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Evolutionary Patterns on Human Design Issues
An analysis on Urbanism, Architecture and Interior Design

Once we traced connections and found similarities among the evolutionary processes, it will be proposed a first testing for the theory in Design. This parallel research allows us to identify connections between evolutionary issues and real conflicts in design and furthermore, suggested the formulation of a hierarchical scheme of relationships among elements and between elements and the environment.

The main reference chosen is an unique work on design method, an overall guide on urbanism, architecture and interior design. It starts with the premise that all human design conflicts can be grouped, categorized and resolved following a pattern, or rather, 253 patterns.

Although the work was never massively accepted by architecture professionals and academics due to its pretentious proposal of solving all design conflicts in a single book, the book is the result of an extensive research and above all, it's the only work that minimally intended to deal with design evolution in a more pragmatic abstract way.

A pattern language along with its complementary works ("The timeless Way of Building" and "The Oregon Experiment") which were, according to the author divided in cover but indivisible as study, an attempt to understand the conflicts and solutions of human evolution and occupation as a mathematical formula.

> "Each pattern describes a problem that occurs over and over again in the environment, and then describes the core of the solution to that problem in such a way that you can use this solution a million times over, without ever doing the same way twice."

Christopher Alexander
A Pattern Language
1977
p. X

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Although the work presents a very linear list of patterns, sometimes excessively arbitrary, sometimes naïve and reductionist, the assemble of conflicts is comprehensive and was a rich source of design phenomena, which in general are represented by the two main forces that give shape to human evolutionary process, the urge to expand versus the impositions of the environment, scarcity, competition, cooperation etc.

Evidently, all the patterns described in the book are conflicts on urbanism, architecture, and secondarily, interior design and engineering, but given the nature of the premise that evolution is a natural process notwithstanding its moment, environment or elements involved, it represents an important scientific verification. Extracting the core of every pattern, there were the same principles found in design evolution and in any other kind of evolution.

> "Each building and each town is ultimately made out of these patterns in the space, and out of nothing else: they are the atoms and the molecules from which a building or a town is made."

The timeless way of building
Christopher Alexander
p. 75

In A Pattern Language there is a clear intention to establish rules to guide evolution in a humane and culturally benignant way, so that the fundamental element of the process, man, wouldn't be neglected. By doing so, some patterns are not properly conflicts, they are more like utopist visions of how people should interact and relate among themselves and with the world around them. The approach of this paper on A Pattern Language though is intended to be profoundly practical and pragmatic. In this sense the social humanistic character of the book must not be considered, some conflicts must be studied as natural phenomena, not necessarily to be eliminated, but instead to be understood and administrated.

The formulation of the analysis led to the definition of elements that in theory

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compound every evolutionary process, those element were arbitrarily named and their names were intentionally repeated in almost every description, in a way that the mathematical principle emerged more clear and evidently.

In the human social urban evolution, more than in many other processes, this complex scheme is important and evident, and so it will be analyzed notwithstanding its relative importance on the design evolution.

Those elements are: the system (complex system, simple system, subsystem etc.), the structure (complex structure, simple structure, substructure etc), the function, the individual, resources and the environment. Other than that, there were used all the previous terminology presented in the introduction of this paper such as the basic evolutionary variables, fusion, division, expansion, reduction, dominance and so on.

System

A system is any being that evolves vertically or horizontally, or rather, capable of evolving fusing with other systems and change linearly or just capable of performing adaptations over generations. Ultimately, the system is an entity with an identity, with a functioning and a series of components, elements and individuals that perform functions. The more commonly accepted concept of system in biology would be the "superorganism", but since we intend to understand complex systems like multicellular bodies, termite nests and cities as different scales of the same basic logic, the term system suits better our intent.

> "Societies, like living bodies, begin as germs - originate from masses which are extremely minute in comparison with the masses some of them eventually reach. That out of wandering hordes have arisen the largest societies, is a conclusion not to be contested."

Herbert Spencer
The principles of Sociology
1876
p. 463

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Structure

A structure is the mathematical composition of a system, it can be vertical, hierarchical, horizontal, it may have substructures, make part of a bigger structure, and it can be isolated. A structure is the set of connections among its elements.

