A Novel and Modern Comprehensive Theory to Create an Anthropocentric Architecture Based on Laws of Chaos (Part I): Adaptability and Flexibility
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ABSTRACT
Architecture begins with the definition of the project and a wish. In the first step we aim to create an embryo for the generation of the work. Like any chaotic system, architecture must gather vital information from the environment in which it intends to grow through negative feedback in order to survive, and with adaptability and flexibility, start to grow like a small bud while remaining flexible. So, in order to prepare the conditions of creation, we need to properly know the context. In addition, architecture is the child of its ground and is responsible elevate the soul of the location and promote it. Flexibility against the environment can guarantee the uniqueness of the design because the environmental conditions are never the same, therefore the work based on it would be non-repetitive. A designer who attempts to create independent form with no regard to the climate, topography and cultural context cannot benefit from this advantage. Studying and analyzing the setting information of the project is the most important stage of designing which, in a perfect design process, equals the time of the execution of the work.

1. Introduction
As we discussed, a chaotic system is formed in the framework of determined and stable rules. Such a system, as a subsystem of the bigger system of environment, follows it and adapts to it [1–11]. The limitations that the antecedent system of environment puts on the child to be born determine a framework that the smaller system must not transgress and its general behavior is determined within this scope [12–35]. In the language of chaos, the scope of the phase space where strange attractor of the architectural system is being formed is the determined framework defined by the higher environmental factors [36–73]. With some leniency, it can be considered representing the defining forces of the scope of architectural system [74–81]. The four systems displayed are the four sides of the Iranian snowflake which determined the initial conditions and position of the architectural system enclosed in the circle of determined, perfect architecture. We orient towards that ideal from this source [82–93].

2. Climate–Natural Systems
For thousands of years, different civilizations were formed in perfect harmony and adaptive to the violent conditions of the nature of their lands. Although people of the past always tried to build their buildings and cities according to the sources of water and fertile soil and considering the natural dangers and to act in a way that they benefit the most from the natural energies, failure in estimating the unpredictable status of the Mother Nature led to their obliteration. As the glorious city of Pompeii was buried under the ashes of Mount Vesuvius, and the burnt city in Sistan and Baluchestan, Iran, was vacated and many magnificent buildings were destroyed in the earthquake. However, those ancient civilizations and their surviving buildings are considered stable compared to our modern civilization which is based on rebellion against the natural environment and indiscriminate utilization of non-renewable fossil fuel.
For a short while, mesmerized by the facilities provided by the oil energy and the invention of new machinery, architects and investors philosophized and made claimed in regards to modern aesthetics, but soon, they found out these riches are fleeting and sustainable architecture is not possible except by following the laws of nature and respecting them. In fact, the sustainable development approach was proposed after the energy crisis in 1970 due to the fear of oil export being cut off by the oil-rich countries especially Iran and the destruction of Western industries and led to the adjustments in Western policies concerning research on green architecture, environment protection, the production of fuel-efficient vehicles, and industrial development that can be sustained in long term. In fact, at the beginning, sustainability was introduced not as a humanitarian and naturalistic approach, but as a strategy to maintain the capitalist system.
The term sustainable development was introduces for the first time in 1986 by the World Commission on Environment and Development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs threatening the resources of the next generation” and every day, its dimensions and scope are widened more so that the world is presented with appropriate techniques. The sustainable architecture approach is not in fact a style but an attitude: a holistic and comprehensive attitude toward sustainable development in search of an optimal solution to interact with the environment and proper use of the resources and recycling the waste. The most important goals of sustainable architecture include the reduction in the usage of non-renewable resources, the natural environmental development, elimination or reduction of the
use of toxic or harmful material to the nature in the construction industry, reduction of carbon dioxide and recycling of the aggregate. In this regard, the amount of energy which is used to create and construct the building and the amount of energy used to operate and maintain the building are all taken into consideration.

Sustainable architectural design starts by examining the climate and environmental setting. Understanding the environment helps determine the facilities and limitations of design. Some of the basic issues which are to be considered in the examination of the site include: the possibility of natural threats such as cosmic radiation, earthquakes, volcanoes, floods, hurricanes, tornadoes, lightning, tidal waves, the form and dimensions and orientation of the land being designed, Universal Transverse Mercator (UTM), natural complications of the land including hills, valleys, canals, groundwater, watercourses, fault, grass cover, animal burrows, underground mines, etc. topography and its use in excavation, avoiding soil erosion, optimal utilization of heat energy inside the earth and the flow direction ground waters, the geographic North and proper exposure to sunlight, type and quality of soil and the degree of toxicity and radiation on site, favorable and disturbing directions of wind, the amount of precipitation and humidity, the temperature in different seasons at various horizontal, vertical, and oblique levels, suitable view and perspective, the accessibility to those riding or on foot, noise and respiratory pollution nearby, etc. Recently, the softwares introduced the computer in designing the site. After the ground, one of the most important aspects of sustainable development is conservation and utilization of water resources. Tomorrow’s crisis, before energy, would be the war over freshwater resources. Thousands of years before, Iranians succeeded in inventing infiltration galleries and the best utilization of underground water resources which can still be held accountable and they built the first water civilization in the world in ranges of Zagros. Sustainable development was celebrated by the Achaemenidsh who passed on five generations of tax of those who dug a subterranean water canal and brought water to the surface of the earth! Dam and dike are also among the accomplishments of Iranians. The dike, Band-e-Bahman, south of Shiraz with the length of 126 meters was built at the time of Achaemenidsh. Water structures of Shushtar are considered the most complex and profitable ancient structures of their kind since Achaemenids to Sassanidsh. Without harming the nature, they were responsible for irrigation of high grounds of Karun against the slope, determining the city’s security by digging rivers, proper distribution of water, procuring the flour supply by mills, adjustment of Karun’s water between Gargar and Shotaif rivers, generating water and moisture in warmer months of the year, etc. Izadkhast Dam, the world’s first arch dam, was on Isfahan to Shiraz road with 65 meters in length and 6 meters in width and was built during the Sassanid era. Shah Abbas Dam in Tabas with 60 meters in height and only one meters in width of the crown, was so calculated that it remained the thinnest and tallest dam in the world for 550 years until Hoover Dam was inaugurated in America.

