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INTEGRATED TEAM FOR PROGRESSIVE HOUSE IN THE XXI CENTURY

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ABSTRACT

Rapid urbanization to solve the housing problem is a reality in many parts of the world, in Asia, Africa and Latin America. The current severe economic crisis and the unemployment that will result will bring this issue again to the European agenda. This crisis is increasingly pointing to a subsistence economy. The single family dwelling with a piece of land for farming is becoming an option as an alternative to the tenement block. Solutions have to be easy to use and adapted to different conditions and different people. Construction processes have to be quick, simple and optimized. The solutions that have been implemented - pre-fabricated houses with small areas - despite being economical and using rapid construction methods have, with few exceptions, poor architectural and urban quality. The designer's task for these housing projects for prefabricated non-progressive houses is fairly straightforward, requiring only a degree of sensitivity in the composition of the urban agglomeration. But when it comes to progressive housing, designers face a number of problems: 1. Prospective - the evolution can be urban - this requires predicting the growth of the cluster and all its urban, architectural and technical implications; 2. Economic sustainability - housing and urban settlement should support cost-effective solutions - must be adapted to the local construction market, with regard to both technologies and materials; 3. Flexibility - the solution of the evolutionary model of housing should be sufficiently flexible - so it can be adapted to different circumstances, e.g. geographical or cultural; 4. Easily manageable - the evolution of each dwelling shall be managed by its people should be sufficiently controlled so as not to detract from the set.

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All these constraints imply a rigorous method for their application. After the definitive module provided for all situations, it should be easily put into practice to make it viable in many situations. It needs a project that is simple and efficient to implement. This type of program, however, is a difficult challenge for architects. The project is perceived as an industrial product that can be applied anywhere, and it rules out the possibility of close control of its implementation and construction. In the case of housing, this fear of the way it evolves is even greater. The building will grow over time at the hands of the inhabitants. The progressive evolutionary housing project assumes a distinct approach to project methodology, and a greater complicity between the various design specialties is inevitable. All the fields should be complementary, to achieve an integrated answer, to optimize the implementation phase and thus simplify the construction, in any situation and any terrain. An integrated progressive project, in an inter-disciplinary approach from urban, to architectural and to construction.

Key words: Progressive House, Open Building, Sustainability.

Introduction

"En este "malpaís" de escorias y ceniza dejado tras de si por la erupción financiera, bajo el que no se reconocen ya los paisajes familiares de la indulgencia y el capricho, parece imprescindible levantar una arquitectura de la necesidad, a la vez lacónica y coral, donde la disciplina de la austeridad se reúna con el placer y la conveniencia de lo comunitario." (FERNADEZ-GALIANO Madrid 2008)

More than ever, the role of today's architecture is to improve the quality of life. After a season full of false economic hope, "housing for all" is coming back on the agenda. It is not only in countries that were developing programs in the eighties that they think of national housing - in the coming years Europe will have the same problem. The mass prefabricated houses construction of the 1950s have become obsolete; they are static and do not allow an adjustment to the growth of the family. Today, they have turned into social ghettos of dilapidated buildings.

The economic and social crisis that we are witnessing today is resurrecting the urgent need for the rapid construction of economic housing, of technical and professional quality, and it is no longer acceptable to put people in precarious, eternally provisional situations.

In certain countries such as the UK and Chile, solutions to resolve this problem were achieved in recent decades. The governments launched a challenge to construction companies to develop and solve the housing problems of each region, together with Municipalities within partnership processes.

In Chile, a team led by the Catholic University partnered with an oil company, COPEC (Chilean Oil Company), and created the 'Elemental' by the architect, Alejandro Aravena.

"Its field of action is the city: the development of housing, public space, infrastructure and transportation projects that can perform as an effective and efficient upgrade in the quality of life of the poor. ELEMENTAL operates in contexts of scarce resources, using the city as a source of equality, and moreover, as a shortcut to correct inequalities."(ELEMENTAL 2008)

Figure 1 : ELEMENTAL Quinta Monroy, aerial photograph; 150 Houses Complex | Built: 2010 | Initial Built Area: 28 m^2 per unit | Expanded house: 70m^2 | Location: Lo Barnechea, Santiago. Chile

For the first time, building companies, design offices and university research centers worked together towards a common goal, to find a model of housing adaptable to various situations and urban or rural contexts.