Function

Every evolutionary process is based on the idea that systems tend to grow, they perform tasks, which complement or compete with tasks performed by other systems, with the ultimate goal, prevail and endure. Functions are manifestations of every element of a system, and that includes subsystems, individuals etc.

Individual

That's the most irreducible component of a system. In human social urban evolution, the individuals are predominantly men, animals and living creatures in general, but as we are going to understand more profoundly during the reading of this paper, life is a relatively expendable condition for evolution.

Resources

Resources are the means for evolution and for every changing process. The use of the word resource must not give the reductive idea that these elements would be merely physical matter. information or money are sorts of resources as well. In a most abstract interpretation of evolution, excess and scarcity of resources are the motor to any adaptation.

Environment

It is the ultimately complex system, the Universe. It is the ensemble of all systems in relation to time and space. As described in the informational physical universe (IPU) hypothesis,

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Evidently, the environment to be analyzed is the overall context of a certain set of interacting systems. For example, if the systems involved are human beings in cities, the environment is the geographical or geopolitical context in which that city is situated, not the universe.

The following pages present a set of conclusions and cues subtracted from the A Pattern Language, a gathering of the most evolutionarily significant phenomena and their connections with the evolutionary big scene.

Complex Phenomena on Human Social Development

Social organism

Analyzing macro system issues of human occupation such as the distribution of people in cities, states, countries and ultimately, on the planet, Alexander implies that, in order to solve the hypertrophy of human occupation, it's mandatory to organize hierarchically the dimensions of human structures. This diagnosis is a sign of an evolutionary crisis, created by the overlap of complexity in the development of the society. In theory, humans are still primates, still have tribal instincts and needs. The size of the cities reached proportions that conflict with human's very nature. Considering the demands of modern life and the fact that this dimensions were pursued, theoretically, the development of big cities should not conflict with man's nature, but men

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and any other evolutionary being are not adapted to the environment, they're adapting.

The duality between human's strong expanding drive and the apparent limits of human biology is probably the mostly debated argument on A Pattern Language. In Pattern 2, the solution for the necessity for either small cities and big cities led the author to propose a fractal distribution of dimensions and quantities of cities and inhabitants. In Pattern 190, this duality is expressed by the need for variation on ceiling heights inside a building. That coexistence of bigger and smaller structures within the same system is a recurring in human social structures and in nature as well.

A tree that grows in a hierarchical pattern, a bole that supports a series of branches, every branch supports a series of smaller branches and ultimately leaves. These leaves follow in most cases the same hierarchical pattern inside the structural skeleton in order to compound their flat light capturing structure. From the human point of view, this social crisis is a consequence of the tendency to behave in manners that diverge from the natural standard, but still following primary instincts.

It is a repetition of a common evolutionary pattern: Performing new tasks with old tools, a characteristic presented by countless other animals. Some examples are, as described on The Naturalist on the River Amazons (Bates, 1863),, some butterflies that may use the same pigmentation genes to develop, in one evolutionary moment flashy coloration to attract mates, and in another, fake eyes in its wings to deceive predators.

The social structure is an extrapolation of more primordial systems. The associations of people, the division of tasks, professions, the social classes, the industrial, residential and commercial districts, the streets, avenues, highways, the public transportation, the public squares, parks, circuses might be read as a large scaled version of the bacteria associations that form our bodies, with the task divisions, tissues, circulatory system, respiratory system and so on.

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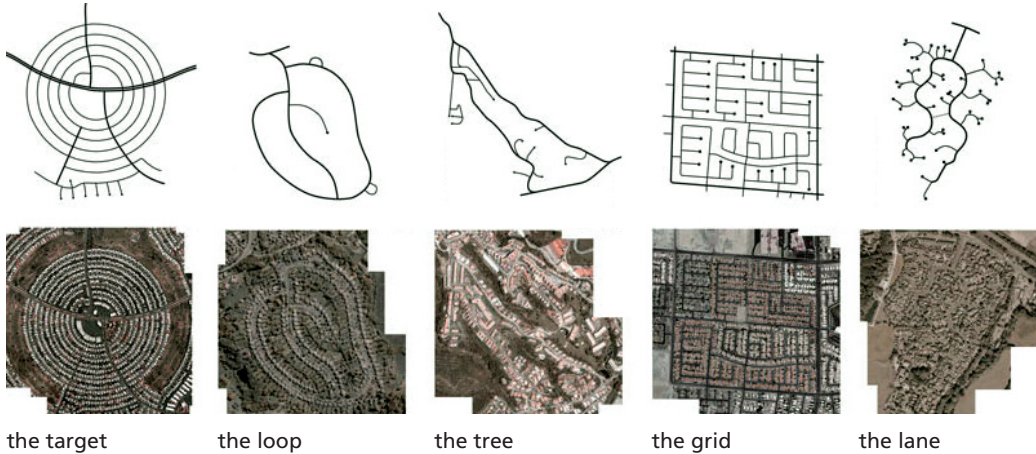
the target   the loop   the tree   the grid   the lane