But Iranians found that due to the hot and dry climate in most regions of Iran and the high rate of water evaporation and gathering of silt and mud in the bottom, dams are not cost effective and they deliberately stopped building dams. Today, we also should seriously try to find effective strategies to ensure the provision and proper use of water in architecture and urban development.

Globally, sustainable architecture has not made comprehensive progress yet and most claims in regards to using recycled material versus high costs allocated to special constructions are under question. But, as striking examples, we can refer to some designs from Renzo Piano and the Masdar project of Norman Foster in UAE which seek to create spaces which interact with the environment and cause the least amount of pollution and damage to it and consume the least amount of energy. Of course, the great amount of energy consumed for the construction and transportation of special structures are not accounted for in these collections. Yet again, if we want to consider the problem holistically, we’ll have to acknowledge that in a country which plays a key role in oil industry and where astronomical budgets are allocated to encroaching on the waters of the Persian Gulf and creating artificial Palm Islands which lead to the alteration and destruction of local ecosystem and adverse changes in the tidal area and protecting it is not possible without oil energy consumption and high costs and soil erosion, introducing the Masdar project is more politically, promotionally, and economically motivated than environmentally!

The architect, eco-friendly and heedful of energy resources, must prepare the human environment in a way that it is located in the comfort zone. So, adjustment of the environmental conditions in a sustainable manner is a prerequisite. The climate condition, from the macro-status of the region (moderate, hot and dry, hot and humid, cold and dry, etc.) to the amount of rainfall, seasons of rainfall, the optimum light direction, temperature in different seasons, dominant wind currents, and the amount of moisture are among these issues an must be considered in design in terms of user convenience. In fact, the art of the architect is revealed through sustainable design which can create a micro-climate system within the comfort zone by minimal use of mechanical energy and maximum utilization of passive energies in a macro-climate system. Add to the list, consideration of security, health, and fire protection issues.

Material is another issue focused on in sustainable architecture. Material should ensure durability, statics, health, safety, and protection against natural factors such as moisture,
cold, heat, fire, and earthquake. In addition to reducing the cost of transportation, local materials derived from the location are the most adaptive with the climate condition of the region and due to the ready access, maintaining and substituting them over time is cost effective and possible for anyone. Clearly, in using the materials, we need to consider points such as its physical, mechanical, and chemical resistance and the toxicity and radiation (e.g. granite) and the quality and quantity of resources in regards to the soil erosion and cost efficiency of extraction. Again, it should be emphasized that in using the materials in sustainable architecture, all the biological aspects should be considered.

Of course, all the above mentioned items can be observed only when the process of designing to implementing run seamlessly and in perfect harmony in teamwork of urban developers, architect, construction engineer, electricity engineer, interior designer and technicians from the beginning to the end under the supervision of the main designer. A very fine point here which the architects apparently are not ready to change is that most architects tend to be loners and prefer to create ideas individually so that the building is registered under their name. Therefore, it is seldom seen that the main designers be receptive to others’ comments in regards to the design or be tolerant of their criticism. Even creating sustainable architecture not only requires teamwork, but also patience and acceptance of other users’ requests and unless architects stop to be so ego-centric and oppressive and manage instead of control, no design would ever really be sustainable.

So far, nearly all the major concerns of sustainable architecture which is today a prominent topic of architecture were presented. Usually, the followers of sustainable architecture do not go any further than this and environmental objectives are their ultimate wishes. However, from the point of view of my new theory of chaos in architecture which is introduced here, all these issues are merely the first step of the first stage of architecture and the rest are to follow!

3. Cultural Systems

If the followers of sustainable architecture make do with observing convinced to just climate and energy concerns, they won’t be able to create a humanistic and thus real sustainable space. As it was explained before culture also plays an important role. If the environment and nature determine the physical conditions and limitations without regard of which we cannot design, culture and the social context determine the psychological conditions and the behavior of people. The culture system creates cities and countries. It is due to the rise in human communication and the focus on respecting and spreading the culture that ancient cities had a natural structure and form. It is due to the lack of attention to the essence of humanity or culture that modern cities, despite the strict rules and innovation in form making, have lost their identity and livelihood. Any architectural building must be subject to the rules hidden in it which arise from the identity of the place, the culture of the society, and the soul of the time for the city to preserve its integrity as a system, survive and embody a specific location.

Culture in the system of architecture is determinant in all three sub-systems of the mind of the architect, the building and in relation to the users: firstly, the mind of the architect must have reached a level of growth by passing through the stages of perception and cognition that s/he be aware of the necessity of the cultural continuity and able to improve it. Secondly, s/he must have so much experience and awareness towards cultural context and its characteristics that s/he be able to reflect it in the features of the building and thirdly, s/he must be able to communicate with the employer and users of building in a cultural and promoting way and besides fulfilling their psychological, perceptual, and physical needs through architecture, prepare the ground for their cultural growth and awareness. That’s the only way culture would flow in architecture. Architects, who have not gained cultural conviction themselves, cannot build a cultural building. This won’t happen with imitation and repetition or imposition of architectural elements. Those who are always asking about the nature and reason of culture or consider it a behavior current in the society are those who haven’t internalize culture, and are never going to succeed in sound creation. Culture appears first in the soul, thoughts, approaches, ethics, and ways of socialization, speaking, and dressing of the architect and is then manifested in his/her productions. You can’t expect from people alienated from culture to promote the culture or reflect it in the building and don’t ever doubt that these people merely consider architecture a means to get to fame and riches and their relationship with the employer is at best, not so much about fulfilling his/her true needs and promoting his/her cognitive levels, but rather about his/her own domination and justification of his/her designs and approaches. Meanwhile, the true mission of the architect is to gradually preserve and promote the culture.

