Modular Architecture as a Synergy of Chaos and Order – Case Study Prishtina

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Abstract

Modularity has been applied in many fields and is always seen as a synergy of opposite sides, as: independence and inter relation; as standardization and customization; fixed module and flexible design; whereas this study will investigate a novel perspective of modular architecture as coexistence of chaos and order. The research methodology of this study employed combined strategy: of historical and comparative interpretation; and case studies as a phenomenon rooted in its realistic setting. This study aims on finding the most favourable answer to the informal architecture, residential buildings in particular, which are very often presented as chaotic. The chaos created by informal builders' actions implies that it's actually their living necessities for expansion that have emerged in such a format. The project proposal of modular architecture still respects the residential need for expansion, as dynamic vibrant organism that grows and changes accordingly to the needs and projections of its tenants. The modular architecture remains a powerful and visible expression of resident's requirements and dreams, only channelled into an ordered module and strategy.

The specific context of Kosovo (where the informal architecture has been quite evident), has been used for a better comprehension of a problem, but the same approach can be easily converted into other architectural stands and contexts.

1. Introduction

It is believed that the architecture contains order and chaotic elements at the same time. By manipulating these two elements, outstanding designs can emerge. Chaos and order is a combination that represents true quest for the future. This study tends to elaborate the flexible approach, transformable in form and content, at the lowest cost as possible, to residential buildings in particular addressing informal architecture as a threatening phenomenon in environmental, economic and social development. Our focus has been the city of Pristina as one of the most affected cities in the region by informal and unplanned buildings or planned buildings adapting to a small group of interests and destroying the urban structure of the entire city. Since 1981, there has been no proper population census in Kosovo. After the recent conflict, Pristina is overloaded with population, it is estimated that during the day, there are approx. 500 thousand citizens. According to the latest statistics made by the Municipality of Prishtina, only in Pristina (during the post-conflict construction period) the number of illegal constructions exceeds the figure of 43 thousand objects of different categories, such as: new constructions, extensions of different types, garages, occupation of public spaces, etc. as showed in Figure 1. City is facing serious problems, due to: fast urbanization; expansion of the city boundaries; illegal constructions; bad construction practices; overloaded infrastructure; outdated urban plans; weak institutional capacity; unemployment; social differential; environmental challenges [1].

Therefore this study will consider the modular, flexible and prefabricated architecture governed by the order as a basic principle and sufficient criterion for meeting the diverse needs of residents and at the same time will try to answer the research questions:

1. How can the synergy of opposite stances such as "chaos" and "order" be achieved?

Figure 1. Identification of buildings without and with legal permission in Pristina;
(red-without permission; blue-with permission); (Source: Municipality of Prishtina)

Figure 2. Illegal construction in Pristina
(Source: author's photo)

2. Is modular architecture a solution for informal architecture and social problems?

The methodology of this study uses a mixed methodology design, it was considered that a more integrative approach to research will complement the shortcomings of only one method [2]. The raised problem is of a complex nature whereby multiple methods from diverse traditions are incorporated in one study. The specificity of the subject allowed original tailoring of the alteration of the phases, entailing the combination of not just data collection tactics but also distinct research designs, such as: Interpretive-Historical design of modular architecture in three distinctive cases;

Urban analyses of the site in Prishtina; Archival documentation of informal buildings in relevant institutions; Verbal / visual analyses of media representations; Configurational analyses of representative projects; and Computer-based spatial and building analyses.

2. Chaos and order in informal architecture

This study aims at addressing the informal architecture through modular architecture as synergy of chaos and order, therefore the informal architecture will be segmented into the two opposite stances, so that later

in this study, can find its correlation through modular architecture.

2.1. Chaos in informal architecture

By aiming to address the issue of informality in architecture, regarded as an unpredicted growth and leaded by the user's life style necessities (Figure 2), the natural investigation line of the study leads the treatment of the *chaos* as theoretical discourse. One of the main achievements of chaotic theory is its ability to show how easily models and organizations can be created when their final result is unpredictable [3]. Same as in informal buildings, *whose pace is hard to track and the actions of the people are based on different assumptions and not reliable data's, endangering firstly themselves and the others around them; by not following any building codes, ecological misuse of environment, or by occupying arable land. Being burden to the city and at the same time burdening themselves from the full usage of the benefits of the city, and never having the sense of security [4].* The chaotic system never returns to their initial state, their further development continues to produce unpredictable results.