"How can we design housing that is flexible enough to accommodate users' desires and needs, both before and after occupation?"
(Schneider and Till 2007)

The construction-related industry sees in these experiments the opportunity for the prefabricated house to be shaped not only as a final product, but by the building systems for the different constructive elements involved in home construction. Like in open spaces for offices, it is now possible to build a house as a kit, where one can buy a bathroom, a kitchen and wardrobes and erect them inside the support. The open building. (Kendall, 1999 # 98)

This new industrial approach of architectural design emphasizes the need to streamline the building process. It has brought back pre-fabrication work to the drawing board, particularly in the process of parameterization of the process, which starts in the design and culminates not in the construction but in its use. Architecture

today has increasingly moved toward design, particularly the processes of design and construction, just as the Bauhaus tried to find solutions to an earlier crisis.

The concept of the House has changed for these teams. An evolutionary house does not imply highest construction costs; on the contrary, in the medium and long term it is a more economical solution than a home poorly suited to adaptation and evolution. A house can be an evolutionary durable home, reducing maintenance costs.

This approach provides a new condition for project methodology in architecture, forcing a holistic view of the building which involves an integrated project. The project is a system of solutions.

For a project that aims to be universal, it is almost obligatory to look for simple and industrialized building systems that point to pre-fabrication.

It does not make sense that large-scale housing is built with construction processes that are highly dependent on manual labour. It is the duty of the project to optimize the construction process by simplifying the construction system, seeking to adopt easy methods of prefabricated construction. Factory production is faster, cheaper and more accurate. In evolutionary homes in particular, the structural system should be very easy, because the simplicity of the growth of the home must ensure the continuity of its quality.

"In the rush to construct, short-term expediency overcomes long-term sense."
(Schneider and Till 2007)

The Evolutionary House As A Mirror Of Modernity

The notion of the evolutionary house comes from the concept of the home. When Man settled down, he built a more resistant home than the ancient shelters where he had lived until then. They were the direct consequence of the trinomial - 'space, function, and available raw material' – and evolutionary because they were sequentially adapted to the needs of family experiences in their own home.

Even when the house does not initially have the capacity to change, it is common for its inhabitants to gradually adapt it to the history of the family. This is the history of architecture. Take churches as an example: the buildings are successively changed, extended or modified in order to mark the tendencies of the time. In homes, such changes occur due to the need for personification, identification of place, life changes, adaptation to new demands, new technologies or new regulations.

The increase in the household will require a shift from one typology to another during the life of the family: 1st Stage - childless couple; 2nd Stage - couple with small children and 3th Stage - elderly couple.

In this last stage two different situations can occur in different cultures: either the second generation remains at home, or the children move to their own home and the parents are left alone again, but now with motor difficulties associated with age.

The question that arises in the design of an evolutionary house is how to manage these changes?

Modular houses are defined as homes that grow in a built-up area and volume and allow the transformation of the interior space. This evolution should offer the possibility to manage the construction according to the financial means and family situation, adapted to different conditions of mobility.

"Tan solo cuando los individuales pueden tomar decisiones sobre la planta y equipamiento de su vivienda, verdaderamente será posible decir que dicha vivienda expresa sus aspiraciones personales."(Habraken 1979)

The evolutionary theme of the house is directly related to the flexible home. A House concept that adapts over time to user needs, be they personal, economic, constructive, etc. A house is flexible when it allows all settings to be easily changed, joining or separating spaces, and the technology involved easily performs this evolution. The industrialization of housing is inseparable from the pre-fabrication of building components, and the modularity of the design of these houses. In 2007 Elsevier published an important document that brings together studies by the Sheffield School of Architecture between 2004-6 by researchers Jeremy Till and Sarah Wigglesworth, and Dr. Tatjana Schneider (Till, Wigglesworth, and Schneider.) It defines the principles and types and presents a set of examples.

The principles of mass production embraced by the automobile industry in the 1920s had an effect on the construction industry and consequently architecture. In the 1920s and '30s, Germany tried to solve the urgent problem of relocation to large cities with the help of industry prefabrication; in the 1940s in the USA, new towns were built at great speed, thanks to the coordination between the components industry and the streamlining of the construction process.

Since the Industrial revolution, many architects have studied this issue, especially when dealing with the pre-fabricated building system as a base. From Frank Lloyd Wright to Gropius, Marcel Breuer and Le Corbusier, in every generation this has been a recurring theme for industry, in architecture and engineering.