Cultural continuity and preservation of the identity of the location in architecture is important because humans, in order to cognize themselves and settle in the world, need to know the environment, trust it, and determine their path direction in the world and thus acquiring an identity. A fixed location is one of the most basic human needs. The growth and development of individual and social identity must be a slow process which doesn’t take place in an environment with constant changes. Piaget studies proved that the revolving and changing world connects the humans to an independent level of growth, while the constant and structured world free their mental powers.

A sound city must be created in the form of a chaotic system all of whose sub-systems homogeneously follow its determined frameworks including culture, environmental concerns, energy sources, economic resources, regulations, etc. and within any of them an amount of variety exist in order to create diversity. If it’s not so and anyone attempt to design and construct based on their own preferences and concerns and ignore the main configuration and the cultural characteristics of the city, the city would gradually lose its culture and past and thus, its identity and even the fundamental meaning of being a city. A place which constantly changes form cannot create a referential pattern in the mind and be known as a city. The determinant characteristics of a city must be old and fixed in order to create a pattern and be addressable. The essence of these characteristics must be spread through the city in order for the backbone of the culture to be preserved. Without these, we cannot properly define a city because nothing determined the city’s system and if we don’t have a definition for it; it would mean that it’s not a city anymore! The citizens of a city which is constantly changing and the face of any building is independent from the next one suffer and their mental power, instead of attending to important personal affairs and sound social relations, is dedicated to the challenges of improper changes, sound, visual, and environmental pollution. Tehran is an example of a city which is not city anymore! Those
determined frameworks which must define the bounds and chaotic system of city within them following culture and identity have been severed there: the bounds of mountains, watercourses, and the cultural legacy are constantly violated. There is no edge, no urban sign and even a constant path that the citizens can use to find their direction and consolidate their position. Neighborhood would be destroyed and all the aspects of making memories would fall victim to self-interest. When neighborhoods, as the most important identity centers of the city, are destroyed, the city, as the place where we take up root and home and thus a sense of belonging, would be destroyed. People would no longer attach any value and respect to their homes and would easily destroy it in order to build up a few smaller and dehumanized units upon one another. Others, whose homes, neighborhoods, and familiar signs are destroyed, no longer find anything to belong to, so they easily emigrate from their homeland. If city and citizenship is destroyed, the homeland is lost and the bond among the nation is severed. In a city where culture is lost, the lives of people are worthless and their homes are turned into goods. Humans without culture are devoid of humanity.

Determinacy and unpredictability of mental patterns confirm that humans don’t like to go through a change of the generalities. Human need a place with a specific identity which would change little by little over generations so they can innovate on a micro-level scale of their lives with its support and be ready to face unexpected incidents.

Cultural criteria and characteristics are among the most important factors determining the patterns of design. Note that since the culture, as described before, is a chaotic system, its vitality depends on its change and dynamism. That is, in addition to preserving the identity, it is subject to its time. If the cultural proof and architectural forms do not change as a consequence of the development of technology and materials and the change in needs and functions of the day, they’ll turn into tradition and as we know, tradition is rigid and fragile and is only able to survive in controlled conditions. This means, even though the old general cathedral in the center of the city is still enjoying the credit and respect of all people and culture fans, it’s not recommended to build a building just like it considering the wide access to modern technology. Whether we use traditional or modern technology to create repetitive old forms, we are still lying to people. In architecture, the way to preserve culture and cultural characteristics is to preserve the internal meaning and the familiar context and gradual change based on modern technologies, materials, and functions. This way, in a gradual change, architectural forms of the past may change into very different forms while maintaining their identity and audience of many generations later would still find them familiar. The architect must be adequately familiar with the cognitive and functional position of symbols, signs, elements of ancient architecture, colors, textures, and architectural forms of the country and by clever thinking, manifests his/her message in the design in multiple ways so that different social classes enjoy it in their own cognitive level.

In the discussion of the art, it was explained that art can never be born out of nothing and no one can create a work of art starting from nothing. Perforce, art is created from a context, the most accurate of which is the environment of the work. Otherwise, the created form would be like an alien object which is forced upon the digestion of a live system. People don’t relate to this alien creature and if this creature is able to be substituted with other supports, in the long run, it would cause a change in the system. Change in the system is positive only when it is presented in the context of a homogeneous system on a level so high that it improves the utilization of the space and the cognitive-perceptual level of the people and the general system of culture become inclined to be modified in its direction. Such changes are in fact considered the turning points of the cultural cycles which are represented in architecture more in regards to technologies of structure and materials. However, since geometry in architecture of any country is subject to the concepts and beliefs hidden in the culture of that nation, innovation and show-off in the form, although the easiest thing to do, is the most sensitive kind of change.

The intelligent human mind can never form patterns and be creative without the presuppositions and out of the general system which defines the relations and social institutions. Those who deny the history and culture due to the difficulty of researching about them, and try architecture outside of the environmental system, create an architectural form in four ways: at best, they resort to embodying other systems like climate, natural forms or forces or function; or basically, instead of making architecture, they make some compositions of volumes and shapes; or they blindly imitate others; or knowingly, replace their culture with irrelevant concepts or a foreign culture. None of these methods can promote the mind at the cognitive level. Most of the architects of the new generation have a series of illustrated books in order to create a work which make up the main source of their designing. So, intentionally or not, they import incongruous cultural shapes and characteristics into their country’s architecture and culture which disrupts the native system like a virus. We need to peacefully exchange and interact with other cultures in order to promote our culture without losing our identity as Gandhi beautifully put it: “I want the cultures of all lands to be blown about my house as freely as possible. But I refuse to be blown off my feet by any”.