The chaotic development is characteristic to the informal architecture, and identified as such, it must remain as part of the solution. The objectives of a "chaotic" system in this study are to create a new architecture, environment tolerance, different, "n" spaces and perspectives.

2.2. Order in informal architecture

The informal architecture cannot have a true correlation with *order* in its rigorous justification. In this study it is the order itself which aims to be a solution to the informal architecture. As Albert Einstein, when supporting Le Corbusier modular architecture said, 'it is a scale of proportions which makes the bad difficult and the good easy' [5]. The only order found in the informal habitation is the order of function, since the entire architecture has been created as a respond to the needs of the inhabitants, implicating, it has been created in harmony with their life style order, and in return it functions just fine.

While on the other hand if the user's necessities need to be fulfilled, then this continues need for expansion, adaption, needs to be formatted into regulation and standards, which can be controlled and manipulated within certain *order*. Same as Le Corbusier noted that pure architecture is led by simple geometry laws that produces forms and embeds them into an easily calculated design/layout. This order is governed by laws that mimic or are inspired by nature [6, pp 9].

The current architectural phenomenon established on astounding technical acquisitions expressed by means of the purest geometry, the modern architectural phenomenon brings us to the heart of the mathematic domain…. constantly meeting and overlapping on precise formulas which are the formulas of greater efficiency, inevitable functionality, more beautiful proportion [6, pp10].

Informality is characterized by growth and change, a phenomena that needs to be taken into consideration when addressing the issue. If these aspects can be fitted into an ordered strategy, a simple mathematical order of functions, a framework which allows the expansion and change, than the informal becomes ordered and formal architecture. The integrated order must enable the user to become the leader of the changes of their living space, having in mind that the tenant of the illegal building is always led by its own interests autonomously from the system. Therefore the proposal should enable the replacing or adding elements within their living area but without damaging the rest of the object.

3. Modular architecture

This study represents modular architecture as a synthesis of chaos and order. What modularity makes possible is *ordered* strategies in which architects define numerous variations that provide different functions, features, with dynamic performance of resident's choices, which is viewed as a *chaotic* from the outside configuration and exterior.

Modules are units in a larger system that are structurally independent of one another, but work together. The system as a whole must therefore provide a framework—an architecture—that allows for both independence of structure and integration of function [7]. This modularity brings several advantages such as reduced financial investments especially when the scale and scope of the project is relatively large. In such cases, it is a practical and economic option. Architecture needs to create structures and projects that are capable of providing the flexibility to customize the living space for individuals. The specification of the modalities is critical to the design of flexible architectures that allow you to substitute component variations within a design without having to make adjustments in other components. With modular architecture, the users can become the drivers of the module variety. In effect, the advantage of modularity allows the module definition to shift from architects to its users/community [8].

For a better comprehension three distinctive cases of modular architecture have been analysed. These cases have assisted during the design proposal by tackling specific issues, be it in a capacity of advantages or short fallings.
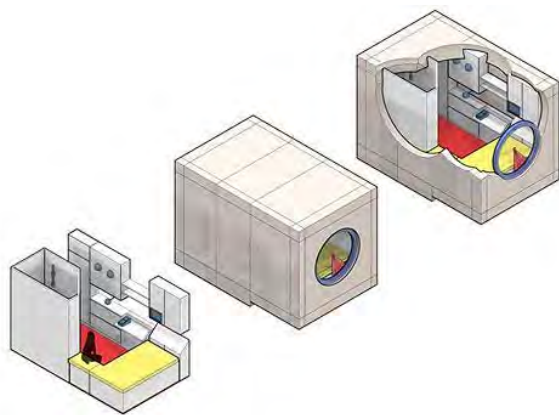
Figure 3. Nakagin Capsule Tower [9]   Figure 4. Habitat 67 [13]

