodied cognition is based on action-perception, which claims that human brain does not store the data but constructs the information as new actions and behaviors appear depending on the context of the environment "not a map-like entity internally stored in the `brain's atlas', but rather a dynamic ad-hoc construct produced by the brain in the course of an agent's specific bodily action in a specific urban or environmental context" (Portugali, 2004, p. 594).

As the models started to be analyzed to understand relation between the cognitions and structural environment of the city, the difference and similarities between cognitive city and cognitive map should be clarified. Both phenomenon are the representation of a city, as well as they are different in the way that they have been interpreted and tooled for, "in that the term 'cognitive map' usually refers to a cognitive map of a specific city, whereas the category 'city' refers to a schema of a city or to a cognitive map of 'city'"(Portugali, 2004, p. 594). They both contain high amount of information of an image, or a mental image. Nevertheless, neither of the approaches makes the cognitive image of the city less complex then the other, rather, they are being one of the factors that makes it a complex system. Cognitive images were discussed to be personalized. Cognitive maps and cognitive cities are also personalized depending on the similar scenario of pattern recognition. Besides the recognition and adaptation of cognitive images and information, as the cognitive cities of a mind is being constructed, a concept of cognitive planning emerges. Every human being, therefore every citizen tends to plan their lives. In urban scale, as they plan their daily routines and habit, they plan their own flow through the structural design of the city. Later on, the behavioral flow might have an impact on also the structural planning strategies, as a reflection, inspiration, bottom-up decision or as many other possible policies they would be able to impact. However, the institutional planning will continue to exist. The challenge would be between the cognitive and institutional planning being the most adaptable and compatible to one another, so that unintentional interactions would rise as well as the intentional interactions.

4.4.2. Intentional vs spontaneous interactions

Implications of planning have some several stages and different effect on social and physical scale, which at the end sums up the whole activity of planning as a basic cognitive activity. Some of the implications more design based and physical that forces some interactions, which can be considered as intentional interactions. The cognitive planning implications are using the provided range of flexibility of the institutional planning, which aims the intentional interactions, and create spontaneous interactions. Considering the institutional, or structural, planning as top-down rules, that provides the base of interaction flows, then the cognitive planning is more based on bottom-up decisions that the individuals design their own social patterns, "By a structural approach I mean an urban simulation model that explicitly considers the evolving global structure of the city and its role in the dynamics, as revealed, for example, by classical location theory. By a cogni-

tive approach to urban modeling I mean a model that derives its agents' behavior from first principles of human cognition as revealed by cognitive science" (Portugali, 2008, p. 357). According to Juval Portugali, the tension between institutional and cognitive planning keeps the system of the city work, and the patterns of both together composes the machine-like working city.

To analyze the process between structural and cognitive approach and why the cognitive approach is needed to imagine and plan the city, some urban models started to be developed, which are 'agent base (AB)' and 'cellular automata (CA)'. The advantage of these models are being simple, straightforward and intuitively clear, hence they have disadvantages, such as being strongly influenced by the surrounding environment of the model[19], and because of its simplicity by the cellular automata network[20], failing to include the quantitative approaches to the model (Portugali, 2008, p. 359). Because the reasons of failures that are mentioned, the link between the self-organized cities and the models lost its meaning, and the models did not manage to be the solution of the urban issues, but ended up being the description of the environment and the placement of the city. The failure of these models mostly caused by models being very simple, and the system of cities are being so complex that the simplicity of the models could not tackle the complexity of the existing facts. The models are missing out the components which are making the city complex. The CA models are based on so many numerical calculations that they are failing to include the unintentional and spontaneous interactions and patterns appear in the city. To understand the spontaneous interactions happening in the city, a cognitive approach is needed. With the help of cognitive approach, it becomes possible to include the human behavior to the structural autonomy of the city model. It has been believed that the human beings are reacting and behaving accordingly to the complexity of their surroundings, such as the Ant Hypothesis of Simon.[21] This hypothesis also supports the idea of city is not only being artificial, but also natural by their social components. The adap-

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19   The cells of the AB/CA models tend to determine the relation with the environment of the land, the value of the land and the physical description of the urban environment rather then the meaning of the places and structures (Portugali, 2008, p. 359).

20   Allen and Weidlich models had an inclination toward the so called 'quantitative approaches'. Most people in who were dealing with these models were and are mathematically non-experts and thus had/have only limited access to the exact differential equations (Portugali, 2008, p. 359).

21   Simon develops two parts of Ant Hypothesis by describing the similarities of humans and ants. Hypothesis I is about the observation of how ants behave in a simple way, which by time the complex appearance of their behaviors are reflections of the environment they move, depending on the obstacles and sources they found. The ants are developing a flow according to their surroundings. Hypothesis II is the version that human beings are included. The movement of the social flow in the city is simple, and yet complex as it has been influenced by the environment and reflecting it to the spatial structure of the city as well as they reflect to their flow as human beings (Portugali, 2008, p. 360).
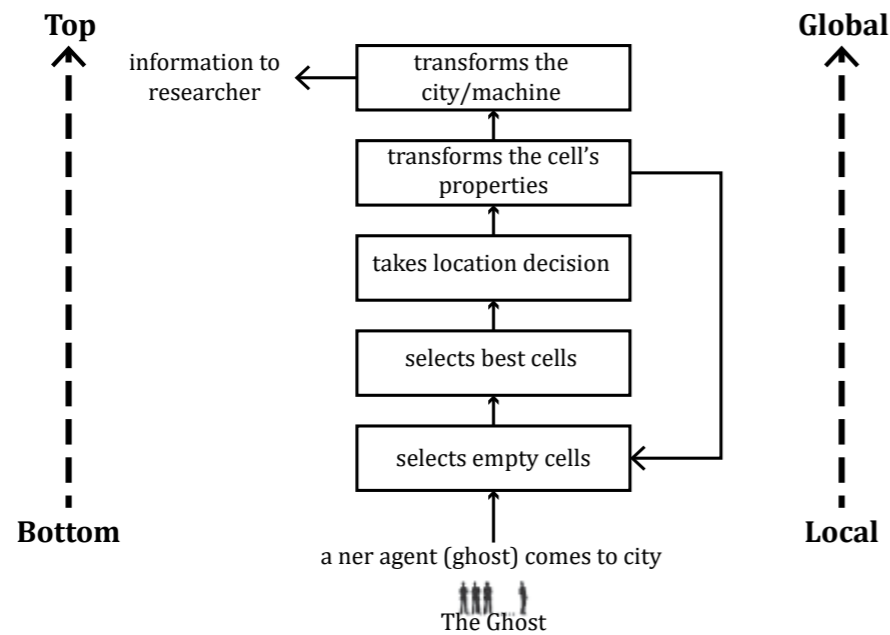
Top　　　　　　　　　　　　　**Global**

Figure 9: 'the Ghost in the Machine' by the AB/CA urban simulation models
(source: Portugali 2008)

tation of the physical and social components as they reflect of refuse each other through their interaction develops a variable source of information throughout the city. One way to understand these variable interactions is to analyze models in microscale, so that it becomes easier to observe and predict the dynamics in the local scale.

To understand the flow of information depending on the location, some acts are designed in the simulation models. The outcome that is seen in 'the Ghost the Machine' scheme (Figure 9), the agents start their flow without any connection to the physical environment. They only have some actions, such as 'selection a cell', 'taking location decisions' and 'transforming the urban environment', and by the end of these actions they provide an information pool. So hat the specific city that has been modelled can be observed as a whole. However, the global structure is left out in such models, so the behavoural interactions in these kind of examples can only apply to specific cities.

The problem with the approach of 'the Ghost in the Machine' was not really answering the role of human behaviors in building cognitive images, rather the studies created two types of categories to cognitive maps, "C- cognitive maps that are category-like and refer to agents' perception of a City, and s-cognitive maps that refer to agents' perception of specific cities. Both c- and s- cognitive maps refer to the global structure of cities with the implication that a substantial part of agents' location decisions, behavior and action

in cities is taken in a top-down manner" (Portugali, 2008, p. 363).

As it has been mentioned , the problem of mismatching characters of the AB/CA based models and real-life urban places, (one being simple and the other being complex) continues in this approach. Since the city is a complex system, imagining the social flow
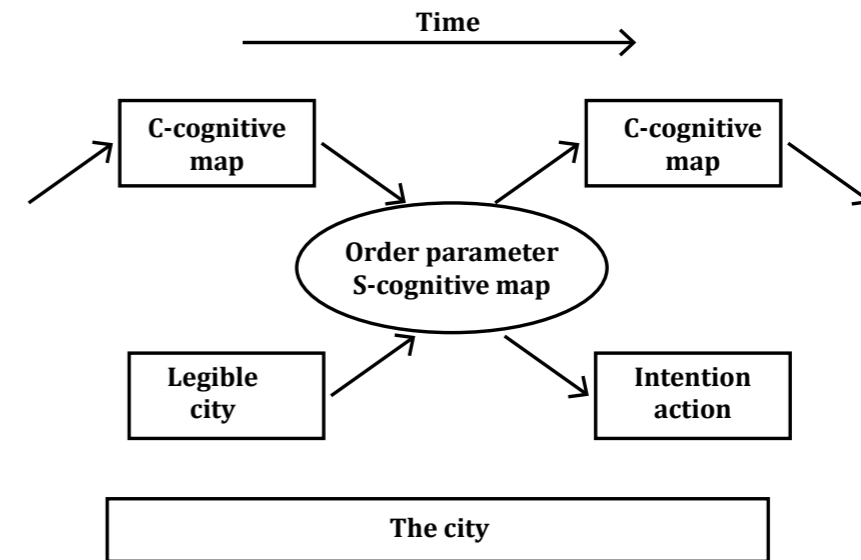

Figure 10: Cognitive image recognition flow (source: Portugali, 2008)

in a linear way with less interaction to keep it simple is also causing it to be unrealistic. Another issue with the model is that it is limited with a specific type of behavior, "agents' rules of behavior are embodied and situated, namely, they are not fixed nor pre-determined. Rather, they are emergent forms of adaptation to specific task and the properties of the environment" (Portugali, 2008, p. 364,365). The ignorance of city is self-organized system as well as a complex system, which makes it complex internally, the disconnection between the global scale with the human interactions is another cause of failure of the model, though it has been design to study the complexity of the city but being an oversimplified model in comparison.