The most important cultural characteristics of the design setting are the surrounding texture and architectures. If we were committed to the human institution, we would know that any new building is like a guest descending on the host, the city. By human standards, the guest is bound to be humble and respectful of the host. The guest must graciously and confidently sit at the table of the host so that little by little, its essence is revealed and affects the environment. If it is so, the ancient textures are never torn and while architecture is optimized over time, the city won’t suffer any arrests. Any building without an identity which is built with no regards for the message of the context would cause a great confusion in the environmental systems over time as a result of butterfly effect. On the one hand, it is further spread by others’ imitating of it and gradually, it turns into a chaotic system itself in a negative direction, and on the other hand, it kills the sense of belonging in people and cuts their relation to culture and collective identity and replaces social empathy with individual greed. Therefore, paying attention to the context and deep study of its history and culture is a fundamental rule of chaotic architecture.

After making the level of architect’s cognition and awareness and manifesting in the formation of space, the system of culture turns to the needs and approaches of the employer and the audience since all these arrangements are really to satisfy them. Undoubtedly, in designing a public building, the work is addressed to the general crowd in which cultural themes of the country are required, but in regards to a
residential building, the cultural considerations would be focused on the perceptual-psychological needs, religion and beliefs of the specific beneficiaries, their customs and specific spatial behavior in order to provide the desired functions and preparing the space according to those needs with the goal of promoting their level of cognition and awareness. The physique of the architectural building, while uniting the privacy of people with the city, is a container in which the architect, while maintaining the identity and individuality of the people, settles them in the context of the culture and society. Here, the serious mission of the architect, as the linking ring of the individuals to the society and the architecture to the city, is clarified. In this regard, the architect is bound to use architecture as a means to define the position of human in the city, the city in the country, and the country in the world like a psychologist who helps people to form a healthy relationship with the society while maintaining their privacy and individual identity.

Besides studying a branch of psychology and gaining mastery over the local cultural background, it is recommended that the architect becomes aware of the demands of the employer through several sessions of consulting and without imposing anything on him/her, fulfills his/her personal needs and also tries to attune it to the higher system of culture and guides the individual towards higher levels of cognition. The architect, as the social reformer, is responsible to protect the culture and promote it by innovation and creativity. This can be done not only through architectural form, but also by communicating with the audience and presenting reliable information. The architect shouldn’t submit to the employer and his/her requests because today, most people are either separated from their cultural lineage and have resorted to show-off and superficiality under the influence of imitation, the domination of media, the preferred economic values and social confines, or they are forced by economics into settling for a primitive and disqualified shelter. It is on architects to amend, by ethnological, climate and cultural studies, these destructive approaches and behaviors and thus the materials and spaces of poor quality, unhealthy, wasteful and abnormal while explaining and respecting the humanity of the employer and by spreading culture in the lives of people and embodiment of the real needs of people in architecture, bring the two area of public and private closer together. This way, the architects can gradually balance the level of people’s requests, stabilize the necessity of expertise in architecture, reconcile human and space, revive the position and status of true architecture in the society, and ultimately, amend and elevate the culture of the society. Here is where the architect, as the guardian of culture, is turned into a true cultivator of culture and revitalizes the dignity of humanity as the beating heart of the culture. This is the epitome of the mission of architecture.

4. Policies

Undoubtedly, the formation of any work of architecture, micro to macro, is directed by the objectives and requests of the employer and depends on scale, under the influence of current policies of the respective authorities. Macro designs of architecture and urban development are basically political projects themselves which are formed with affiliation to dominant centers. Ancient magnificent palaces and monuments are typical examples of these kinds of designs. The remains of Roman Empire’s structures including the temples, palaces, coliseum, baths of Caracalla, etc. are buildings which the kings built to display their power at the expense of a hungry nation. Persepolis is a perfect example of a political project which the great Darius built to ensure the union of various tribes of Satraps and yearly renewal of their pledge to recognize the Achaemenid as the center of power. Huge worship centers which were built with extreme designing consideration were in fact, specific religious statements of self-assertion and manifestation of the scope of domination. These were the super-systems which tended to answer merely to politics and not the climate and environmental conditions despite their high cost.

The Guggenheim Museum located in Basque Country, Spain that designed by Frank Gehry, is a work with no compatibility with the climate or cultural systems of its context. At a very high cost, titanium was used in the coverage of this building for the first time to increase its resistance against cold and rainy climate and mechanical systems were in complete charge of its maintenance. The people of Basque are very traditional people who speak the most ancient language of the Europe and are not familiar with such American ventures in designing. Then why the authorities of Bilbao spend so much money to build this unsuitable complex?! The answer lies in the political and economic requirements. The capital of Basque was in a bad position. Its economic foundations were crumbling and the rate of unemployment was over the roof. The city and regional authorities of the Basque Country started a major operational plan in Bilbao in order to stop the progression of degeneration. The extraordinary and strange building of this museum was the front runner for these upgrades. In fact, in the criticism of this building, the form and space doesn’t matter at all. This work is a subset of a huge political system which aims to trigger a leap forward in the economy and culture of the society in order to globalize the Basque and help its independence process. In this regard, the authorities acted very cleverly and with planning. Now, they own one of the greatest monuments of the 90s which can give this city a more significant presence among European cities and give a boost to the economy of this industrial city in decline. No work of art could attract more attention than the scruffy works of Frank Gehry. This building’s perceptual and environmental values are low and yet it attracts millions of tourists’ attention and draws them to itself with its bold stance in Bilbao so that the region benefit from its economic profit. Here, compatibility with the culture is not the point. The point was to change it by the presence of foreign tourists. The unusual and anti-cultural form of this project is the prelude to turning this semi-industrial capital (mainly shipbuilding industry) into the capital of a post-industrial city which of course, is not possible without the help of the superpower of US. Therefore, Basque bought the license to construct a branch of Guggenheim which was inevitably directed from New York. Connection with such a power center which would support its offspring was a calculated move. America’s media called Guggenheim which would transfer its rights for money Mac Guggenheim after McDonald. Before that, no museum has thought to sell its rights.