The Nakagin Capsule Tower, built in 1972, in Tokyo (Figure 3), designed by Kisho Kurukava was chosen for its emblematic role in Japan's postwar cultural resurgence [9]. A total of 140 capsules are stacked and rotated at varying angles around a central core, standing 14-stories high and completed in just 30 days [10]. The modules contain all the needed amenities for one person to live in, although the capsules were designed with mass production in mind there was never a demand for them [11]. The idea of expansion and adaptability did not happen, reality deviated from the anticipated future. The replacing of the capsules is too expensive while the durability of the materials was of short and unpredictable lifespan since the architect used the Japanese way of building with natural materials [12]. The building has not been maintained for more than 40 years, and there are various stands toward its existence: the ones that want the building to be demolished and the ones who appreciate its symbolic meaning and try to keep it.
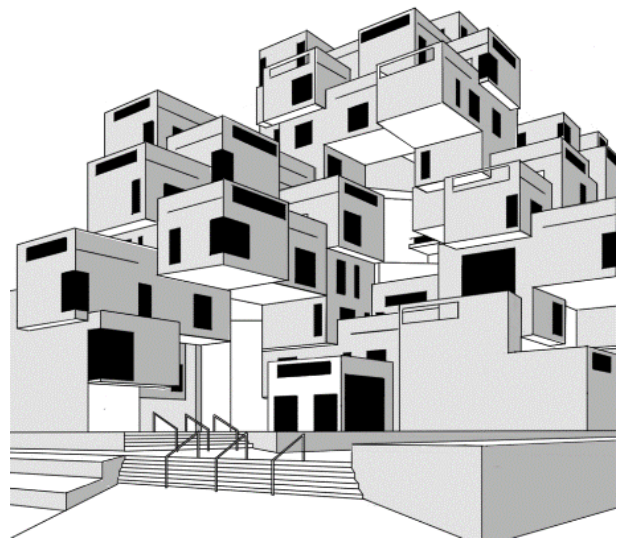
The second case study is characteristic since it seeks to reconcile quality of life and urban environment by rethinking living spaces building. It's chosen for its captivating work, which keeps on inspiring. Habitat 67, was designed by Moshe Safdie, in 1967, in Montreal Canada, as the Canadian pavilion for the 1967 World Exposition (Figure 4). It was originally intended as an experimental solution for high-quality housing in dense urban environments. Safdie explored the possibilities of prefabricated modular units to reduce housing costs and create a new typology of residential units with high quality living in a high urban growth. The module is the basis, 354 identical prefabricated concrete modules are placed one on top of each other in various positions that form 148 residential units in different sizes. All come together in a giant sculpture with a rich interior, large terraces, air space, glass roof at different angles [13]. The year it was built, 1967, was marked by social change, which fostered the emergence of a new openness and to the world it is still a dominant element in the Montreal landscape.

The third case is of a recent projects and of new emerging architect, Alejandro Aravena as a winner of architecture's top prize, the Pritzker, at the relatively young age of 48. He tackles many fronts, from guaranteeing very concrete, down-to-earth living standards to interpreting and fulfilling human desires, from respecting the single individual to taking care of the common good, from efficiently hosting daily activities to expanding the frontiers of civilization. As in his speech as a curator for Venice Architecture Biennale 2016, under the title *Reporting from the Front,* he emphasized the role of the architect as being challenged to serve greater social and humanitarian needs [14], and true to its words his project, such as the Quinta – Monroy (Figure 5), where the architects together with the government, have contributed meaningfully to the discourse of social housing. Their solution of providing a basic quality house, for a very small amount of money, was to provide half of the house. By working closely with the residents of squatters that had lived unsteadily on an urban site, the architects designed a lot of capacity for the community to live their lives and which could then add on and expand their house whenever possible, and in many different ways, customizing and individualizing their spaces [15].

Each of the three cases comprises elements that will be treated into proposal projects, Nagakin Capsule Tower for its original aspiration and inspiration to later architecture; The Habitat 67 for its actual remaining magnificence same as at the initial appreciation, by addressing a high quality living space in densely urban environment; and the Quinta Monroy for finding a descent solution to great number of the low-income habitants. It is at this point where this study is considered to extend the literature and concept of the modular architecture, with its creative endeavor on addressing the issue of informal architecture in an original setting of Kosovo.

4. Modular in informal architecture — Results and conclusion

The correlation of Modular architecture and informal buildings is seen as a natural bond, having in mind that the modular architecture arose as a respond to the post-war and post-construction initiative of rebuilding the place. Modular was an instrument with which architects tried to maintain their control over post-war production [6, pp.9].

The informal buildings in Kosovo are a byproduct of the recent war, where the legal vacuum of post war period made possible a massive informal undertakings [16]. The illegal architecture/settlements is an undertaking of numerous individuals each with its own interests and desires. The different lifestyles and their everyday concern is represented in an uncoordinated and chaotic look of their built setting. One of the main challenges of today architecture (especially in collective residential buildings) is finding a way how architects can design altogether with the community, by trying to find the principle design strategy that needs to be used, in order to accommodate all diversities of needs and desires of the users. *This axiom recognizes that human beings have an innate ability to improve their living space by changing their designs.* Value-seeing and -seeking are what ultimately cause designs, hence living space to improve and to become more complex [7, pp 93]. Modularity, allows various designs, while achieving low-cost for development, as well as cost saving in design and construction.