In relation to the pattern recognition, cognitive maps have a similar process of recognition. The main idea in this paradigm to see the relation between the human behavior and the environment. So, the urban patterns would differ according to every individual and their behavioral pattern would adapt to that cognitive image, or the other way around (Portugali, 2008, p. 369). In Figure 9, the relation between the global scale and the human pattern recognition's relation has been shown, and analyzed as CogCity model.[22]

22　　Cognitive City Model (CogCity) is a cognitive oriented agent based urban simulation model that has been developed from the first principles of human cognition (see Figure 11). Cognitive image recognition includes the global structure of the city and the role of dynamics that effect the pattern in human mind.

According to the cognitive map recognition flow, another scenario has been developed as a contrary to 'the Ghost in the Machine' as it is followed in Figure 10. The scenario is built up as, (1) agents come to a new city to live, each of them having a cognitive image of a city (c-cognitive map), (2) each individual recognizes their own cognitive patterns by com-
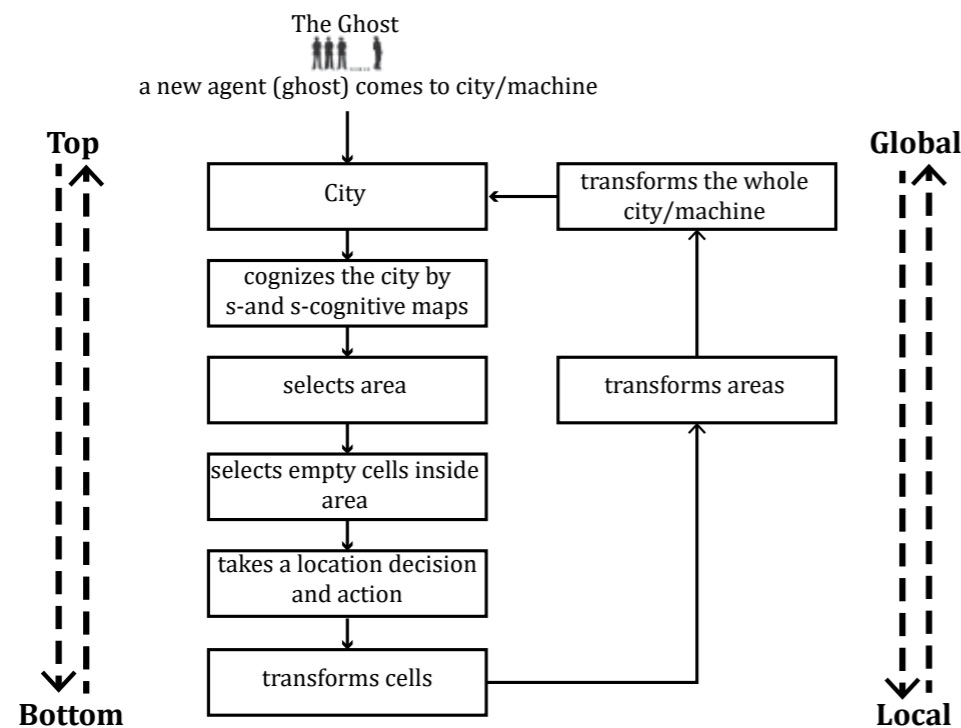

Figure 11: Figure 10: CogCity model scenario (source: Portugali, 2008)

paring the c-cognitive map and resulting their s-cognitive maps, (3) making hierarchical decisions, (4) every individual takes their own decision and actions accordingly in a local scale, (5) the synergistic interaction between the individual agents builds up the global form and structure of the urban environment, (6) feeds back are being received from cognitive maps to the individual agents, (7) the repetition of the scenario continues mutually (Portugali, 2008, p. 370). The outcome from the analysis of CogCity model and its scenarios is that AB/CA models are aimed to be designed in a bottom-up manner, though they still consider to take actions in top-down processes, "The model CogCity demonstrates that a AB/CA urban simulation model that combines top-down and bottom-up processes in one model is possible and useful" (Portugali, 2008, p. 371).

4.4.3. The Link Between Social Dynamics and Self-organization

Systems of self-organization of human behavior in urban environments is being discussed and studied recently to find an answer how urban places are being shaped by so-

cial patterns by the human beings that live in the urban physical system, or the other way around, how the physical conditions effect the social patterns of the city. To understand and create a better understanding of urban phenomena and to produce more beneficial urban models, sociological and physical analysis are concerned to understand how society is being self-organized. As Juval Portugali mentioned in his book Self-Organization and the City, "Self-organization, as is well established today, has captured the forefront of the system approach in science and as such became a paradigm relevant to phenomena in a wide spectrum of domains in the life sciences, social sciences and humanities" (Portugali, 2000, p. 1). As much the fact of self-organization is considered more as a sociological and humanist approach, it has a lot of relations with city systems and tends to offer many to urban sciences. While designing and planning urban environments, it is unescapable to consider such facts like 'how it can benefit the social life or citizens?', 'how the urban flow would shape through this urban system', 'in such a design, can people continue their routines or violate the policies of the authorities?' and so on. Briefly, it is cited as "self-organization has much more to offer to the study of cities, planning and urbanism than being regional science's sophisticated modeling approach" (Portugali, 2000, p. 2). The study is broader than being only limited to the socio-spatial systems, but more related to reasons coming from different cultures, economic and political background and regional sciences. Moreover, and an important fact, that is cities also should be considered time and space dependent stretching networks. This must be reason why the identities and patterns in the cities differ from each other.

Social theories focus on the societal behaviors and how the behaviors and social flow evolve, and if they do evolve, what triggers them to evolve. Taking into account the social revolutions, there some events in history that changes the attitude of human being on the land, they effect where they produce, where they live, or interact, and so on. These social revolution events differ from each other depending on the scale of impact and the periodical time that it influences the spatial and social environment of the happenings, "according to this view, are relatively short social events which, on the one hand, disintegrate and thus bring to an end old, relatively long, periods during which society was dominated by a certain mode of production, and on the other, open the way for the emergence of new social forces with a new mode of production"(Portugali, 2000, p. 317). The revolutionary social actions happen in a collective way of acting. People intentionally follow a kind of decision or an unrevealed rule to develop a new harmony from the other, with the will of keeping the new produced harmony of the social flow.

In daily life routines, social dynamics are constructed through some preferences and needs. Citizens develop an imaginary path in their mind, with respect to the structural pattern of the urban area, so that they can choose the places and people to interact. This imaginary path is a part of cognitive image in human's mind, that is based on a city and social identity of its sub-places. People develop their cognitive paths, maps and images as they self-organize themselves, so the link between the dynamics of behavior and self-organization is two sided depending on their common cognitive focuses "cognition and the city are strongly connected via studies on cognitive maps, spatial behavior and the like. On the other hand, complexity and cognition are strongly connected due to the complexity of the mind/brain" (Portugali, 2011, p. 131). Human beings collect data from the places they identified and add some personal information to the existing ones so they can decide how to intervene in the area. The complexity level grows as people add more information over another. Influential effect of the actions has a capability to grow collectively as every individual in a collective behavior adds their own perspective of the dynamic. However, the observable part here is the outcome. The reasons of the individual self-organization might differ because of some personal choices, though, they would combine with some other mental paths which would physically overlap, intentionally or unintentionally, in the urban area. Urban places' flexibility to spontaneous interactions of intentional and unintentional path crosses construct a flow of urban dynamics, including its fits and mismatches when there are observed. The fits and the mismatches in the social dynamism paths in the city would give the idea of the urban areas within the city that has been defined as places, observing the social information and identity they have been attained by people's self-organized behaviors.

5. DISCUSSION AND CONCLUSION

The discussion of cognitive images of the city on human's mind and the mutual impact between the social and spatial information of the city, brings up the fact that social dynamics and the urban flow that affected by the human behavior has a major role on the identification of the places throughout the urban environment. The exception of citizens that are planning their own cognitive maps on mind, opens up the discussion about whether every individual living in the city is planners. Every individual takes place in the city have their own cognitive image of the city, depending on their own routines,

preferences, experiences, and many other poetic landscape images they develop in their mind. Regardless of their profession, for developing their own cognitive map in mind and creating building their own behavioral patterns in the city within the urban flow, every individual human being tends to be planners. This action of planning by the citizens is considered as cognitive planning, and institutional planning is including the design of the city. Both classifications of planning provide and uses major amount of information to define an urban area, and also the city. Institutional planning is related with the physical information of the city, the structures, streets, plazas and every measure that visually describes the environment, including the design principles and planning policies during the process of the construction. Since cognitive maps are a product of human mind, cognitive planning is related with the social components of the city and the information they provide for the urban elements and the environment. Cognitive planning involves, emotions, feelings, personal and collective decisions of urban flows, experiences, preferences and many other parameters that takes place in social construction of human minds and their reflections in the city. These reflections are being performed as the social behaviors of the city. As to be discussed further, there would have been a participation that involved in planning in design process of the institutional planning to leave an opportunity for cognitive planning.