People’s houses also reflect their demands and their life policy as much as possible. But in the process of construction and urban development, governments and municipalities dictate their policies to the citizens through imperative rules and regulations. Creating a work without considering municipal regulations, national codes of construction and executive indices is impossible. Legal and civil constraints and civil rights are among other issues posed in the face of other
citizens and the government policies: all are free unless they obstruct others’ freedom. Construction and civil laws intend to control and regulate urban growth can be positive factors in design and control of urbanization as a super-system should not be considered as barriers we would want to overcome. We need to become adaptive to and consistent with them. However, it’s possible that many of these rules seem irrational and wrong but the right path is to amend these rules and then follow them, not run away from them or lure the eminence of the current tastes instead of knowledge and the relations and forms should be, but more economic.

The architect must deal with these issues consciously and responsibly so s/he can gain maximum efficiency in design within the framework of these policies. In other words, the mind of the architect should not be merely focused on creating the work in terms of how the relations and forms should be, but more than that, s/he should determine the scope of his/her work by acquiring information in circulation of laws and current policies and converting them to generative information.

The architect must consider the extremity of the current conditions and enforces policies and management in the work that could reduce the chances of error to a minimum so that the work would be closer to what was predicted. Since the design process and implementation is time-consuming, neglecting the smallest of issues can direct the system of architecture to an utterly unexpected position. In addition to climate conditions, the dominant culture and the general texture of the city, all the human artifacts in the place, even the sporadic ones (e.g. means of transportation) should also be considered. The adjacencies of the design, the dimensions of the site, and municipal regulations define the physical limits of the building. The situations and accesses and even the relative distances of the site at the level of region and city from service centers are important. The status of other buildings nearby including their architectural style, the number of floors, the age of the building, the building orientation, other visual-physical qualities are information equal to environmental information and should be considered as part of the context. The artificial environment could leave such an impact that even influences the dominant natural environment. Noise and visual pollutions, air pollution, fumes, green space, air or light being barred corrupted by other buildings are among these effects. While the architect must be adaptive to the super-system of climate, in dealing with artificial systems which act locally, the goal of flexibility and promotion of quality is in a way that a homogenous system is created at the level of neighborhood. For instance, if you are designing a residential house at a site with a building with red-brick rendering situated on one side and a building with white-stone elevation on the other side, choose a design and material which combines these two, not exactly contrary to them and not necessarily imitating them. Even if the texture of the region is basically random and heterogeneous, you still cannot ignore it.

Beyond politics, in most designs, economy affects the decisions deeply. Today, the budget allocated to a design is so important that in most instances, it becomes the first and the only priority of the designing. It can’t be denied that one of the most important reasons for the beauty and the human nature of past architectures have been access to inexpensive land and enough opportunities to define open and closed spaces and creating suitable views for the designer. Today that every meter of space is judged merely from an economic perspective and not in terms of perception, the scope of operation for architects is much reduced. The elevation of the building, instead of representing the volume of the building, has become a mask covering the surface of the building. Anyhow, considering the economic power of the employer leads to either never constructing the design (like competition designs), or being defaced, or being completely changed during the execution which is, either way, a waste of time and energy. Since the process of design and execution is long, rigid planning cannot predict its executive costs. So, in dealing with financial issues, the architect must act strategically.

All the attention to different issues is merely aimed at meeting the needs of humans as the intended audience of the architecture. In regards to public buildings, these needs are met according to the cultural systems and different layers of cognitive levels. However, in regards to private buildings, the needs of the employer and the real users of the building, general and specific psychological issues, tastes, interests, ideological and personal issues of the audience must be considered through several sessions of counseling. Note that as the architect, as the social reformer, is required to promote the culture and avoid repetition, here also, the purpose of adaptation to these issues is not to blindly imitate and carrying out orders. The architect, rather, must propose a design that generally meets the majority of demands and promotes the cognitive level of the user of the building by controlling the information and deep and adequate cognition of his/her inner and psychological demands. The employer should not determine the policy for the formation and physique of the building, S/he can only express his/her mental-functional needs and the architect is to meet those needs through the design in a way that it promotes the awareness, cognition, and taste of the consumers of the architecture and reforms their psychological condition. In this sense, the architect must have such a high level of knowledge and awareness that s/he be able to decide what’s best for the users even better than they themselves can. If the architecture is merely an act of taste and desire, and the design of the architect is based on tastes instead of knowledge and reasoning, the employer can impose his/her taste the same way and the architect would be defenseless.

Attention to personal issues in conflict with the dominant natural and cultural systems is more a matter of flexibility and a countermeasure rather than adaptation. The person we are building a house for, might be a loner with a depressed spirit. Our job is not to submit to his/her ill demands and make his/her condition worse. We must try to show him/her the joys of life. Giving in to him/her and creating a cozy, dark space is a betrayal to him/her. On the other hand, if we expose him/her and guide him/her to the outside by wide windows and bright light and sharp and reckless colors, we are adding to his/her anxiety and psychological repulsion. The most suitable space for him/her is a space with tender lighting of the morning which develops to a brighter state as the noon approaches, a closed and semi-closed space with average size, a bathroom with natural lighting, a garden and natural plants, furniture with specifically designed details, tender colors derived from yellow and orange, soft textures, etc.

All the following sections would be dedicated to how are the perceptual and behavioral needs of humans are to be met in space so that they can settle in the architectural building. In
general, the important issue is to meet the perceptual, psychological and physical needs of the users in the space. Otherwise, the space would impose itself on them, the message of the architect is not delivered to the audience and ultimately the users would change or run away from it.