Location: As a basic feature of the project proposal is the location itself, which includes a large space in the center of Prishtina. This will make the position more attractive and more representative. Based on the Regulatory Plan of the site, the plot is in harmony with the surrounding, and vividly maintains the vertical as well as horizontal
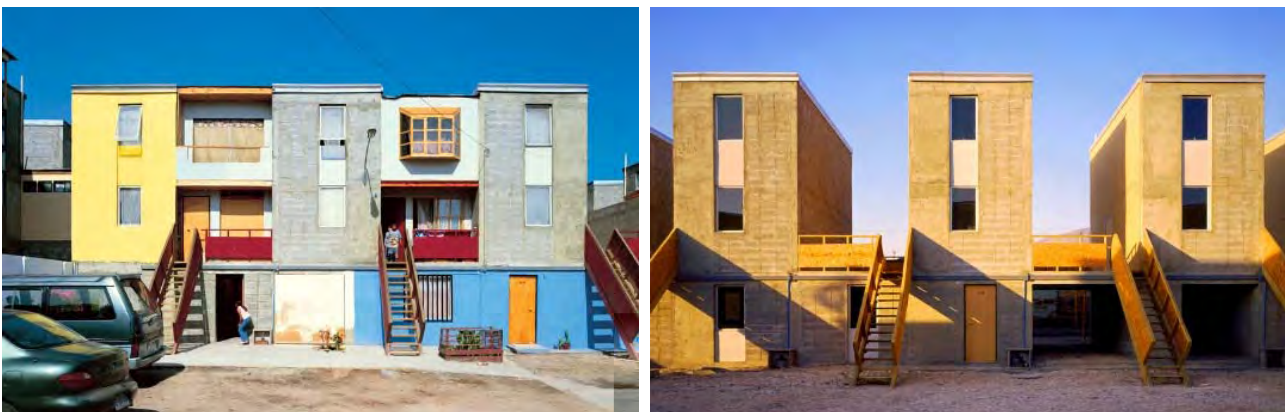

Figure 5. Quinta – Monroy [15]

Figure 6. Dardania– neighborhood (source: Berat Istogu)

Figure 7. Dardania neighborhood 3D model

proportionality [17]. The construction of the buildings in the urban area "Dardania", dates back to 1946. Post conflict period (1999) of this neighborhood is characterized by usurpation, illegal buildings as well as degradation of common facilities and spaces. Dardania location was chosen as the most suitable site in Prishtina, due to: the available regulatory plan for this area "PRRU Dardania" (which is still actual); Streets provide easier mobility for pedestrians and vehicles (Figure 6); Most of the area is defined mainly as residential area with high rise buildings; and appropriate orientation of the building within the location. Most of the area is largely defined for high rise residential buildings with some mixed use areas, mainly commercial

(Figure 7). The plot for the development of the conceptual design of modular architecture is oriented in the North -South stretch.

The situation in which the conceptual project is foreseen, is in block 8d of the urban regulatory plan of the Dardania neighbourhood. The terrain configuration is steep, and bordered by streets on its three sides. The surface of the block 8d is 22045 m2.