5.1. Institutional Planning and Cognitive Planning

Planning institution has been already involving public participation into planning practices, under the planning principles of communicative planning, advocacy planning and such. The communication and involvement of societal communities to represent and find a solution for the social needs, and therefore citizens has risen its importance as the planning institutions started to evolve in a participatory practice principle, together brings up some new complexities in planning practices "It is not only a means of very enriched 'public participation' in formulation of plans and the taking of decisions. In addition, it augurs the need to abandon the traditional rational model of planning and evaluation for new methods based on discourse and exchange via communication" (Lichfield, 1998, p. 3). As an outcome, the effect of the society on planning practices has already got stronger through the evaluation of the institutional planning practices. The main common ground that has been shared was the realization that the citizens are becoming the actual client of the planner, "While the forms vary in essence, the communicative turn is expanded to result in community led planning and decision making. In effect the planner/

public relationship is turned on its head, so that the public become the driving force with the planner becoming the interpreter of their wishes, views etc." (Lichfield, 1998, p. 5). The focus became into a perspective of how to make urban environments more beneficial and livable for human beings. In this manner, some urban models are practicing under these participatory planning principles that aims to be the solution to social problems and needs. However, most of the models ended up defining the problem rather than creating a solution to the needs. The ignorance of people's cognitions would have eliminated the prediction of spontaneous behavior in the urban areas. The study of cognitions and cognitive maps were to find an answer to behavioral patterns and how dependent or independent they are from the spatial structure of the city. Then it brough up the fact of cognitive planning, which human being to in their minds to construct their own cognitive image of the city.

The urban researchers already agree that cities are not only composed by the structures, but also with other components including social flow and interactions, "When we examine a map of any actual city, we are virtually always struck by the regularities that usually run through intraurban space as expressed in wide swaths of different types of land use. Equally striking, however, is the heterogeneity of the detailed social, economic, and physical elements into which these swaths of land use themselves decompose" (Scott, 2017, p. 23). Besides the examination of the land use systems and the usage of it, the social components take a major role to define their functions in the urban structure. Citizen's definition of a place might be adaptable to the spatial organization and accordingly, the urban flow might follow the structure. On the other hand, the social behavior patterns might follow a different behavior, some behavioral patterns other than it has been purposed when the urban environment was being planned and scripted might occur. This does not necessarily mean that the informative components are not adaptable, but does not correspond to their dynamics. To go in deep with the mismatches between the spatial organizations and the behavioral pattern of the society, the cognitions have been studied. The discussion of cognitions approved that human mind can observe and define patterns in a different way that the actual pattern has intended to represent. Same finding applies to the city pattern, which effect the behavior patterns in the city in a strong way and brings up the concept of cognitive planning.

The studies that lead to cognitive planning agree that every human being is a planner up to some level. Individuals decide what path to follow in the urban areas and how to behave according to the urban areas they are visiting. Some areas to interact with people, some of them are just hubs to pass by, some are the connections between the places that they reach for their daily routine habits and so on. Adding the experimental, preferable and emotional factors that people develop in their minds, cognitive patterns are created for an urban area, which is more specifically called cognitive map in this scale of focus. The challenge here is the cognitive map is not really structural and constructed, it is a product of human's mind. The base for the cognitive map is still the spatial planned urban environment, but depending on the social flow and behavioral actions taken place on those urban places, people develop their own personal images to locate themselves and their actions in the city and they redraw the urban environment in an abstract way. Which means, cognitive planning is highly depending on human behavior in the urban places and how they link and treat them. It is assumed that it is being constructed by the physical information that has been represented including the structures' and urban elements' names, perceptual characteristics, functions, and scales that are variable. As the scale is being expended to city scale, human starts to include the elements to construct as Lynch defined. They are composing the base elements that defines a city in their mind. The organization of each cognitive map depends on people's own perspectives and different scales of attractiveness including personal and collective parameters. Therefore, they can built the social flow on the built environment, as they analyze urban areas that they would use, interact, pass by, or even avoid (Garling, Book, & Lindberg, 1984). Overall, since citizens are practicing cognitive planning within their daily routine, that would be on point to define each citizen as everyday planners. Institutional planners are also citizens and everyday planners. This point of perspective should also inspire institutional planners to imagine their own daily life in an urban environment, as a part of the community. In cognitions, the routines and behaviors are being planned and analyzed, so people find a way to adapt their routines with respect with others and the structural organization of their surroundings. Adapting the idea of everyday planning with the institutional planning would have given the perspective of being able to plan/imagine the human behavior. The involvement of the human cognitions into planning practices would help to adaptation of social and structural information, in order to benefit and harmonize in an efficient dynamism in a city.

Cognitive images are endorsing the future predictions of the city planning if they can adapt to institutional planning practices. Since institutional planners are also considered as everyday planners, going in deeper with the studies of cognitions and cognitive

maps of a mind would have been a key to plan more adaptable cities. There are debates among researchers to link the cognitive images of the city and the planning organizations that are taking through the urban environments, "Planning – that is, the ability to think ahead to the future and to act ahead toward the future – is also a basic cognitive capability of humans. Psychologists and cognitive scientists tend to refer to this domain as cognitive planning (...) Whatever one's stand on this issue, it is clear that planning is specifically characteristic to humans" (Portugali, 2011, p. 255). The challenge is that everyday planning is distinctive from regional and urban planning by not requiring a special profession and practice. Human beings are able to develop their own cognitive maps unintentionally. They plan their routines, paths and journey in the city depending on their daily needs and schedules. They decide some destinations throughout the base of a structural organization and add their own plan. This addition gives some other information to the environment, other than its quantity. There are some other factors that have been discussed that includes the variable of tools in between two planning concepts, such as, there are some digitals tools like GIS to develop and analyze the designing and planning practices. In the case of cognitive planning, or everyday planning, AI (artificial intelligence) and AL (artificial life) studies are closer, since the cognitive science is involved. It has been also believed that the current studies in city planning might bring a another approach that might be 'cognitive complexity approach', and finally, the major fact is being discussed as "the fact that humans are cognitively planners affects their behavior in the city and as a consequence also the dynamics of cities with the implications that we have to take cognitive science's findings into consideration in our complexity theories of cities and their associated urban simulation models" (Portugali, 2011, p. 256). The urban simulations that are aiming to find the answer that how adaptable that planning approaches can be to the human behavior should start with analyzing and involving memories. Collective data of memory of an environment might be concluded in the design, that might be inspired by the dynamics and predict future social flows accordingly.

The memory of place that had been collected every time that has been interacted, might be interpreted as 'poetic geography' which would have unintentional meaning and identities according to individuals' own perspectives. This would affect their behavioral pattern and lead themselves self-organize. The structural organization is the composition that gives the information to citizens how much they can self-organize themselves accordingly to their poetic geography, that would constrain their cognitive maps. The collection of all factors that creates the everyday planning practices and behaviors as its

outcome, specify a collective information of human behavior in a bigger frame. Analyzing the behaviors is always a challenge regarding to human minds own complexity but the studies show that it has been started to be understood that how it the influential relation can be between the social and spatial information of the city. The acceptation of institutional planners are also everyday planners, as if they are also part of the social flow of the city, encourages to practice more humanistic policies as cities are organized... The collection of all the phenomenon that creates everyday planning is a major part of the social information of the city. The relation between the everyday planning and institutional planning can be observed through daily analysis and observations through time. Each individual is likely to have their own memory and routine throughout the day, though, in the bigger picture, there is a bigger frame of collective memory as a common sense. This fundamental discussion started as a philosophical view to understand how people build their memories and reflect them.

5.1.1. Poetic geography and structural information

The development of the cognitive maps depends on some humanistic wisdom to picture the pattern in a mind, which had been defined as a phenomenon of 'poetic geography' by Vico. Distinctively than the geographers, Vico focuses on the impact on human psychology and behavior that places can create depending on the impressions they represent for each individual, and in some cases groups of people, "Michel Foucault has said that, for modern philosophy since Kant, what is to be thought is time, leaving untouched the political, philosophical, historical, and general humanistic importance of space and place. Vico shows how a correction of this omission lies neither in the domain of the 'phenomenological' subject or the 'scientific' object but in the idea of humanistic wisdom that envelops a self-reflective knowledge of culture" (Kunze, 1983, p. 246). From the philosophical point of view, the place was defined as an image that combines and force to adapt with the memories of the individual. Since every human being is able to develop memories and relate it with the environment, according to Vico's view of poetic wisdom[23], every individual is born as planners and designers. He links the beginning of setting rules for society and curiosity to science and human psychology started with the interpretations of poetic wisdoms of a geography "Thus, a science of auspices grew up around the need to interpret the meanings of the sky, and human institutions arose around the authority of the auspices. Society began to transform itself by imagining a truth contained in nature

23   To explain the phenomena of poetic wisdom, Vico gives an example of how primitive people of ancient time interpreted the thunder. He states that the effect of the thunder was powerful and significant on them, so that people started to link its power to some other facts that they have experienced and linked in their memory.

which could be transferred to human laws, language, and customs" (Kunze, 1983, p. 241). Therefore, poetic geography was believed to be developed through memories, that would lead to the constructions of cognitive maps information.

Alongside with the pattern recognition algorithm of cognitive images, the memories, emotions, feelings and experiences that affect the behavior of human beings help them compose the poetic image or 'poetic geography' in their minds, in an abstract way. These memories are being collected and materialized, cognitively, day by day, as human beings trace their personal routines. They recognize patterns, as it is being defined in cognitive sciences, furthermore, they link with the interactions, feelings, experiences they gain through that pattern, or through a similar pattern they recognized before. All of the process of this poetic geography's constructions in mind links with the cognitive planning, on in other words, everyday planning, because of the inclusion of memorial information of a mind, that creates the major information source for the social flow of the city. That has been claimed that the adaptation between the retrospective and prospective memory, that would go through the process of pattern recognition, and finally "the third feature suggests that the realization of the prospective plan emerges out of a competition between existing and prospective attention parameters that compete for control over working memory" (Portugali, 2011, p. 260). Memories that people would gain in a certain place would be a reminder of a pattern or behavior elsewhere, so that would lead to similar behavioral patterns to occur. The structural organization takes the role of the urban environment composing the pattern to take place in the memory.