5. Operational Limitations

As long as the design is on the sheet, it can be of any nature and condition. At the stage of finding the ideas and drawing the diagram, dimensions and the size and how to execute the design are not fully taken into consideration. But, as soon as we decide to build an architectural space based on that design, the operational realities must be taken into consideration. These realities can be divided into two categories of the conditions of the implementation of the design and the functional issues.

Undoubtedly, issues of structure, statics, construction technology, execution expertise, available technical facilities, materials and the accessibility to them in the market are among the determining constraints of the design. It is clearly observed that in architectural competitions, all these issues are ignored and most of the time, the winning designs are nothing more than a drawing on paper. In contrast, most practical architects, due to lack of familiarity with the executive issues, completely surrender to the dictated conditions and the decisions of the construction engineer which results in creation of repetitive structures and usage of material of the lowest quality possible. In practice, the construction engineer is one of the most important barriers to the art of the architect! Although it’s not possible to meet any expectation when implementing the design due to the limitations of access to construction technology but in normal circumstances, adequate knowledge of the architect regarding the structural issues can prevent the manipulation and domination of other engineers and make it possible to most efficiently use the available facilities. It’s very important that the architect be aware of different kinds of construction technologies at hand and the quality and reliability of materials. Lack of knowledge about these issues leads to either improper execution of the design or the design being always limited to the dictated conditions which are not real. This is while knowledge of the structural capabilities and construction technologies can give the architect an unrivaled power in appropriate circumstances which allows him/her to even go beyond the limitations.

Santiago Calatrava is a designer who believes the statics and construction technology to be the most fundamental issue in creating a work. Inspired by the skeleton and focus on its station, he created many extraordinary buildings which are not only innovative architectural masterpieces, but they are easily perceived by any human. Although his works don’t have the high cognitive level of a cultural masterpiece, but he is considered a global and international architect who by addressing the public perception using a global language, i.e. natural forms, considers himself accountable to the most powerful and universal force of the nature, i.e. the gravity, and of course provides it with an appropriate response. He designs all the spaces by practical standards and while keeping an eye out for cultural systems, focuses the most perceptual attention and aesthetic need to working his magic of statics.

Clever and appropriate use of material can also be considered one of the strengths of an architect. For instance, proper understanding of concrete and the additives can provide the architect with a wide range of facilities for provision of proper structures and innovative forms with diverse frameworks. As Pier Luigi Nervi was able to create invaluable works inspired by the natural forms by mastering the knowledge of statics and the properties of concrete. Since operational limitations and the construction technology are local achievements, they are not the obeyed completely dominant super-systems of nature and culture. It is rather the amount of domination and knowledge of the designer and access to the technology that determines his/her amount of freedom in regards to these systems. Usually, architects, due to lack of sufficient knowledge and assigning the decision making to the consulting engineers, operate in a much more limited circle than these systems determine. In a country like Iran, architects usually perform spatial divisions regardless of or with a passive position towards the structural requirements and the structural engineers also calculate the number of parking lot required for the structure regardless of the architectural design based on the parking lots. The result would be flawed spaces among thick columns which are set to accommodate the cars not the people! It appears that in practice, true pioneers of architecture internationally are structural engineers who are familiar with architecture or architectures that enjoy the consultation of prominent and creative experts in the field of construction technology.

It is also essential to point out those modern artifacts and technologies are not all useful and profitable. Besides damaging the environment, they leave some irreversible effects on human health which demands special attention from modern architects. Electric, magnetic, and electromagnetic fields’ contamination is a result of modern technologies. If these fields are caused by high voltage cables, they would cause conspicuous damage like leukemia, but we are not immune even on smaller scales. AC currents which change direction 50 times per seconds generate an electric field in all electrical appliances, lamps, and electrical cables which alter their direction 50 times. The adverse effects of these fields on the neurological system and the electric fields of the body have been proven to include headaches, dizziness, nausea, amnesia, anger, fatigue, inability to make decisions, and depression. The length, intersection, and improper covering of electric wires and failing to put the disconnect switch on the phase wire lead to the generation of an even larger and stronger electric field when the wires and light bulbs are off which affect the humans during sleep and wakefulness. If the earth wire has not been considered in the common wiring of the building, the engines of the electrical appliances also create a very strong magnetic fields which also cross the walls and pollute the whole life space. And of course, the most dangerous of all are the radiation emitted from cell phones, cordless phones, wireless internet, and satellite parasites which over time, cause incurable diseases and genetic alterations in humans. It appears that due to the effects of these radiations and fields on cerebral waves, today, our sense of time is much faster than in the past. One of the most important factors involved in our disconnection with the nature and the total loss of intuitive perception is the effect of these radiations on the brain. It’s time that designers adopt a critical stance towards these manifestations of modern life.

Another basic and important issue in architectural design is attention to the intended use of the building and its subspaces. This issue is important to the extent that “form follows function” became the principal motto of modern architecture of 20th century. The intended function of any
space anywhere is defined based on the type of behavior performed in it under the local and natural conditions, the micro- and macro-culture of the beneficiaries, and the operational limitations and the architect is required to gather specific information about these factors. Undoubtedly, the architectural design drawn with no heed to the functional need is basically not considered architecture. Designing the spaces must be done according to the definition of the type of behavior and the work done in them, anthropometrics and ergonomics. If the environment is not capable of providing a certain activity, that activity is not performed. The direct answer to specified use in design is taken for granted in this book. Although today it appears that we need to fight over such an obvious matter with some architects!