Floorplans: The concept of organizing such residential buildings with a modular, flexible function and the ability to transform without changing the basic shape (Figure 8) requires that the interior spaces needs to be carefully designed (Figure 9). Especially the vertices
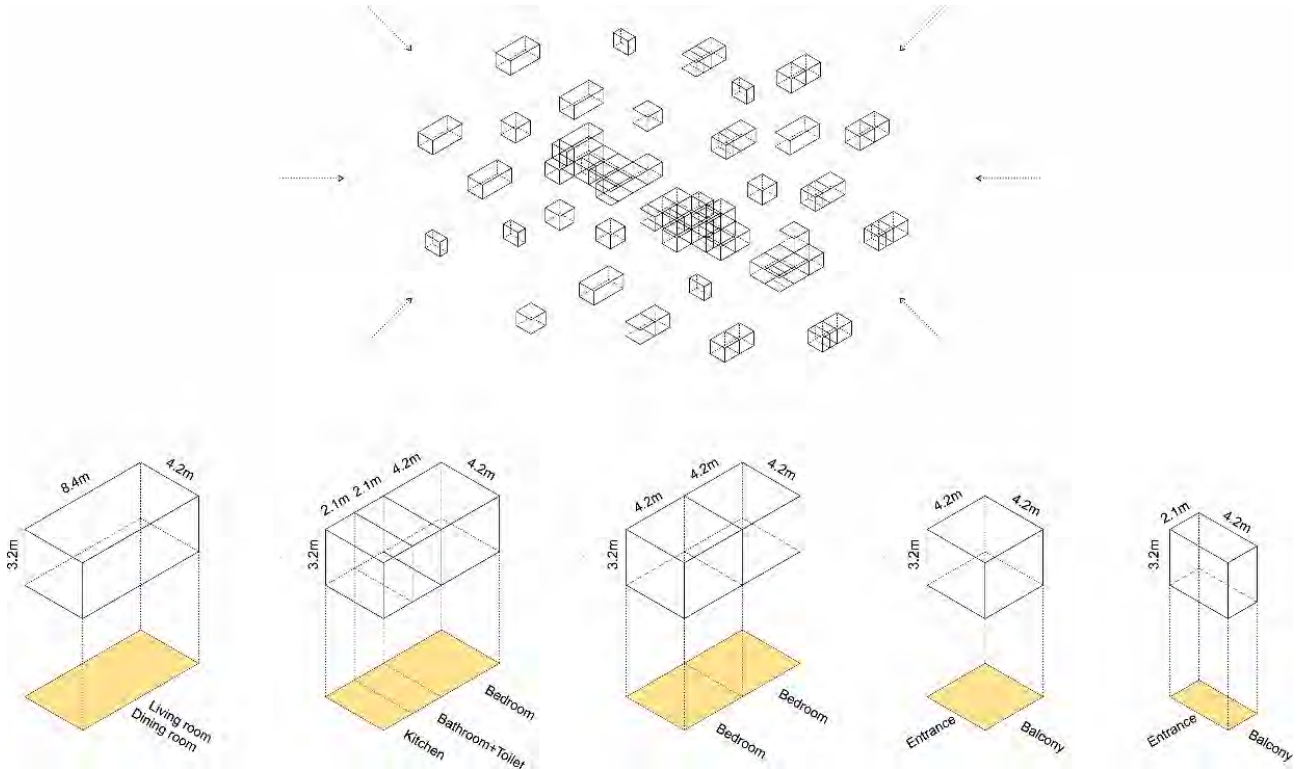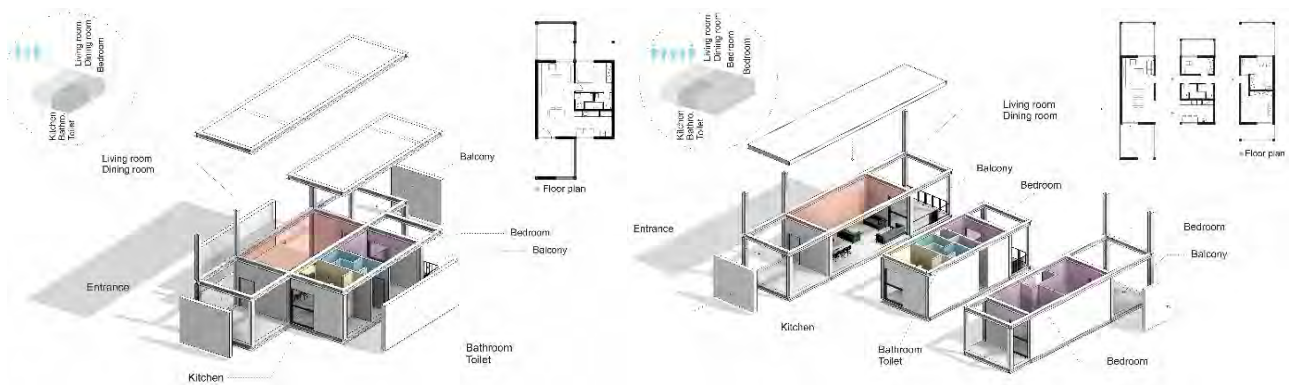
Figure 8. Modules