Road distribution models - Tom Vigar, Subtopian Dreams, Sheffield University

The very idea of "being", that happened ages before the first living creature, is, reproduced in a larger scale by the constructions that surround human beings, houses, apartments, cars, buses etc. These first semi permeable surrounding organic shapes, kept some matter inside and some outside,
Houses in that sense could be compared to even more evolved entities, a structure that provides thermal isolation, physical protection, has different parts such as kitchen, bathroom, plumbing, electrical fixture, with different functions, require external resources and produce residuum.
As demonstrated in different ways, evolution is based on adaption necessity. It is driven by very simple rules. Those rules are going to be applied in sociological and architectonical cases as a premise confirmation. It's a final verification before the definition of the model applied on design. Some examples are mainly related to the social case, but they have got to be contemplated.

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Conflicting existence

The first and most primordial one is the antagonism of the two universal invisible forces, that respectively holds back and pushes forward all existing things.
This rule can be identified in every moment of evolution, it's manifested by the urge to expand, performed and sought by every existing thing, fighting against the opposite force that holds it back, gravity, the resistance of the physical material world, the scarcity of the environment, and the depleting result of live itself.

> "È una caratteristica illuminante del microcosmo che gli avvenimenti dirompenti del passato geologico non abbiano mai portato alla totale distruzione della biosfera. In verità, come un artista, la cui miseria "catalizza" la creazione di splendide opere d'arte, sembra che estese catastrofi abbiano immediatamente preceduto importanti innovazioni evolutive"

> It is an illuminating characteristic of the microcosm that, disastrous events of past geological have never led to the total destruction of the biosphere. In actuality, as an artist, whose misery "catalyzes" the creation of amazing works of art, it seems that extended disasters have immediately preceded important evolutionary innovations "

> Lynn Margulis
> Microcosmo
> 1986
> p. 254

The more inhospitable is the environment, the slower the reproduction will happen. The paradoxical fact about the conflict between those two forces is that, when a system or an individual is too successful in an environment, there won't be any reason to evolve and no reason to grow in complexity, or to become more efficient. That logic can be found in most patterns described in the book, but can also be found in many other evolution processes. In nature, when one element finds itself in an environment with excess of resources, or

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rather, when one element is highly adapted to an environment, the spread is exponential, for that reason the evolution is slow or even stagnated. If later, the excessive spread or internal competition presents challenges, necessity forces the system to evolve.

Neutrality and unbalanced processes

For a system to be completely adapted to an environment, the result of its existence must be neutral or there must be a counterpart that evens out the environmental impact, and in this case, either both evolve by competition, either they coexist in a cooperative relationship.

In competition regime, one system forces another to deal with new adaptations or improvements achieved. Those regimes can be found in many natural coexistence relationships, like cheetahs and gazelles, a relationship in which cheetahs keep the population of gazelles healthier by chasing and killing the slower and weaker members of the group. From the opposite perspective, faster gazelles force cheetahs to become always faster stronger hunters. That is probably the long term process that led cheetahs to become the fastest terrestrial animals on earth.

In cooperation regime instead, systems are complementary, like the cooperation between plants and the mycorrhizal fungi that grow on their roots and aid the plant in absorbing nutrients from the soil (Paszkowski, 2006). When the systems are in equilibrium, none of them change. In complex systems, no context could be compounded by just 2 elements, but for didactical sake, some aspects of a case must be simplified.

This basic phenomenon points out the next one found on human evolution, a rule that will determine the evolutionary flux: the easier natural flow. It's basically the physical tendency of every existing thing to flow towards the easier possible way. Like a river that flows through the lowest path of a terrain, every existing thing follows the easier path available and will flow just when there is a favorable set of circumstances.