The structural information is able to bring back some memories to people, or make them build some new memories, so that they can reflect in their poetic geography, and they can trace, or retrace their everyday plan through the city. Through the process of memory making depending on the physical patterns of urban environments, people would be able make some connections between the places. They might choose to form interactions and social behaviors similarly to the places that they find connection by their own poetic image. The physical organization of the city has the role of composing the informative source for the memory and emotions. Whenever human mind can adapt the information of memory and the structural information of the urban environment, they construct their cognitive map and draw their personal urban path in the urban flow. As every other individual does the same and the cognitive maps and paths in the urban flow overlaps, the collective cognitive planning appears naturally. That has been claimed that

cognitive planning has more potential to be a collective act, distinctively to any other behavior and capability that has been studied in cognitive science. Besides, cognitive planning includes the constructive city, and city involve compositions of collective behavior by nature because of people's will to plan together in variable groups (Portugali, 2011, p. 261). Following this claim about cognitive planning phenomena, and the term everyday planning is taking into consideration, would make it clear to understand that there is possibility of people's synchronization as they combine their daily routines and building up their behavioral patterns. The acceptation of this phenomena of planning has many starting points and more than one dynamic. This makes the system and its connection more complex and leads the variable other dynamics accordingly. Urban models that aimed to figure out the adaptability of the different start points of such information sources has been developed. The role of the human behavior has been still a gap to be analyzed since they managed to be the definition of the mismatches and urban problems rather than being the solution to the needs and gaps. To understand and examine the relation in between, and analyze the urban problems, some urban models are being simulated, focusing on cognitions and collective behaviors. Since institutional planners are also every
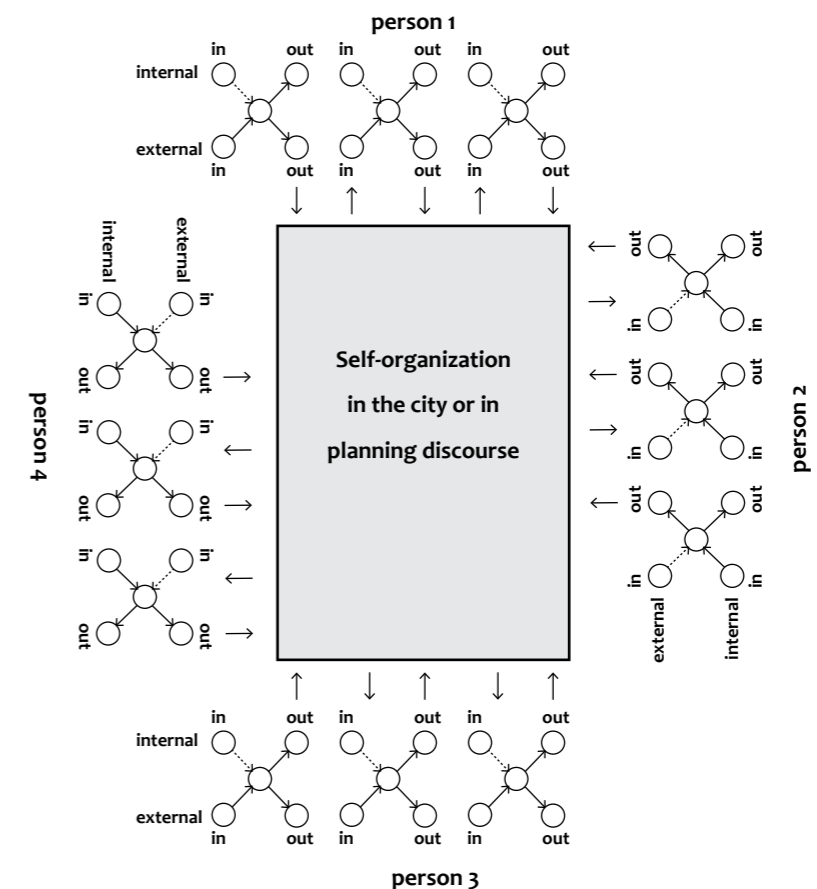

Figure 12: A submodel of SIRN that can be applied to collective planning and decision making (source: Portugali, 2011)

eryday planners, the models are including their behavior. The outcome is relevant as the competitions of different behaviors are being observed until one dynamic would become domain and define the place.

5.1.2. Participation rather then intervention

The relation between institutional planning and cognitive planning has not been finalized in practices in the urban environment. There are some initiative SIRN models that apply collective planning and design and study the participatory role in some planning
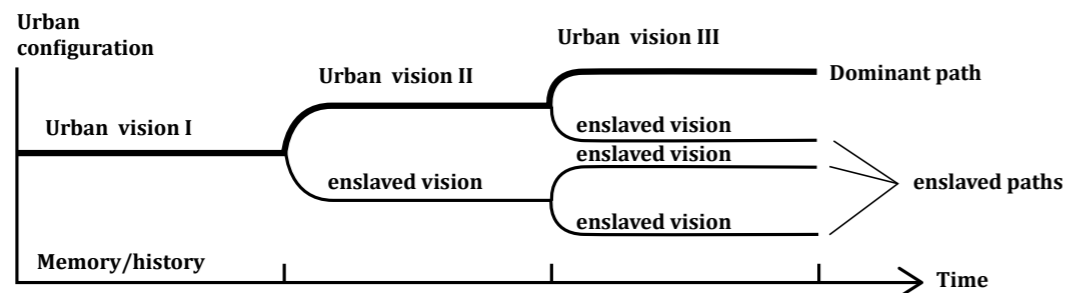
Figure 13: Bifurcation diagram of the collective planning discourse (source: Portugali, 2011)
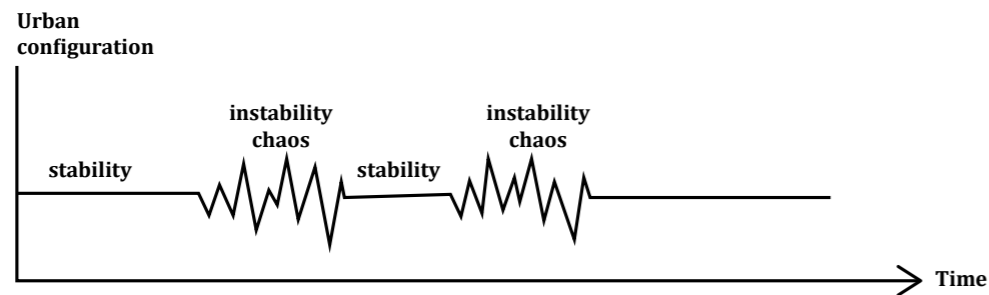
Figure 14:The diagram of collective planning process as it is evolving with the self-organizing system (source: Portugali, 2011)

games and self-organizing behaviors that likely to occur in the urban models. The main aim was to analyze the planning practices that are likely to be collective, which means a group of planners would plan together. Participatory observation of the planning practice would be performed by a complex team that is likely to develop complex dynamics so that the self-organizing systems would be identified and analyzed in the SIRN model.

The potentials of city planning with the variety of individuals can be concluded through their different patterns of decision outcomes as collective planning. Each individual would represent a different player of a planning game and would have a contribution to make in the planning process. Through the analysis of SIRN model, the urban dynamics

become the components and makes it possible to affect of the personality and charisma of the individual planners in the planning process (Figure 12). The analysis would help to observe the compatibility of the urban morphology and the cognitions of the planners that are involved in the simulation. Variable paths are likely to occur and related with the memory, in order to reach one dominant path that has been significant in the collective cognitive map that has been constructed in collective minds as it has been illustrated in Figure 13. Since the planning simulation are composed by different planners as individuals that are already complex systems on their own as human beings, the variable paths are likely to occur. However, one dominant path would be the major path that would be powerful enough to define the human behavior of the urban model. This dominancy of paths is likely to occur in the constructed urban environment. The weak paths would be likely to continue in reality, but the dominant path of behavior would be the one identifying the urban place's major character. Within the period of emergence of the dominant path, self-organizing behaviors occur to seek the most adaptable urban flow, and theory of complexity is merging with the edge of chaos and order (Figure 14), until the system is able to stabilize itself. SIRN urban model offer a simulation of planning that participation is involved in the decision making. However, the members of the simulation models are already planners.

The idea of the participation that means to take place in the planning practices is considered that, every human being involved in the structural environment has an ability to compose their own cognitive maps. SIRN's models are the examples that self-organizations are the outcome of human's cognitions and spontaneous or intentional behaviors. These behaviors are depending on the many parameters of human's pattern recognition and transmission. The challenge to be aware of the public participation should be the part of planning processes is that the prediction of spontaneous orders should be taking into account by analyzing the existing dynamics of the urban environment, "every practicing professional planner is subject to a built-in tension between planning according to the book, that is, according to the prevailing methodology – the way the community of planners have defined the appropriate approach and methodology of 'good planning', and planning that results from the fact that each professional planner is first and foremost a human being and as such executes solitary and collective cognitive planning as everybody else" (Portugali, 2011, p. 267). The tension between the cognitive planning and institutional planning is able to be analyzed through different forms of SIRN models. Communicative planning practices are some examples that show to keep the balance between two

concepts of planning, so that the outcome of planning practice can be participatory rather than an intervention. Overcoming the solidarity as practicing collective planning between planners prove that complex systems take time to be analyzed, the dynamics of the urban environment identifies the urban place over a time. Through that period, the flow of paths that occur with different dynamics overlap with each other and/or polarize from another. Avoiding the failure of urban places so that the urban spaces would be left undefined because of some failures of urban dynamics, urban models have the potential to be the tool to predict the spontaneous behavior emerged by the cognitive images of the citizens. The challenge here is to consider a wider range of human behavior as the urban models are being analyzed. So far, the participation of the models was between the institutional planners. Institutional planners are also everyday planner, which they would also except this fact themselves as being a part of the model. Even in that range, there were unlimited combinations of cognitive behaviors and dynamics. As the dynamics and behaviors adapt, there has been a domination of one. This fact doesn't also mean that the weaker dynamics disappeared, they continue but as sub-dynamics. A certain measure of people would create many complex information for a city, inclusion of many more characteristics and behaviors would have increase the complexity and strengthen the complexity theory of the city, once more.