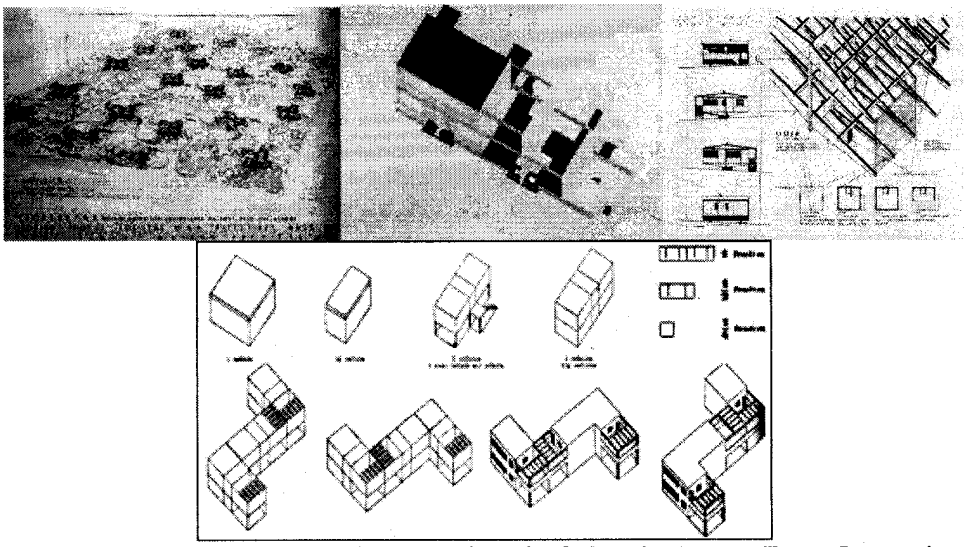


Figure 2 : Frank Lloyd Wright, 1942 cloverleaf; Gropius Torten Estate Isometric 192628; Marcel Breuer, Plas-2-Point House, 194, Le Corbusier Casa Dominó, 1914

In 1929, CIAM introduced the term flexibility into the lexicon of contemporary architecture, in response to the dynamism of modernity. In Germany in the 1930s, Alexander Klein studied the standardization of housing, and in the Netherlands, Van den Broek studied the spatial flexibility of housing in the short and long term. Studies by Mart Stam on the everyday flexibility of housing have actually appeared (Schneider and Till, 2007).

Every year since 1940, MoMA has promoted exhibitions in the gardens about the industrialization of housing. The purpose of these exhibitions is to cross the trends of contemporary architecture with more advanced pre-fabrication technologies. Examples of other exhibits are the Dymaxion Deployment Unit by Buckminster Fuller, 1941, and until recently, in 2008, Home Delivery: Fabricating the Modern Dwelling, where several prototypes were built - the Cellophane House, the Micro Compact Home and System 3.

Open Residential Building

In the 1960s and '70s, social participation in the design process in modular houses had the answer to family needs over time and their financial capacity. John Habraken, Dutch architect, developed a set of studies on mass housing and how people could participate in the decision-making process. In the book De Dragers en de Mensen, Het einde van de massa Woningbouw (Schneider and Till, 2007) he developed a method for designing modular houses combining industrial production and the ability to adapt to different individual needs with no great effort by the resident.

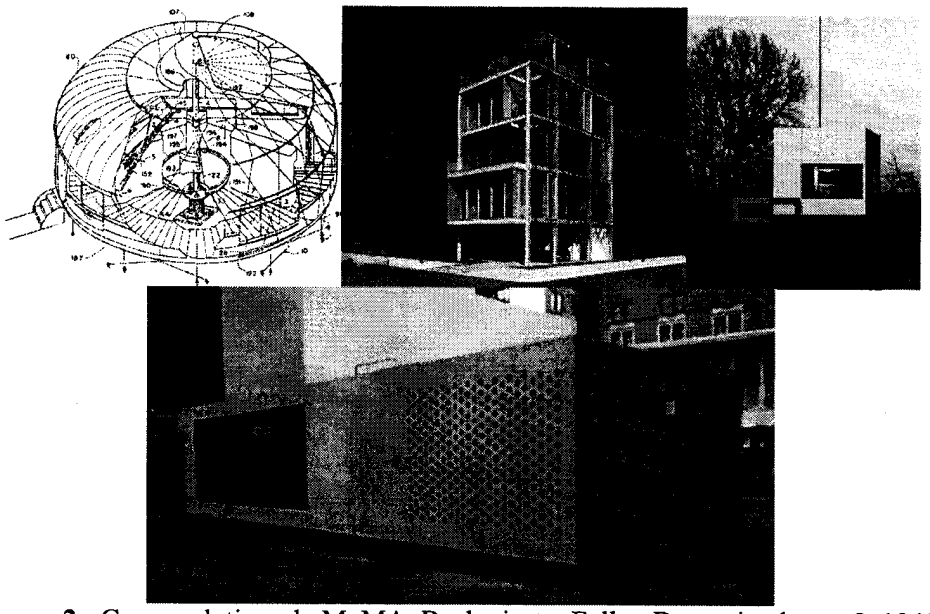


Figure 2 : Casa evolutivas do MoMA: Buckminster Fuller, Dymaxion house 2, 1941; Cellophane house, 2008; Micro Compact Home, 2008; System 3, 2008

In 1971 came a study that would become central to the issue of evolving housing: "Variations: The Systematic Design of Supports", edited by SAR. Directed by NJ Habraken, SAR was a scientific research group, part of the Design Methods Group of the Department of Architecture at the Polytechnic University of the Netherlands in Eindhoven (Habraken, 1979).