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"Ogni individuo, popolazione o specie è un'opzione che si esercita soltanto in condizioni favorevoli."

"Every individual, population or species is an option that operates exclusively in favorable conditions."

Lynn Margulis
Microcosmo
1986
p. 282

In that sense, evolution is impulsive, doesn't make plans. Eventually, as systems grow in complexity, the birth of conscience and all the instinctive behaviors triggered by the overlap of evolutionary attempts, allow individuals and systems to have predesigned evolutionary behaviors that do not offer immediate results and are demanding but aim towards a higher goal. This behavior is manifested either for human beings that, for example, work incessantly for years in the construction of a bridge that is going eventually to reward the effort, either by simple systems like a society of termites that build four meter high nests or bees that store honey for procreation purposes.

This predesigned evolutionary behavior, now leads us to analyze the next fundamental phenomenon in human society, the vestigial behavior. It's a basic instinctive evolutionary behavior developed over numerous generations of a system, useful initially, but useless in a new environment. This behavior, due to its major importance on human evolution, is going to be more deeply inquired later on this paper, but basically it regards to the tendencies that perdure over environmental changes. For example, some studies associate psychiatric conditions as panic syndrome to vestigial self-preservation behaviors. One of the first reflexes of a newborn human baby, grabbing, is also associated to a vestigial behavior that perdured from the period in which human ancestors lived in trees. The need to belong to small groups, around 12 people, pointed out by Christopher Alexander in A Pattern Language in many occasions,

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manifested by human beings is another example of vestigial behavior.

Another good example, this time in interior design, pointed out by Alexander is the environment change in the social function of the kitchen. Till the beginning of the 20th century, in most countries, kitchens were a merely functional part of the house, in general used by servants. No social activity was developed in kitchens and for that reason it was an unpleasant hidden, neglected place. The social context changed, servants are a kind of luxury that very few people can afford, cooking, in the other hand, became a recreational, almost artistic activity, and yet kitchens are in general designed and placed in the least esteemed part of the house, occupying the smallest possible amount of space. This vestige is a sign of adaptation speed, a process. In the human society, actually, those behaviors are uncountable.

There's a strong connection between the characteristics of an individual and the characteristics of a system. This connection was previously approached analyzing how the nature of man interferes on the functional health of a system, applying restrictive forces on the expansion of cities. This same example gives a glimpse of how systems form groups or how they subdivide.

Notwithstanding the scale and proportion, some aspects of a system can be isolated to understand what is the common denominator among various subjects. In human society, the common denominator is the individual, followed by the family nucleon and the tribal ensemble.

This formation is found in any social environment, repeated, multiplied, grouped in bigger configurations, but always respecting these parameters. The consequence is the difficulty on expanding human agglomeration over a certain limit without loss of group identity or loss of individual integrity. In biology the composition of living structures follow the same logic, that's why insects and big mammals don't have proportional characteristics. A flee jumps around two hundred times their own body length, the best mammal jumper would be the Klipspringer that reaches no more than fifteen times its body height. The elements, molecules, cells and nutrients that compound their body structures have a common root, which does not restricts growth in complexity or in size, but imposes restrictions on the functioning.

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The common result of these expansion processes is the enervation of the system. If the system is compound by divisible elements, subsystems or individuals, the tendency is the division of the core. In the microcosms, the simplicity of the structures allow the easy splitting of the system.

In urbanism, the phenomenon was repeatedly documented by Alexander. One of them, mentioned in Pattern 44 is the necessity of a town hall in every small community that compound a big city, through which the individuality and integrity of its members would be preserved. In another case, appropriates the very word Ecology to explain the phenomenon.