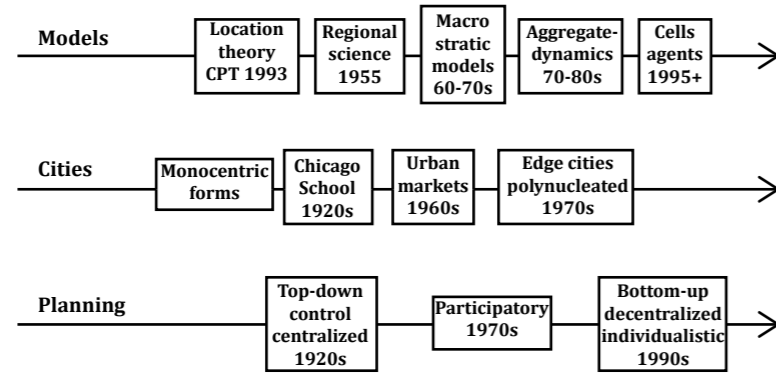*5.2. Limitations of the Research*

The fact of cities being a source of information is an unlimited area to study, because of its complexity, time dependency, variable characters of components depending on the location, culture, cognitions and many other factors. Including the unsteady factors that affect the city's information system, it gets harder to predict how the new dynamics would change the information of the city. The social components' influence is significant for identifying the information of the city; human beings are including their cognitions to the physical information and defining their level of interactions, identifying the places as they reflect their recognitions of patterns and so on. Cognitive science already accepts every single human being as a complex system by their own, which makes it more complex to analyze and define the decision making and reflection process of citizens. Time dependency is a major factor in this process, which means some events happening that taking place in the urban places would make them significant, or the time period of adaptation between the structural organization of the urban place and the social flow would be observed in a certain time, whether they would be able to adapt each other or not. In the

SIRN urban model that many planners were involved the dynamics and cognitions differ, and the adaptation process took time as it has been ranging between order and chaos, so that the dynamic would adapt until a dominant dynamic to identify the urban place would be able to occur. However, the planners are still professions of urban scale developments, besides being citizens. The cognitions between the planners who are included in the urban simulation were differing from each other; the variety would have been bigger when every citizen in the city is involved. As the complex factor grows bigger with, the limitations of the urban models and studies of the information system also grows bigger. The possibility of spontaneous interactions rises, as well as the increase of number of weaker urban flows.

Today, there are some planning practices that would encourage and apply bottom-up policies, to involve more of public participation and leave room for spontaneity in urban environment. The flexible urban places would leave the decision of flow boundaries and functions to human beings so that they can develop a cognitive map and interact with people accordingly. As the focus is more on bottom up decisions, analysis that are taking place show that people are choosing their location destinations depending on some factors, by making such comparisons like; essential and anti-essential, affective reactors, measure of personal pleasure and the time to be spent in a location (Lewicka et al., 2019, p. 11). Nevertheless, there some limitations and dilemmas of planning, with the inclusion of authorities, construction practices, and the growing scale of impact depending on the policy, which becomes the factors that forces the bottom-up policies to become top-down rules. The bottom-up policies are effective in microscale decisions in urban places. Larger scale practices tend to involve the authority more than the public decision. The challenge between the scales balances of adaptability would have been inclusion of participation and analysis of social flow, so that the information of the urban places would avoid mismatches and failures for future decisions in variable scales.

5.2.1. Urban models cannot predict but address the question

The urban models are usually simulated based on the existing traditional cities. The analysis of the models is made by the policies and physical organization that already exist. The single centered cities are the models that are most predictable since there are limited alternatives of interactions. As timeline of the city has been changed (Figure 15) in terms of its planning and policy practices, the models temped to follow, "Three key ideas

| Models | Location theory CPT 1993 | Regional science 1955 | Macro stratic models 60-70s | Aggregate-dynamics 70-80s | Cells agents 1995+ | → |

| Cities | Monocentric forms | Chicago School 1920s | Urban markets 1960s | Edge cities polynucleated 1970s | → |

| Planning | Top-down control centralized 1920s | Participatory 1970s | Bottom-up decentralized individualistic 1990s | → |

19th crentrury industrial city ·· **21st crentrury global city**

Figure 15: Intersecting timeline of models, cities and planning practices
(source: Batty, 2008)

of explanation, each based on the notion that it was the cross-sectional structure of cities that should be explained, developed from the late 19th century which we can christen 'economic location theory', 'social physics', and 'geographical/spatial morphology'"(Batty, 2008, p. 6). The hierarchical fields that makes the city mean to picked up to study on through the urban models, in order to analyze how the components would adapt in certain urban morphology, and how system might be improved. However, as the cities start to expend and mono-centric cities have become polycentric, or even metropolitans, the complexity range increased and models struggle to predict the urban dynamics and how they might evolve.

Through the timeline of city development, the ideas of urban theories are followed by discussions of location theorists, spatial morphologists, and social physicists. The changes follow as; (1) city changes are happening by growth and change of behavior rather than structure, (2) city planning should address more bounded up with innovation, creativity and surprise than homogenous land uses, (3) city emerges from bottom-up actions, not collectives of population and employment, and (4) idea of scale is more concerning with micro-scale studies rather than macro-scale studies, since the multi-scale planning practices are emerged (Batty, 2008, p. 7). Moreover, the theorists that has been analyzing the change of urban growth focusing on different solutions, such as location theorists are studying on the link between the policies and largely influences urban planning practices through the public policies. Spatial morphologists focus less on the solution of the problem, their study is more non-policy oriented and non-operational as they focus on non-traditional analysis of morphological descriptions. Social physicists are focusing on the transportation problems as an example, using a developing tech and simulate the

solution. Nonetheless, the urban models are mostly limited by defining the problem and lacking of developing a solution. The reasons for this are claimed to be, that, some of the models are simulating an answer to a wrong question or lack of prediction due to time-depending situations of global cities, "When the questions were the right ones, invariably there were arguments over their robustness, given the open and uncertain nature of social prediction while quite often the planning context was so volatile that the very questions changed while the models themselves were still under construction. This was not a good beginning. Combined with the cost of such models and the lack of data along with the fact that this entire domain was being invented on the job, so-to-speak, it is not surprising that the field virtually went into hiding as model-builders retreated to reflect on the experience and nurse their wounds" (Batty, 2008, p. 10). Accordingly, the simulations of urban models challenge to define a solution to urban problems would be because of their lack of prediction of the consequences of the real-life cities' complexity.

The attempt to study the urban dynamics through models are being performed by planners, depending on the idea of they are also everyday planners besides their profession. As a result, dynamics are differing from each other, and by time, a dominant dynamic would be able to define the urban place. This definition takes time. At first, with the emergence of a new urban policy, people temped to build their own behavioral flow, depending on their own cognitive image of a memory, or mind. Then these variable dynamics from each individual collapse, overlap or beat one another in order to dominate and define the urban structure. In the process, some dynamics might vanish, some might weaken but not disappear, although they would not be able to define the urban structure either. At the end of this process of timeline, through many complexities a major would be able to define. The timeline is considered as simple as the planning practices evolve so that would have been reflected in the urban models, but outcome would have been misleading as the planning practices continue to evolve and develop. The cities' heterogeneity and rapidly changing complex system is the urban models study handicap "This was the nature of the theoretical critique but the key problem in articulating models and theories that dealt with urban change rather than urban structure involved our woeful ignorance of urban processes. Moreover the data problem which had plagued the first modeling efforts was doubly severe when it came to thinking about simulating dynamics" (Batty, 2008, p. 10). The urban models are getting so attached with defining the spatial structure and the information that is been provided by the spatial organization, they are lacking of defining the social dynamics and predicting potential changes that would affect the social and spa-
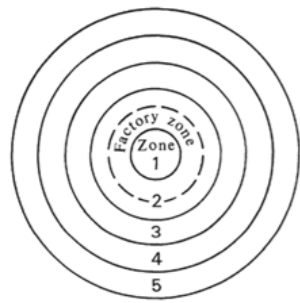
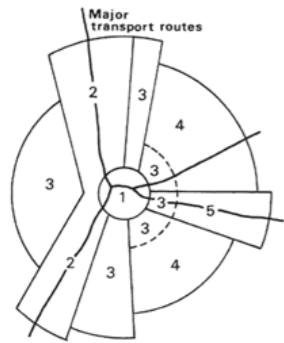*Figure 16: Burgess' model (source: Portugali, 2000)*

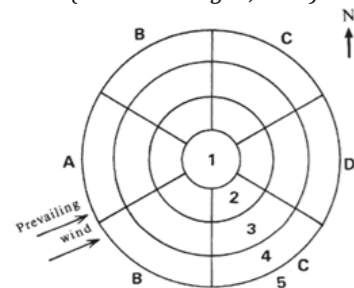*Figure 17: Hoyt's model (source: Portugali, 2000)*
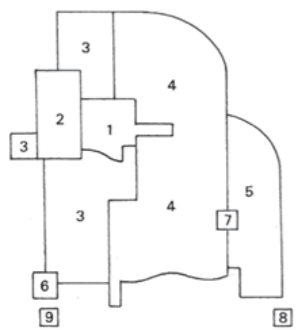

Figure 18: Mann's model (source: Portugali, 2000)

Figure 18: Mann's model (source: Portugali, 2000)

tial information of the city.