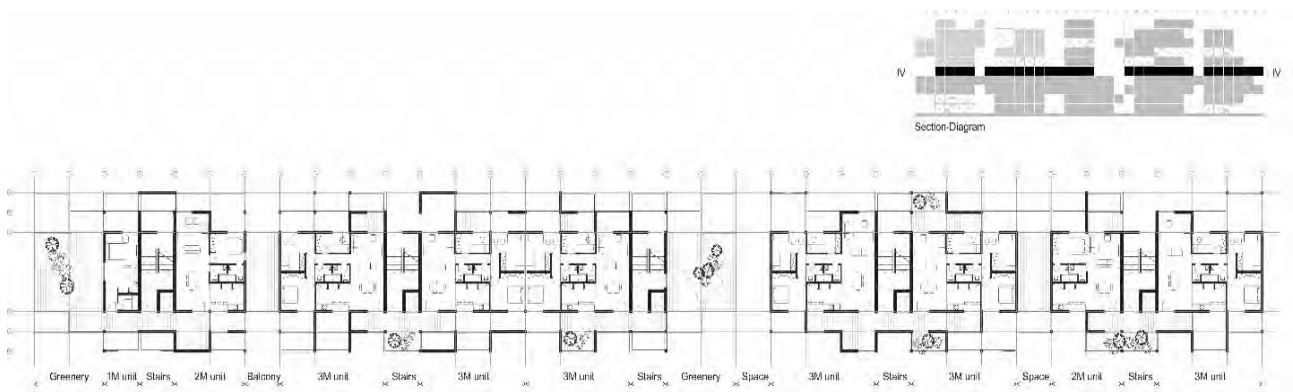Figure 9. Modules within the living unit for different size of family

Figure 10. Floorplan of the level four

(baths and kitchens) need to be situated in a favourable position which can be easily interlinked and adapt to the future changes that may arise. Another aspect to consider is to ensure sufficient natural light to the moving modules.

The ground floor is foreseen for different commercial use and business needs, while the first floor is designated for administrative use respectively offices with different activities. If necessary the ground floor as well as the ground floor-I can be easily transformed into residential units.

The floorplan, of the second floor up to the ninth are conceived to be residential units of different sizes (Figure 10). All residential units are anticipated to be developed in these floors with variety combination that is most conducive on meeting different requirements for different families. While basement will be used as parking area, and the rest will be a storage for the substation of heating, water tanks and storage for different resident's needs.

The idea of such an organization has been to create a concept of organizing a hybrid object with many functions and characters that will suit the changes of the time, and at the same time enrich the contents of such a compound that would be more attractive and more conducive to the development of many activities that would enrich people's lives in particular (Figure 11).

Facades: Careful handling of the facades of residential buildings is as important as their function. The importance of the line in art and especially in architecture is crucial to adequate expression. In architecture, the lines are formed with planning and many architectural, constructive, functional and decorative elements. During the design and analysis of the facades and the whole form, particular attention has been paid especially to the character of the object - in what way these façades reflect and show what is actually happening in that object, for what this object actually serves . It has been attempted that the object, the spaces and the form of the object, clearly and definitely determine the destination, the importance of the object and our conceptual order.