At that time, the Dutch government was investing in housing solutions that would boost the development of this theme in the European architectural media, where scientific research and professional practice worked hand in hand. SAR developed a design method for the efficient construction of mass housing, the beginning of Open Building.

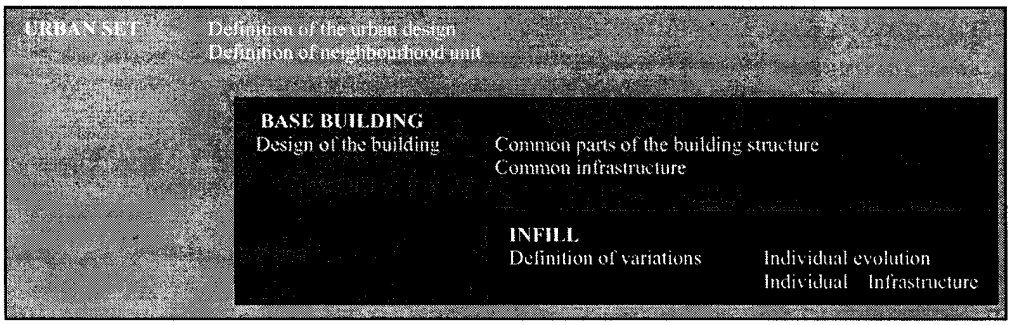
In order to combat the rampant industrialization of housing in the Netherlands, the SAR group acquired the role of mediator between the architects and the construction industry throughout the entire network, trying to find a working method that articulates the various quadrants.

The methodology developed by the SAR group later gave rise to the onset of the Open Building movement. Part of the CIB working group W104, this movement has been developing methods of work, arguing that in the project design of certain buildings, possible changes that have arisen over time should be considered.

Definitions

The architect, sociologist and inhabitant should work as a team, and take an integrated view of construction, from project design to the composition of the team, from the definition of the urban scale to the optimization of the construction process.
The method is based on a set of easy to understand guiding rules and variations:

1. The house must be designed for different people, so common infrastructures and common constructive elements should be built together, the Support;
2. Each house, designed to allow transformation, is composed by the Support and the Infill elements;
3. The Infill is constructed by attachments, unifying the houses or even changing the initial function of the proposed house.



Although the definition approach by the diminution of scales, from general to particular, is not essentially a new project methodology, what distinguishes it is how each of the scales of work influences the development of the sequence. In each phase rules are established that will shape the next phase of the project. The work flow is a process of decision making with specific players in each phase looking for the relationship established between all agents in the process interacting in two areas of responsibility and decision-making:

1. Inhabitant - can change and adapt their housing to their way of life;
2. Local authority – establishes the urban regulations, construction and expansion rules.
3. Project team – defines the support and the evolution of the infill.

This transforms the way of defining the design and construction system, separating from the beginning what is Support, therefore more durable, from what belongs to the Infill. The project is a definition of the performance criteria to which each element should respond, separating the scope of technology from the performance:

Support – the permanent part of the building with the services, infrastructure and public areas and housing units in installments. The infrastructure of each housing unit is fed to the common infrastructure, which must be durable and able to incorporate any type of system.

Infill - A complete building system, manufactured entirely off-site, the kitchen module, the module bathroom, interior openings, exterior openings, etc. In addition, walls and all elements manipulated by the inhabitants in the evolution of the house within the support also belong to the Infill.

Like a hive without honey, the support is a "backdrop building" that allows different units of housing to be easily built in different time slots, but with certain rules and restrictions, combining the regulatory requirements and performance. With increasing speed the focus in the construction process must be not on the design of a single house but on separate building elements and systems. In the USA, there is a steadily growing industry that develops specific equipment for OB homes, the ready-to-assemble (RTA) (Kendall, 1999 # 98); Construct the house type; Plug and Play.

These areas will define the different levels of decision-making at various scales. Urban level, Support level, in-fill level (Kendall, 1999 # 98).