5.2.2. Challenges of planning the spontaneity

The main reason of urban models' failure of prediction is the emergence of decentralization, which are caused by the complexity of social flows within the cities. Urban Models tend to focus on the location theory, which is usually based on a major center of an urban environment. To do so, they focused on the urban morphology and developed the models based on how cities grow, and how the categorization happens depending on the functions and the location. The most influential model has been developed by Burgess, focusing on the central zone practicing of planning system (Figure 16). The model is basically constructed as a CBD zone in the center (described as 1 in Figure 16) that is surrounded by the transition of zones, which goes by high-class residentials and business, working-class zone, middle-class zone and suburban (Portugali, 2000, p. 25). Hoyt's model (Figure 17) is based on a gradient form distinguishing from Burgess, nevertheless, the clusters and the center that has been defined based on the same understanding of dominancy and growth. The inclusion of transportation routes becomes a factor besides the CBD to define the clusters, considering that the city will grow further from the city center, following the road. Both models of Burgess and Hoyt are aimed to be integrated by Mann's model (Figure 18). All of these models consider that urban growth starts at one main city center and expands accordingly. Above these models, starting with Ullman and Harris' model (Figure 19), it has been accepted that cities do not start from a single nucleus but from several ones, "multiple nuclei model in which urban growth starts not in one, but in several nuclei thus producing the morphology"(Portugali, 2000, p. 25). The physical complexity of the city that creates the morphology has been understood and applied in urban models at the end. Though, the complexity of social ele-

ments that combines with the spatial elements are left aside.

Cognitive scientists work on how the social flow is being composed, but since the human behavior is complex by itself and changes rapidly, there is an unescapable gap between the studies of the urban models and citizens' urge to self-organize themselves, "Model builders were forced to look elsewhere for such ideas and as usual it was to physics and mathematics, rather than to the social or biological sciences, that they turned. At much the same time, there were various developments in mathematics focused on rapid and discontinuous change, incorporating radical, qualitative change that became popular. Ideas about how cities could manifest such discontinuous change were examined with catastrophe and bifurcation theory becoming fashionable" (Batty, 2008, p. 10). There has been a loop between the action of self-organization and the development of spatial organization of the urban environments. Some of the simulations, that are based on the centered city models, the prediction of spontaneous order is a challenge because of the mismatches between the intentions and behaviors.

It has been found out that, after the studies of the models, the knowledge has been growing spontaneously and indefinite, models are not able to manage the clear the doubts and structure a definite scientific theory as a finding. So that has been agreed that models focusing on the morphological information system would have been lead more healthy results, so that it might be a tool of storytelling of an urban scenario rather than forcing to predict, since they are unable to, "if the models could not predict anyway, then perhaps the focus should be on building models that informed, extended our understanding, focused us on key issues, but were rich enough to address the questions at hand" (Batty, 2008, p. 11). Instead, such models like agent-based models are being useful to understand the different roles that has implications on the urban structures. These kinds of models are focusing on some possible scenarios more than the policies and practices, such as the attempt of SIRN model is one of the examples that included institutional planners, focusing more on their role of everyday planners more than their practical profession "They deal with intrinsic processes of change and in this sense are explicitly disaggregate and dynamic. They embody ideas about how spatial structures might emerge and they have the potential to deal with surprise and innovation. They represent a new way of thinking about cities" (Batty, 2008, p. 11). The study's evolution in this path helps to understand how spatial and social information of the city would affect each other and create the whole pool of data to fully identify the urban places in the city. The models are

becoming laboratories to study the potential of how much cognitive behaviors are strong enough on a physical organization of the city, and also the other way around. The physical organization might intend to force some interactions, but different types of interactions and behaviors might take place, and domain dynamic might be different from the intended dynamic. So that, urban models are able to give some examples of urban scenarios that can be constructed in everyday life planning practices, that might upgrade or benefit the quality of citizen's lifestyle.

5.2.3. Bottom-up policies turning into top-down rules

According to complexity theory of cities, it is claimed that cities emerge from bottom-up decisions. There are some implications that has been discussed for planning practices, those are related with cognitive science. These implications are discussed as, firstly, productive GIS based models are being used for predictions, that would lead to cut-copy-plan practice of city planning. Then, there is a still being debated tension between institutional planning and cognitive planning, which has been defined as also everyday planning previously, as institutional planning is the physical practice of the planning system and creates the spatial information, but the way institutional planning takes place in real life

Figure 20: an example of HMAX hierarchical computational model, tentative mapping with areas of the visual cortex (source: Portugali, 2015)

is actually cognitive planning practices, that has been performed by everyday planners that include the institutional planners and citizens up to some level. A third implication has bene followed by differences in decision making, as if checking boundaries, taking risks and the not taking risks behaviors between promoters and preventers, that would create a discussion of regulatory focus theory. Finally, the implication of data to the urban environment, showing that the small data that is identifying some information of the city is emerged by bottom-up decisions, which are mostly composed by cognitions, behavior, social flows any other social phenomenon that creates the social information of the city. However, the city cannot be defined and organized by only bottom-up decisions, due to its growing scale and the
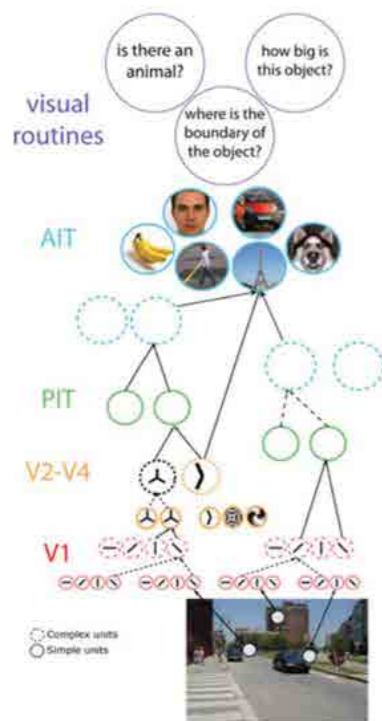
matter of impact on the various scales, though, the processes of bottom-up decisions and top-down rules are likely to meet at some point and create a mutual relation.

The relation between the bottom-up and top-down practices in planning is claimed to be related with the processes of deconstruction-reconstruction, and also analysis-synthesis that cities face. These processes are studied via HMAX hierarchical model[24], which is considered as a typical one to practice a simulation and analyze the outcome, it has been schematically described in Figure 20 and the aim of the model is supported as "the aim of the bottom-up process is to identify the relevant parts of the scene, while the top-down process aims at identifying (or defining) the correlations, that is, the relations between the parts— the syntactic relations (is a given part inside or outside another part?) and the semantic relations (is this is a person or animal?)" (Haken & Portugali, 2015, p. 28). It believed that for human brain to be able to identify relevance of top-down rules, they should exist in the bottom-up cognitions before. The process of reconstruction starts in the top-down level, and as it meets cognitive recognition behavior when it reaches to

24   HMAX (hierarchical model and X) is originated from a concrete neural network design model, to understand the hierarchical cognition about a pattern that occurs in brain. This model has been established as Hubel and Wiesel were studying the lower layers of the visual cortex and they have discovered the specific neurons that react to patterns and comparing the reaction to different patterns of human brain.
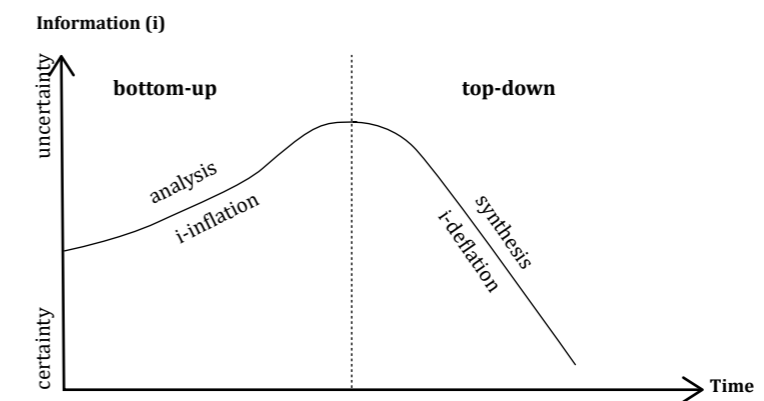

Figure 21: The graph of information adaptation process, from bottom-up to top-down (source: Portugali, 2015)

an identification in human brain. This process goes on in a parallel way as human mind construct memories and develop their own and collective pattern recognition process.

This process that has been developed in human mind is likely to emerge in planning practices as well. The transmission between bottom-up and top-down information is part of the adaptation process of the cities. As the data collection takes place in the human mind and studied to relate with the everyday and institutional planning practices, the information has a need of distinguishing in order to understand the adaptation process

as a whole. Haken and Portugali distinguish the semantic information of patterns in two categories as local and global. As the process starts with the bottom-up stage, the accepted global meaning of the pattern is being analyzed in the human brain and redefined to be recognized as a local information, more simple and quantity based, "rearranged into locally meaningful elements (lines, corners, etc.); by means of this process the MBB 'loses' ('trades of') global meaning in order to 'gain' the locally meaningful information elements that will become the parts of the subsequent process of synthesis" (Haken & Portugali, 2015, p. 38). Further on the top down stage, that the transmission of the shift has been graphed in Figure 21, the MBB is being reconstructed back to the global semantic information. The whole timeline is flowed by information inflation, information deflation and finally synthesize to adapt and reconstruct. The process of planning it the same principle in order to reflect the local information into global information that has been accepted and memorized by the people naturally. The scale is the major impact to provide the order and force and impact on the behaviors.