The facades are modularly conceived, with a 4.2 m wide module being divided into two equal parts: one side of the module is a window while the other is a wall materialized with ventilated facade materials. The windows change its position in such a way that they are not repeated during the same vertical. Part of the facade is of steel structure which is visible from the outside, and besides the constructive aspect of the building it plays a very important role in the aesthetic formation of it.
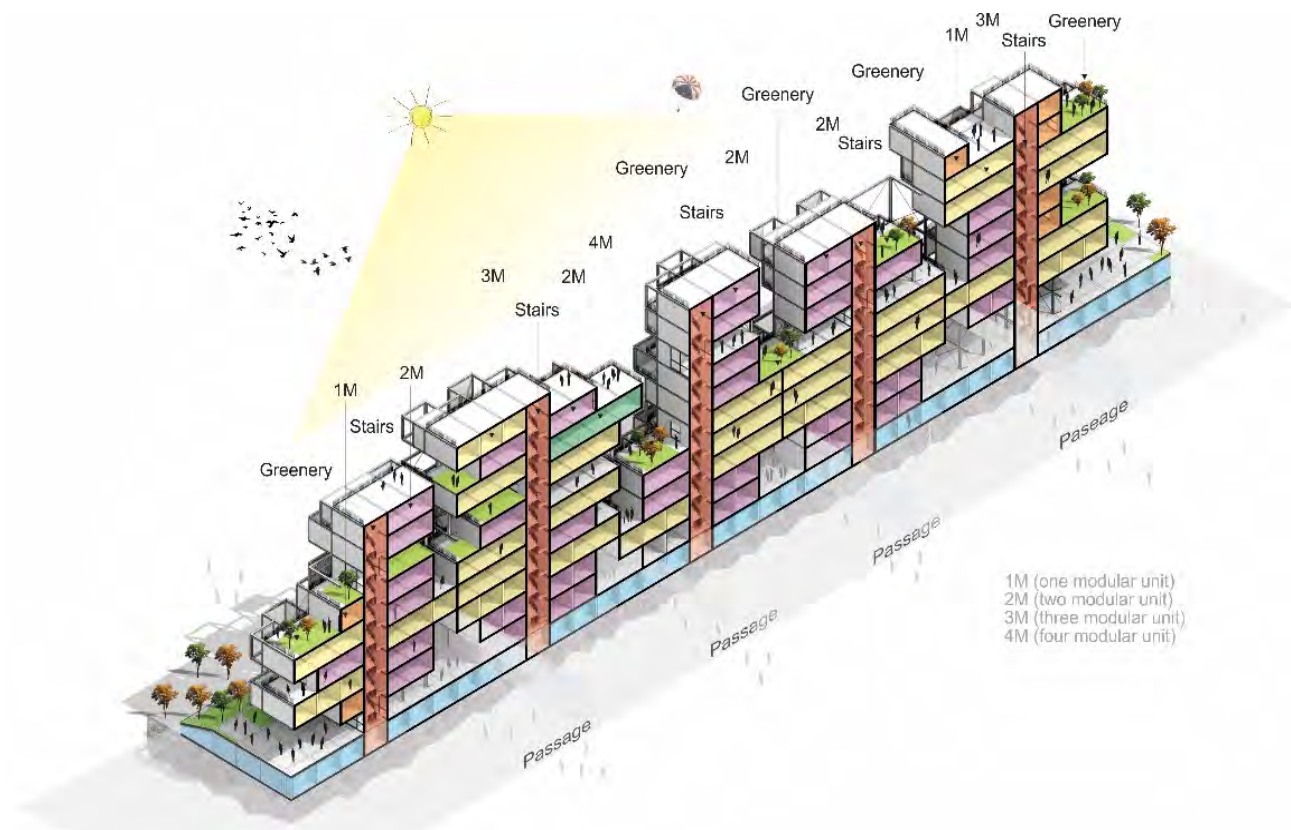

Figure 11. Axonometric section of the hybrid object with many functions and characters
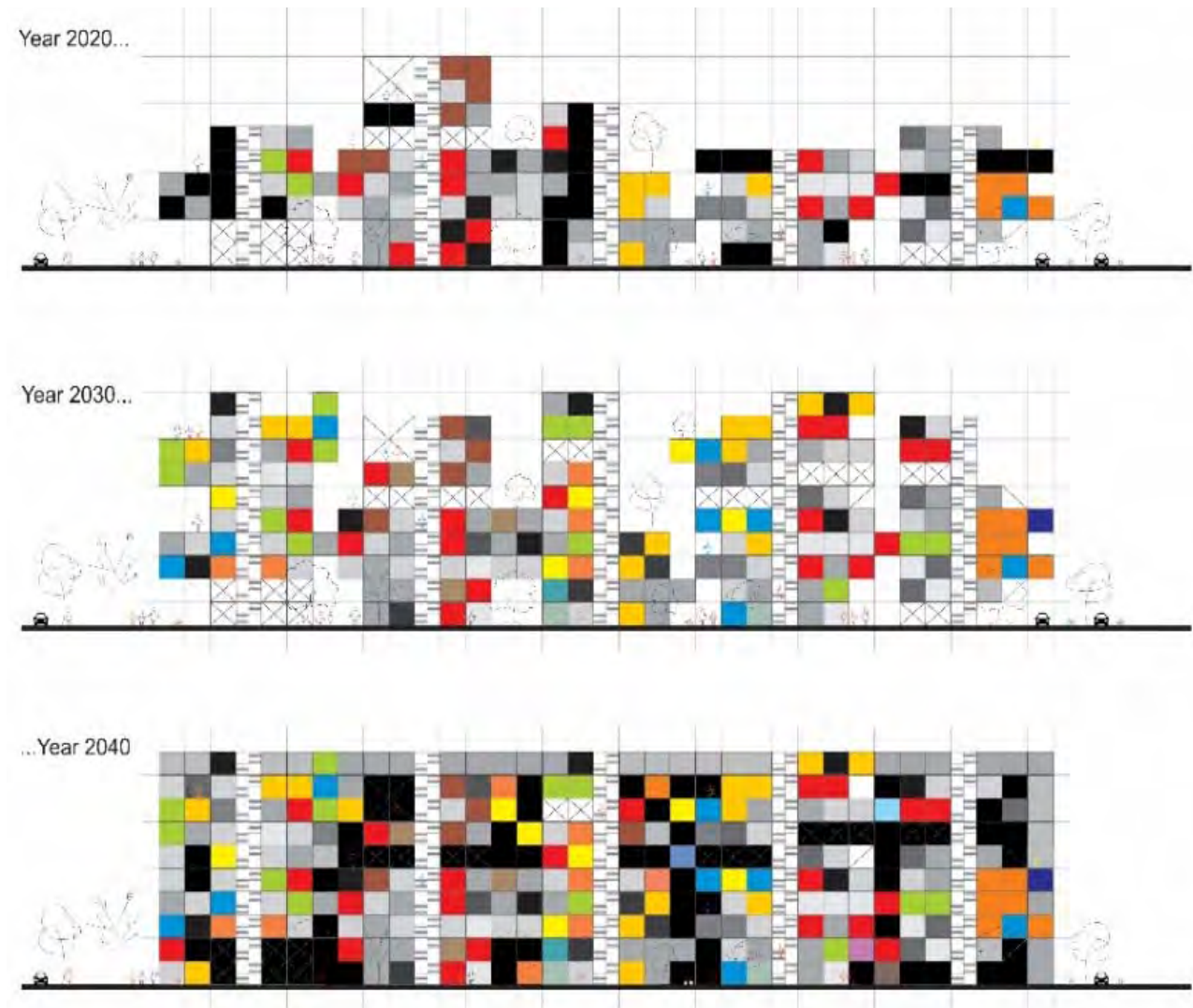
Figure 12. Development projection of the building, progression in year 2020; 2030; 2040