Among famous architects, there are many who are not able to meet the functional needs in the intended space or don’t have a good understanding of the human dimensions and size and scale and their work is therefore, not a humane space. The space should be able to facilitate the behavior that is supposed to happen in it and provide the conditions for the comfort and security of the user in terms of perception or physique. If not, that space should have a different name, purpose and function which need to be justified before execution. The famous architect, Peter Eisenman, in line with his struggle with modern architecture and his challenging of the function in architecture and deconstructing it, in the design of the building known as House VI, or the Frank Residence, included a column abutting the kitchen table which interfered with the placing of the dining table and taking most advantage of the space. He designed stairs which led to nowhere and just occupied space and stairs with no hand railing to prevent falling. He created a gap in the middle of the bedroom which makes using king-size bed impossible and other modifications that made using the bathroom difficult! His action and its results proved that the use of deconstruction in architecture is rejected. The contradiction present in the definition and naming of the space questions such actions in itself without needing any such philosophizing. Because if we believe in deconstruction, we cannot call such a project a house! If it’s a house, then no one is allowed to design it in a way that it’s inhabitable. If we name a space a bathroom, then there should be a place to wash your body. If there is not, the architect has no right to call it a bathroom and must deconstruct the name too. Then, see if anyone would accept it or not?! Ultimately, Eisenman was forced to amend these unusual modifications and return the house to its normal conditions!

The function more than and before anything else is a criterion used to judge architecture. Even if the natural and cultural systems are forgotten due to intellectual indolence and negligence and the legislators are bribed, if a work cannot account for the function, it is not considered architecture. In addition to the functionally defective examples mentioned, there are other cases where some claim innovation not by rejecting the function but by resorting to verbal fallacy in design. Still, it is the possibility of utilization that judges the space. For instance, although continuous surface occupies a special position in the structural terminology, formal exploitation of it is nothing more than fallacy in architecture. Some, without benefitting from statics properties of such a surface, build a building by the same conventional method of beam and column with limited spans. Then, by wasting much space, they superficially integrate the floor, the wall and the ceiling and supposedly deconstruct these elements, while according to the usage type, as long as man is positioned perpendicular to a surface in the direction of gravity, he will consider that surface the floor and upper surface the ceiling and the separating surface the wall. Cutting the perpendicular angles which also was common at the times of cavemen is not considered innovation in contradiction to usage!

Another case of such fallacies in architecture is figurative use of folding surfaces. Folding surfaces can be one of the most important fractal elements in architecture. Folding surface provides the opportunity for much innovation in the structure and for creation of infinite surfaces in a finite space which requires complex computations. The most beautiful, complex, functional, and ancient example of folding surfaces are found only in Iran: Iranian Muqarnases (stalactite works) are excellent examples of real folding surfaces which create structure and beauty in one package and are truly fitting an infinite surface in a finite space. But using a surface of folding surfaces results in the creation of forms of false plates wrinkled on the common structures of beam and column and of course, disproportionate and undue in terms of superficial ornaments: a folding surface diverted from its function, rather than being the structural factor or the architectural- cultural element, without calculated geometry, becomes an excessive, bulky, and superficial object hanging from the hidden bars and rabbets!

It is important to note that the work of architect is a work belonging to the society with a certain goal and function and it is at the service and open to the public. Painters and sculptors create their works in private and invite the public to see and judge them in exhibitions. Therefore, people go to see them on their own and if they will, they pay a price to own a work which would not be visible beyond the privacy of their properties. But the architect is not allowed to experiment personally using other people’s money and at the social level, to create forms before ensuring the security and possibility of proper execution of the building, to question the function of the project s/he accepts the responsibility of, to engage in pretention and deception without any fundamental innovation, or to behave based on his/her personal taste.

6. Formation of Architectural Scope

Once more, it is emphasized that the architecture is not a static object but a dynamic system that should act as a subset of the environmentally formed systems. This system must be able to cooperate with other adjacent systems and be adaptive to the systems bigger than itself. Otherwise, it would be inefficient. It would dissipate and would be reduced to a linear system which is destroyed with an increase in entropy. Here it becomes apparent that architecture is not a rigid product but a constant process that begins from architect's mind and settles in the mind of the audience. The chaotic system of the architect’s mind is constantly searching for proportionate values of changeable parameters which can conform the design to the surrounding conditions and environment. As long as the design exists in the chaotic system of the architect’s mind as generative information, it can find the best way to adapt to the outside environment using the methods of bio-systems and by converting entropy to negentropy, transform into the final information for execution. In this case, the entropy attracted from the environment is not destructive, but it provides the possibility of innovation and dynamism.

The conditions described in this section define the total borders of architecture. But the architectural design must be infinite in finite. That is, while its general scope and the
determining rules are specified and constant, the design itself is like a wide and infinite world. Its finitude depends on the outer circumstances and its infinity depends on the inner power of the architect's mind. The scope of the system of architecture is formed during the negative feedback within the four intervals of natural-climate, cultural, operational, and policy-making systems and during the following six stages, the system itself is formed during positive feedback based on the ideas of the architect and the behavior and perceptual, psychological, and physical needs of the audience.

The mentioned conditions are the chaotic systems themselves which are constantly changing and evolving: Climate- natural conditions are evidently chaotic basins of attraction. Population growth rate of a region, traffic and on the larger scale, the city itself is a chaotic system. The cultural-social issues are chaotic systems on large scales whose change takes place slowly (but noticeably). Psychological-personal issues, as discussed in previous chapters, fit into chaos category and financial-economic issues, despite planning, are still influenced by chaotic conditions of the market and its unpredictable and variable factors. Even the laws are changing and structural technologies, depending on the creativity of the architect, can enjoy a range of variety. Probably, spatial usages change the least and yet, internally, they are in fact, considered chaotic according to the definition of different cultures and human behaviors.

The above-mentioned do not constitute a borderline but they are scopes with variable and fractal boundaries. The building is shaped somewhere among them and must be able to cooperate with them as an open system. As long as the building is not built yet and the architectural building is not finished, it can still grow and change and adapt to different conditions and variable limitations. The intelligent architect is not defeated by narrowing the operational scope and the increase in limitations (not, of course, beyond the scale). If the financing is improved, s/he wouldn’t merely spend more time on the façade or addition of floors, but s/he would improve the entire system and if the financing is reduced, s/he wouldn’t neglect the execution.