The balance between the bottom-up decision and top-down rules would have been leaving opportunities for bottom-up information to emerge so that everyday planning can be practiced within the top-down practices of institutional planning. "Top-down design may indeed be indispensable for the construction of certain common spaces that are otherwise hardly provided by private actors, while as we move down to individual lots, bottom-up design should be favoured to guarantee the emergence of self- organizing complexity"(Cozzolino, 2019, p. 13), which means op-down information and policies are emerged to remain a sort of order and harmony through the city scale, however, if it does not let any room for spontaneous order and self-organization, which are emerged by bottom-up and based on social behavior and cognitions, the placelessness would be appear as a failure of identification of an urban space and anti-adaptive information within the urban environment.

5.3. Developing new forms and policies

The studies of cognitive science and their relation with the physical organization of the environment shows that there are strong and highly related issues and facts that are influencing the social structure of the city. The models and policies are being constructed to find out how to benefit the social flow with the help of spatial structures. The planning practices are tools to create visual reflections of the city so that people can describe what

they can physically see, "Traditional geography and cartography provided society with the map - a medium with which one could literally see (in fact imagine seeing) a world, a city, otherwise invisible to the human eye; geography as a spatial science, with its ecocity and physicalist city, provided a medium with which one could practically see (imagine seeing) not only the physical landscape of cities, but also the dynamic and structure of socio-economic or cultural relations as they take place in the city. The visual became a language, and the very act of observing and seeing, an important component in the processes of explanation, analysis and interpretation"(Portugali, 2000, p. 41). Cities being artifacts is the truth since the planning practices and orientations and combinations of the elements are man-made, in this case planned by institutional planners. However, planning the city shouldn't be only considered to be artificial, since it has been also accepted that it has a social layer that curving with and through the physical structure of the cities. Besides being artificial, cities are also organic because of its social structure. Unlike the artificial layer, social layer is invisible, flexible, adaptable, self-organized and dynamic. Although, the mutual relation between the artificial and social layers of the city would make the pool of information balanced and beneficial for life standards.

The mismatches between the spatial and social components would create some struggles within the behavioral flow and the everyday planning in the city. To prevent this from happening, social sciences have been included so that relation with the habitat of human beings and their routines, behaviors and interactions would be able to define the city together. Without people's definition of city, city is full of physical structures contains the information of the physical measure and quantities of object they contain in their system. By citizens' preferences, behaviors, interactions, density of gathering, flows and cognitive images of the city's structures, the information of the city gain more meaning and refers more to the life that it is providing for the people. In a way, people are giving meaning to some patterns in the city to make their own routines and social patterns in their life more meaningful and remarkable so that they can build their own memory of the poetic images, cognitive plans and maps of mind and so on. The structural information should provide guidance for people to do so. Postmodern geography admits that the ideological platform in city planning is yet to be defined, as the influencing effect of spatial and social information of the city is being studies, and while solutions and proposals are being developed, "Not only that science cannot control society and its shrew environment, but that it should not attempt to do so. Let society, and its artificial products the city, the metropolis, the megalopolis, be what they have come to be: uncontrollable, unpredictable

and unplannable. Let us urbanists and planners make them more so by deconstructing all that has been constructed; let us deconstruct disciplinary boundaries inside science and between it and art" (Portugali, 2000, pp. 43, 44). The models that are being tested and studied, as like the SIRN urban model, and the policies that are being emerged, those are in favor of the social layer and leave room for spontaneity, lead to self-organization activities to be emerged, are all seeking to find the harmony in between the information system that cities contain and how to maintain it, adapt it, flex or delimitate it, so that dynamics would be able to define the quantitative data of the urban environment.

The theories that are being studied alongside with the models and policies that have being developed searching for and answer for how to find the harmony between the informative layers of cities and maintain them, or make each of them able to adapt to changes. Focusing on the social impact of the information system of the city makes planning practices take a turn from the top-down rules towards the bottom-up policies. As self-organized cities are becoming more in favor to promise a variety of definitions and widens the data pool of the city, just-in-time planning ideas takes place instead of just-in-case planning practices. As it has been accepted that citizens, including institutional planners, are everyday planners, as they built their cognitive maps of mind, the policies that promote self-organization and emergence of bottom-up decisions are given focus to be implemented. There have been even some examples such as 'branded spaces' that are actually focusing on what would be interesting for people to spend time in such specific places, and in this purpose, developing places as such, "branded spaces are created in the mind and in communication just like stories. Additionally, meaning is mixed or co-created among brand owners and/or the social milieu and the agents. The next approach is presented as an equation. While it may appear that two ways have been taken in our approach, we see the two as being interrelated. Especially the concepts of spacing, synthesizing and interpreting in the equation lead to story creation" (Sonnenburg & Baker, 2013, pp. 15, 16). Such new developed ideas are all related with how the interaction can be designed and planned as well as the spatial structure of the city.

5.3.1. The link between social needs and built environment

Human beings are social components of the city, which perform most of their routines in the public places throughout the cities. The built environment, where they are building up their cognitive maps and host the social flow that people create, is obliged to

answer the social needs to provide the necessary paths and flexibility for citizens to define, and return, the built environment would gain stronger meanings and definitions to lead many other dynamics to appear throughout the city. Everyday planner role of the institutional planners is important in here, so that they would understand the social needs of people, as they interact with others in public spaces and creating some behavioral hubs and paths through the physical organization of their environment. Since human beings built most of their routines accordingly and based on the built environment, there is a strong relation between the spatial structure of the city and human beings' social needs that included in their daily routines, habits, interactions and so on. Daily life is highly included in the physical structure of the city. The functions of the structures should refer to the needs of human beings. These functions can be social, economic, cultural, memorial, connections and many others that the elements of the cities, such elements that Lynch is referring to, can define and lead people.

The type and the value of the information gains meaning as the combinations vary and grow, "referring to the properties and spatial distribution of the many elements that together form the face of the city, and global information, referring to some general principles according to which these elements are organized. The spatial organization of these elements is of specific importance here. Another type of global information is symbolic information, which refers to a single or several urban elements that symbolize the city and thus distinguish it from other cities" (Haken & Portugali, 2003, p. 397). The symbolic information is attained by people, as they have been provided their social needs by the physical information of the city. In this case, the supply and demand play role so that the new models and policies would have succeed to provide social maintenance for the citizens, or create new dynamics that they can invent new social behaviors. Social sciences are analyzing the cognitive movements of people, and urban models are being built to simulate and propose the most beneficial urban planning practices. The policies are emerging to support bottom-up decisions with are based on citizens behavior mostly. The behaviors that are shown in the city are the reflections of people's social needs. Depending on these findings, that would be right to say there is an infinite loop of infection between the social benefits and needs of citizens and how the city structure is reflecting to it, and reverse, how citizens are reacting the offers of urban structures are giving to them to provide their needs in social life and flow.

The link between the social need and the built environment is proven to be growing

stronger since self-organized systems are emerging in the cities. As the link gets stronger, the information system of the city grows and urban places become more adaptive. The tools and analysis are tended to find the better match to the societal movements that are happening in the city, in the case of traditional cities. Policies are to benefit make the dynamics stronger. For contemporary cities, the case of inventing new dynamics and analyzing if people would accept and adapt it would have been another case to work on, such as the study of 'branded spaces', which the process of the creation has been explained as "To form a branded space, agents have to connect or synthesize the positionings respectively their perceived atmospheres. During the process of synthesizing agents interpret the spatial configuration of the positionings and make meaning or a story out of it. The process triad to create a branded space is a personal, social and situational experience" (Sonnenburg & Baker, 2013, p. 17). That might be an opportunity to observe the information adaptation between the social behaviors and urban structures in real time. The results might differ like as social needs would have been met in the designed urban places, or the design that have been offered might adapt and reconstructed by the effect of the social behavior with the people's desire built their cognitive maps based on the physical organization they have been offered, not necessarily following the boundaries and attained functions and dynamics, but using them to adapt their own cognitive image on their mind to benefit them in the best manner. In return, people make the urban environment richer in terms of identity and information in the collective memories of citizens.

5.3.2. The concept of just-in-time planning and possible levels of impact

The emergence of bottom-up decisions and self-organized systems lead to a change in planning approaches, such as the switch from just-in-case planning approach to just-in-time planning approach. The turn has been forced as the traditional planning practices change and more social related practices and policies gained more importance to be implied in urban scale. The phenomenon of just-in-time planning is explained with a supermarket metaphor of Toyotism[25] (Portugali, 2000, p. 232). The admitted impact of self-organization and participation in city planning has created a lead for a method of such to be implemented in the planning practices as well. The inclusion of cognitive behavior and the consideration of its impact on the city's structure gets together with the spontaneous order and self-organized systems. Depending on all of these progresses, time depended models and policies are studied and being implemented, such as just-in-time method of

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25   The method of Toyotism, where happened in the Toyota corporation, is mainly based on the strong cooperation and interaction between the member of the firm, which is a multi-functional work in total. The participation and initiative had an important role for the method to be successful.
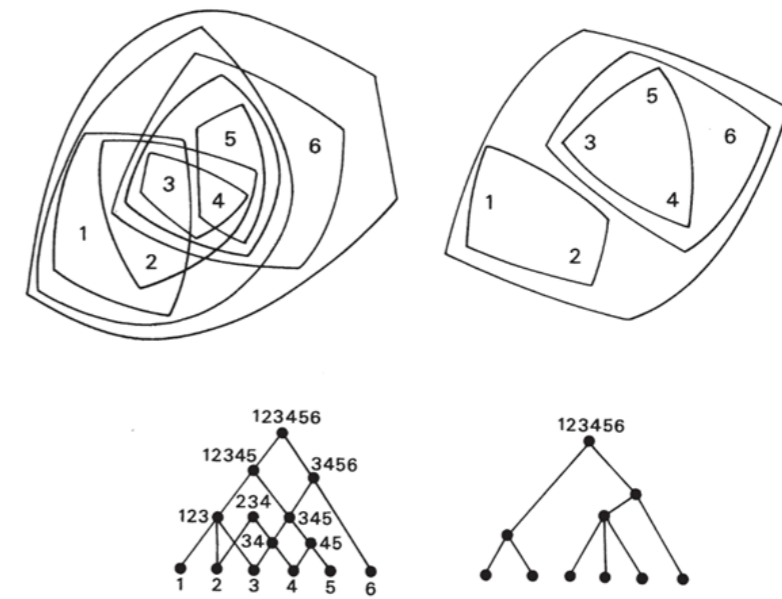

Figure 22: Alexander's schemes of tree structure (right) and a semi-lattice structure (left) systems (source: Portugali, 2000)

planning.