3D Model concept: Space composition of the proposed building is conceived as a composition of two spatial forms: the architecture formed by a closed body that isolates / confines a space inside it, as well as the architecture formed by an open body that embraces a space that is connected to endless continuity.

Figure 12 foresees of the progress of the building within 30 years, by reaching its full potential of expansion. The development of the 3D concept of this work is also closely related to the modular concept, flexible architecture, the idea is that this flexibility should be reflected in the exterior of the building and not just in its functional organization (Figure 13).

The modular shape combined with the volumes that emerge on the: façade, in the balcony and gallery section, aims at giving a dynamic and flexible appearance the object, so that from the outside its dynamicity can be felt and experienced.

5. Conclusion

The study aims to challenge the issue of chaos created with informal architecture, the study still remains within these discourse, but this time leaving it visible only in the exterior appearance. The informal buildings/ settlements are built upon the base of anarchy, they are unsure of their setting, the chaotic development is a natural process that signifies change and development (even if associated as a negative aspect in the context of informality), the chaotic development needs to be noted, as that is understood as life necessity of those living in it. The project proposal still respects the residents need for expansion and growth, as dynamic vibrant organism that grows and changes accordingly to the needs and projections of its tenants. The proposed project of modular architecture allows this expansion and this change, which in any other case would appear chaotic, however in this study, all modalities of:

expansion; flexibility; prefabrication; low budget; sustainability; were analysed and as such were channelled into an ordered forms. The project proposal remains a powerful and visible expression of resident's requirements and dreams. The greatest power is that the modular approach raises the design to a more strategic level, where all stakeholders co-design the space.

A very important issue which needs to be further developed is that the adaptation to modular design needs to be understood and supported by city/state officials. It works out best with the involvement of the local people, architect and the government/agencies departments for a more effective realization. The modular architecture has to be a strategic decision, not just a technical one, because it decides the future options of the city. Modularity is already beginning to happen in a number of industries. The biggest advantage would be that the modular architecture would enable the city to think about developing a strategy for a broad approach, including plans for future upgrading of the city-life and its inhabitants.

Architecture "Ordered Chaos" is architecture led by possible geometric/organic rules and ordered strategy, with the integration of chaos in the sense of creating an impression to the observer as impossible to comprehend, anticipate and aesthetically diverse composite. What leads to such perception is the chaotic architecture representation but based on a consistent and easily accessible rule and algorithm of the function. Architecture has to move to "n" dimensions and should surprise the observer, in these cases it should not be foreseeable.

The project proposal of this study is relevant and can address other social and architectural issues first and foremost because of the today dynamic city and trans-cultural trend. Modular architecture is driven by dreams as much as by everyday concern.

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Figure 13. Modular architecture as a solution to the informal architecture

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