> "The mosaic of subcultures requires that hundreds of different cultures live, in their own way, at full intensity next door to one another. But subcultures have their own ecology. They can only live at full intensity, unhampered by their neighbors, if they are physically separated by physical boundaries. "

Christopher Alexander
A Pattern Language
1977
p. 76

Here, the emphasis on the physical distance among those cultures points out not just the fact that the growth of urbanized areas leads formerly isolated communities to blend together, but also that evolution works in both ways, isolation and contact, division and fusion. Alexander expressed recurrently preoccupation with the preservation of cultural identity. It is the result of another very important phenomenon, the need for diversity, the key for evolution. From the same progenitor system, reproduction creates different new systems that work as test prototypes that perform tasks in different ways. The better succeeded system will prevail pushing forward evolution. A good example of this healthy variety, pointed out on Pattern 220, is the diversity in the engineering and layout of roofs among different cultures. That is a case of divergence followed by convergence, division followed by fusion. Since most of roof layouts were designed in an early age, the mechanical performance of

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the structures evolved in a trial and error process.

In the most demanding structures, most cultures developed their own roof model. The trial and error method led the cultures to develop, among others one of the most efficient roof systems, the ogival shape. When the crusades promoted cultural fusion, the gothic layout of the ogival roof influenced the construction of countless European cathedrals (Fletcher 1996). The fact that a system is not the most perfect possible option to perform a task doesn't disqualify it as an evolutionary being.

As a matter of fact, being partially adapted is what drives evolution. If rich cultural cores blend together, the cultural and technical diversity gets compromised by competition. Regarding ethnic groups, the possibility of blend is also defined by the dimensions of the cultural gap. If peoples with cultural traits too different from each other coexist, the possibility of cultural fusion is reduced, like the relationship between Greeks and Turkish, white Australians and aborigines, Palestinians and Hebrews, etc. In a sense, these too big cultural gaps encumber social blend the same way too big genetic gaps encumber racial mixing.

The more different the individuals involved on the blend, the less likely the blend to happen, example: hybrids between different subspecies within a species (such as between the Bengal tiger and Siberian tiger) are known as intra-specific hybrids, and are more probable to happen than hybrids between different species within the same genus, (such as between lions and tigers). The rarest cases are interfamilial hybrids, like the guineafowl hybrids, have been known to occur in very few occasions (Ghigi, 1936). The human society, as mentioned before, grew a lot beyond the predesigned biological standards, the cultural structure has been developed as a multinucleated system, or rather, developed a system with many subsystems. This characteristic plays an important role in the development of cities, states and countries.

As verged on Pattern 1, in order to evolve, every social core must have an autonomous governance and functioning. This statement represents the need for a plan, a guide through which evolve. Like living creatures, the lack of governance, or more specifically, lack of growing instructions leads to a

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primitive behavior. In living creatures, the phenomenon is manifested when a group of cells stop following the orders from the DNA.

> "The body is totalitarian in its regulation of genes. Once a cell becomes a muscle cell, it is so forever. The only exception for this rule of permanent roles within the body is during cancer, when cells seem to revert back to the more primordial condition of reproducing continuously without regard to their place or function in the body."

> Lynn Margulis
> Microcosmos (english edition)
> 1986
> p. 148

The human equivalent to that phenomenon is the precisely the conflict dealt by Pattern 1, the lack of governance. Some extreme example of this phenomenon is Kowloon's Walled City, a District of Kowloon in Hong Kong that for approximately eleven years (from 1948 till 1959) was out of jurisdiction either from English or Chinese settlements, and even many years before the official "hands off" from the English government, it was already in between the English/Chinese political cross fire.

The consequence was the complete degeneration of the zone that from the urban point of view, became a super condensed pile of improvised apartments. In a 6.5-acre block, the 10 story buildings merged onto one shapeless mass of human occupation, from the social point of view, it became the refuge and unofficial kingdom of all drug dealers, prostitutes and criminals. (Wilkinsons, 123)

The overall analysis

The analysis of A Pattern Language plays a fundamental role on this research, establishing a limit for the confrontation range between natural and human evolution, is such way that no phenomenon would be forgoten. This list of

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human designing phenomena guided the final set of verifications and provided the basis for the method proposed in the next chapter.

The level of complexity of the conflicts quoted would theoretically demand, for every one of them, a deeper analysis as an overlap of various phenomena. However, the intent of this study was just the identification of basic phenomena and the confrontation between this phenomena with the natural ones, in order to prove the thesis of the indivisibility of the evolutionary fabric. Those concepts must not be understood as a metaphorical poetic way of interpreting society or human evolution. The evolutionary fabric is indivisible and these confrontations are a proof of this fact. Evolution started before life. It's not a part of life, quite the opposite, life is a part of evolution.