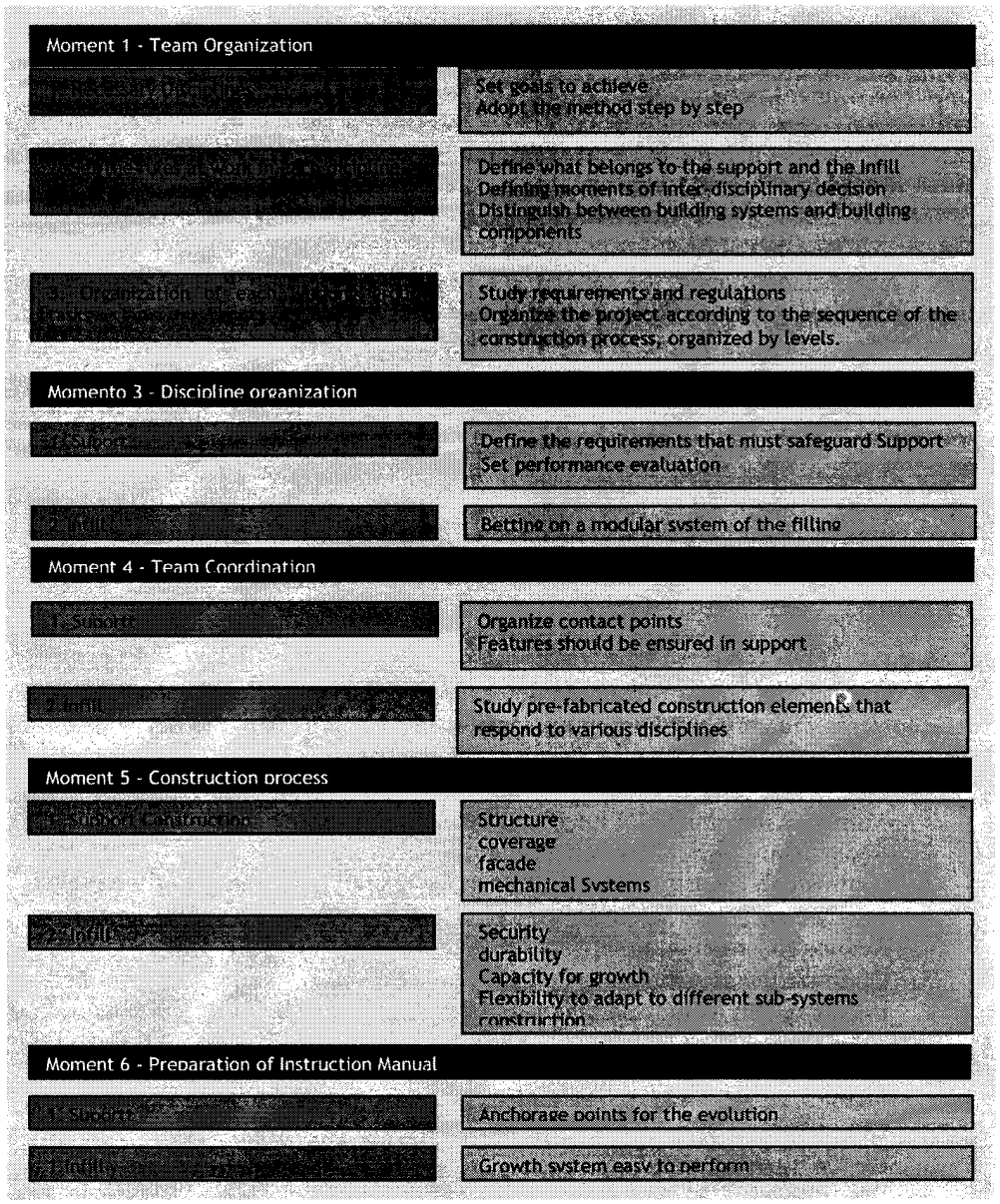
Aims and objectives

Based on the optimization of the construction process and effectiveness of project development, structure building by the Open method approach to the development of the project's goals:

1. Minimize the number of interfaces between the various disciplines;
2. Reduce the conflict between the various subsystems;
3. Optimize the constructive elements in the overall management of the various sub-systems;
4. Reduce construction time;
5. Optimize the construction process;
6. Encourage innovation and industrial development of building subsystems;
7. Take advantage of technology and local knowledge.

Conclusion

Crossing the methodology of industrial product development and building construction requires a multidisciplinary design team, and the intention of this work was to systematize the design tasks in order to optimize the construction process, combining the capabilities of each construction site with the possibilities the industry offers in each region.



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