Alexander also studies on how the implications of discusses about the differences between the just-in-case and just-in-time planning practices. He has been the supporting side of the idea that 'city is not a tree', so that he believes also the just-in-time planning method would have been a better impact on the cities' organization system. He discusses and compares two different cities, which he describes as "a tree versus a semi-Iattice, and in the processes that created them and that take place in them. In the tree city each sub-system in the city is fully independent from all other subsystems of its level, and it can thus interact with them only via a higher order subsystem. In the semi-Iattice city there are overlaps between subsystems of the same order, so that interaction can occur vertically, horizontally and in oblique" (Portugali, 2000, pp. 232, 233). The distinguish of two methods are sketched according to Alexander in Figure 22, that shows the complexity of the semi-lattice structure compared to the tree-like structure. Since it has been admitted that the city is a complex system, the semi-lattice structure is more likely to be considered as a city's information system and so that just-in-time policies are more likely to be adapted in the complex system of semi-lattice-like cities, "the city and the many categories in it are open systems that overlap, or rather enfold, each other, and that they form complex dynamic systems. In short, the just-in-case Fordist cities are simple, mechanistic tree structures, whereas the just-in-time cities are self-organizing systems" (Portugali, 2000, p. 234). Cities complex informative system and emerging bottom-up policies are all time-depended situations so that the just-in-time policies would have a bigger impact on

the planning practices than the just-in-case practices.

The importance and outcome of the participation of everyday planner is being studied through SIRN urban models, which the dynamics were changing spontaneously only one dominant dynamic would become the main information source for the urban place. One solid example was given before, that can be also referred to time-dependency effect of the planning practices, is the self-organization of the citizens that spending time at Tunalı Hilmi Street. They managed themselves to arrange and mobilize through the neighborhood depending on the time schedule that they were allowed or planned individually, as the Minibar activity started to become a collective behavior. In the long run, the happened to flex or shrink their boundaries depending on some rules, which were also taken into decision by time.

The process and analysis of the model is also proven to be time depended since the self-organization systems were also based on the physical structure and each individual's behaviors until they overlap or interact in a common social flow that would build a collective cognitive pattern for the society and the city. Though, the cognitive maps are flexible and time-depended, the policies that are flexing and restricting the social flow with the cognitive maps of minds are tempted to be time depended. So that implication and the influence of just-in-time policies, as based upon mainly bottom-up decisions, would be more beneficial for the provision of a better urban life standard, or maintaining the harmonized social flow with following and matching the times innovative ideas so that it would adapt to the physical information and the social behavioral flow that would have a bigger impact on the city's information system.

5.3.3. Balance of city being socially organiz and physically artificial

There have been discussions about whether a city is organic or artificial, a tree or a machine, plannable or unplannable, adaptive or non-adaptive. The common idea of that cities are complex systems, so that they are not a-tree-like system, but a big machine. It does contain chaos and order in its system at the same time, which makes it one of the reasons that cities are complex systems. Though, the order is contained by the planning practices and policies, which are man-made and makes the city artificial, not organic. "Cities are not natural entities such as liquids, light beams, snowflakes, sand-piles or trees and their parts are not atoms, molecules or sand grains. Cities are artifacts, that is, arti-

ficial systems—facts of art and human culture—and their parts are human beings that unlike sand grains can think, learn, plan, forget, change their mind, ... and their actions and behavior are products of intentions, plans, social and cultural norms, political pressure and the like" (Portugali, 2012b, p. 57), the organic layer of the city can be considered to be the social flow and the cognitive maps of citizens, which are also referred from the artificial information of the city. Hence, the adaptive components of the city are mostly social components. There are discussions about the city is considered as only a living organism is not totally correct, "It is important to emphasize that, although social groups are artifacts, their members are biological organisms and social groups can therefore easily be interpreted in essentialist terms as natural kind categories. In comparison, with the exception of natural environments, places are human-made products. Treating a place as a living organism is a metaphor that cannot be strained too far"(Lewicka et al., 2019, p. 3). The physical guidance that have been given by the institutional planners enable everyday planners to adapt to their physical environment, and self-organize themselves. However, the planners should be aware of the limits of the complex systems, as how much the systems can be adaptive and find a way to gain feedback from the studies of such complex urban models, to be able to find the harmony between the social and physical information in the city.

The behaviors of people as they find their way and perform their routines, some parts of the social flow occur unintentionally, besides the intentional interactions. The unintentional, in other words spontaneous behavior makes a major component of the city to be formed partially organically. There is an example as Alexander describes the city is a semi-lattice system and complex, and how the city's physical components can be a guide to the organic behavior of human beings. He describes a crosswalk in Berkeley, at the corner of the Hearst and Euclid. The corner he describes, there is a drugstore and a traffic light before the crosswalk for people to wait. There is a newsstand in front of the drugstore. By time, there has been an unintentional behavior that has been observed as people are waiting for the light. Since there is not really an alternative for people to spend time while they wait for the light to turn green, they check out the tittles of the daily newspapers on the newsstand, some people actually end up buying and reading it while they wait. According to Alexander, this flow is happened as the human agents are being involves, as the physical environment is also inspired them to act so, which he describes the totality of the system as in the example 'a unit in the city' (Portugali, 2012b, p. 59). Unlike the typical and ordered system of the tree, cities are most likely complex and more

like a big machine that are working by pieces together, finding a way to work together and revealing some information, as some other information are received at the same time.

The mutual flow of information between the social and physical systems of the city creates the total information system of city. In order for the information system to be meaningful and easily to be identified in urban places by its citizens, there should be a balance between the artificial physical information of the city and the organic social information of the behavioral flow, "To go beyond that, CTC have to look not only at the similarities between natural and artificial entities but also at their differences. The same applies to the relations between CTC and complexity theories at large: as long as CTC will treat cities as trees, as long as they will apply the various complexity theories mechanistically in a non-adaptive way, they will not be able to add to the general theories of complexity; in order to contribute to this general body, CTC will have to look not only at the similarities between natural and artificial entities but also at their differences" (Portugali, 2012b, p. 59). As in the given example of Berkeley, the response of the citizens to the offered physical components were matching. Another contrary example might be also the self-organization behaviors of that example given of Minibar in Tunalı Hilmi Street. The physical organization of the neighborhood has been turned into an opportunity by the human beings. Some policies to restrict it were emerged by the authorities. However, people were able to adapt again by finding some other hubs and paths to shape their interactions. During these avoidances and changes of behavior, their cognitive maps of mind were also changing, as they were flexing or/and being restricted. This is also a proof that the cognitive map and the activity of everyday planning is flexible, and therefore organic. The fact that should allow the citizens to be able to reconstruct their cognitive patterns of the city, and accordingly their own cognitive maps, is the clues and guidance that artificial structure of the urban environment.

5.4. Final Remarks

With all regards to the city is being a complex information system and agreed that it is composed by social and spatial elements in order to gain identity globally and locally, the studies, policies and urban planning practices took a turn in order to understand, and propose accordingly. The social science studies which includes cognitive sciences of mind are aiming to understand how the human mind observes and reacts to the patterns. Implementation of cognitive science in urban studies are to be the cognitive maps and

cognitive planning behaviors, which has been also named as 'everyday planning', which would guide institutional planners to decide how to reflect the cognitions into physical organizations of the city, to benefit the daily life of citizens in a most efficient way. The studies of SIRN urban models that included participation between institutional planners were one of initiatives to be able to propose and analyze the possible outcomes of such different dynamics. Through the studies, there has been also a proof that planners, both institutional and everyday planners, are constantly in inteacrtion with each other and the force implication of a single top-down rule has been diminished as they interact. That has been shown that many dynamics could appear despite of the given specific function or flow in the physical organization. In the end, the users of the urban place are to decide how to identify them by time. The emergence of self-organization between the social interactions leads to the variety of dynamics, and by time, a dominant dynamic that intentionally become a collective behavior would be one major information that would define the urban place, though, some other small dynamics would still happen.

The major aim of the planning practices and policies should be an inspiration for people to identify an urban space and turn it into an urban place, by building a cognitive map in their mind so that they can include some spots and physical organizations to their daily routines and interactions. There might be some necessary policies and implementations that would have been taking in order to maintain the life quality through an urban place while citizens are tempted to self-organize themselves, and creating more complexity in the city depending on each individuals' own complex mind. While reconstructing the policies to maintain an order in the urban place, there should be still some room for spontaneity so that the urban places would not lose their once gained identity turn into non-places The main purpose would be let people define the urban places to give them an identity and not to leave the urban environment only with the physical information that have been designed and planned with, but to give a social information to keep the informative system of the cities variable. By doing so, the urban places would have been distinguished form each other and a hierarchical order would occur. The social behavior paths are in power to do so, with guidance of the physical organization of the urban environment.

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