Although such matters are a given for true architects, today, all of these principles are observed in designing by few architects. It is essential that these issues be accounted for carefully and reasonably so that they not lost in the rhetoric and the acts of taste. Most often, they consider these limitations obstacles and think the solution is to overcome them. But in fact, these limitations ensure the stability of the system. The creative architect can create an infinite entity within these limitations and originate a homogenous and improved system. However, designing in an infinite site with no consideration of the adjacencies and the context culture and the users and with unlimited financing, and elimination of the environmental and climate conditions with reliance on technology is in fact, designing a finite entity in infinity. No matter how famous the designer of such a work, from the point of view of chaos, such an object is not architecture: Casa da Música, Porto, Portugal, according to its architect, has actually been designed as a small residential villa which was rejected by the employer despite the efforts made. So the architect sold it as the House of Music without any fundamental change in the form, just on a larger scale! This building is like a spaceship of alien origin which has landed on the ground with no interaction whatsoever with the context. More accurately, it should be stated that the design was unacceptable on so many levels that at first, it ignored all the wishes and conditions of the employer and then, it basically stomped on everything this chapter emphasized on! Truly, if the architect is not accountable to provide some solutions and wouldn’t accept any responsibility for the context of the design, then what is the art of the architect? The true architect is someone who within the limitations of adjacency, with respect for the culture and beliefs of the owners of the work, according to the super-system of climate, within the framework of law and with limited financial resources, gives life to the functional and human spaces and creates a dynamic world in a determined scope.

It should be noted that the chaos requires the targeted observation of all the mentioned points. Unless we have a super-system so powerful that influences the others and is able to permanently support the baby system, i.e. architecture by itself. For example, it’s possible that the execution of a building is so important that it is infinitely funded. Or for security reasons, the cultural issues are ignored, or in a public building, the psychological factors are considered very broadly. Otherwise, if one or more of these limitations are ignored, the system might be born with inherent parasite and so its viability and permanence would depend on the importance of the role of that matter.

However, all too often, the design is of a mega-structure. In that case, the mega-structure is considered a super-system and some of the conditions might be included as its sub-systems and rather than the mega-structure adapting to them, they would comply with its terms. It is clear that identifying how to use the above mentioned matters is the responsibility of the architect and depends on the project. But it would never be possible to design a chaotic system with no limitations at all.

Architecture is responsible for organizing a space. When a building is constructed and finished according to the above matters, it becomes one of the determinants of the future designs. In optimum conditions, the architect’s design can promote the environmental, cultural, fabric-related, and practical qualities as much as a local system and in general, optimize the context of design in the future buildings. Similarly, if observation of these principles is deemed necessary for all, the first architectural work of art created can promote the general environmental conditions in a city in the long term through butterfly effect. It will, however, be a slow start but if it exceeds a predictable limit, according to the principle of universality, this effectuality would enter the phase of chaos and would increasingly, rapidly, and unpredictably promote the situation. Here, we defined the general conditions of creating the work, but in practice, only the architect who has reached awareness is able to identify how to implement these conditions and the determinant references through experience and study and act according to their priority.

7. Conclusions, Perspectives, Strategies, Useful Suggestions and Future Studies
To improve the architectural condition, it is essential that the architects leave their isolation and vague language behind and instead of broad description of their viewpoints, explicitly explain their ideas and use other people’s abilities in a group work in concert. It is also necessary that we equip ourselves with solid means in order to create a mutual language between the architects and the possibility of visualizing the stages provided by the architectural theory of chaos for describing the process of architecture. In this regard, the best
way is to redefine the conventional diagrams of architecture. At this stage, a very general and abstract diagram can be drawn. The diagram used in the first stage is an analytical diagram which is useful in examination of the conditions and the environmental factors and its effect on the site due to its universality. In fact, the diagram accounts for the analysis of the site before anything else. At this stage, the more we gather and examine environmental information; the lower comes the possibility of making errors in the final design.

References
Sanaz Eftekharzadeh was born in 1975 and is an independent researcher and the CEO of Iranian Association of Sustainable Building-City founded in 2014 in Tehran where she can focus on her research interests such as vastu Shastra, sustainability, Chaos, Cognitive science, Transactional Analysis, Semiotics, Persian literature, Aryan culture, archeology, ancient Iranian Mythology and patterns in art and architecture and finds the ways to apply the achievements in practical architecture.

She has got her M.S. of architecture from Shahid Beheshti University/ Architecture and Urban Planning faculty with excellent grade in defense. The subject of her thesis was applying of Chaos theory in architecture, focusing on cognitive science for defining a design methodology entitled: "Towards a Chaotic Architecture".

This theory presents a new definition and then new methodology for creating architecture. It considers architecture a system of distinctive minds of the architect and the audience and the architectural building itself, which is a subset of diverse environment, then chaos, as the agent defining the rules of the mind’s function and the nature and the connector of different branches of science and art, has redefined it as the best system for the human's physical / psychological/ cultural needs which can be named anthropocentric architecture. The achievements of the thesis has been developed in 17 years expanding on different scopes of cognitive science and updated outcomes of chaos theory to present the characteristics of the anthropocentric architecture in 7 stages. The book was published in Persian as: "from chaos of perception to cognition of architecture / a new theory to create an anthropocentric architecture based on laws of chaos" in 2014. In the same year the book has become the finalist of the international award of book of the year of 2014 and awarded as he book of the season in Iran. It also was the winner of the Dr. Mozayani national book award of 2014.

Sanaz Eftekharzadeh has participated at more than 30 national and international conferences and forums, T.V. interviews and academic seminars as the lecturer and architecture theorist and analyst and has presented more than 60 papers and articles in national and international journals.

In 2017 she received the title of "The Architect of the year" of Iran for the best architectural criticisms based on her unique theory. Before that she had been selected as the Best researcher of the year of 2010 by the ministry of habitation, roads and urban development of Iran.

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