

Typo-morphology: from research to architectural education

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ABSTRACT: The contemporary city presents itself as an urban organism of great complexity, consisting of an increasingly number of elements, systems, dynamics and extracts, which makes their reading an equally complex task. The method of typo-morphological analysis, it is assumed in this context, as an important reading tool of the city, giving order to what is naturally disordered through a classification process of the different elements that structure it – streets, squares, urban blocks, buildings, plots, among others. It is precisely from the reading of two structural elements of the city urban fabric, the urban block and the street, that we seek to illustrate the applicability of the methodology and its usefulness in the academic education and as a tool in the (re) design process of the city.

1 INTRODUCTION

The urban fabric, both in its public and private component, reveals in the diversity of its shape the tension between transformation and resistance. This is the result of constant need for man to reinvent the place where he lives. The systematization of knowledge relating to this process of change and to interventions that have occurred in the built fabric is the key in decoding the physical and spatial structure of the city and in its own consolidation/design process.

The complexity of this process makes the articulation of the architectural education with research activities increasingly significant and even directly with the architectural practice. The method of typo-morphological analysis, as a classic reading tool of the city, can contribute to strengthen the link between these different fields of action. It presents itself as an important tool for the apprehension of the urban phenomena, to stabilize and consolidate ideas but also to check the adaptability and consolidation of some concepts, in periods of disciplinary uncertainty.

The article aims to show that this articulation is a reality and it offers added value in the moment of thinking and designing the contemporary city, mainly in the academic context. Its therefore important to explain that this study is related to the development of two parallel researches – “The Lisbon Urban Block: from Shape to Type” and “Emergent Streets. A morphological interpretation in Portuguese urban context” -, whose methodological basis is strongly influenced by the research laboratory FORMA URBIS Lab. This lab to which we belong is composed

by professors of the University of Lisbon - Faculty of Architecture, research fellows, masters and Phd students developing studies related to the thematic of city urban form. The presence of a productive research environment with a common focus - the city - understood from tested and stabilized methodologies - the typo-morphology – makes available both to academics and students useful tools for the process of reading, interpretation and design of the city.

The article shows, at first, the developments of both researches by using the method of typo-morphological analysis, applied to two structural urban elements of the city public and private component, the street and the urban block, analyzed in different urban contexts of Lisbon. Secondly, it tries to show through the work done by university students the utility of this methodology in the understanding and design process of the city.

2 THE TYPO-MORPHOLOGICAL READING

2.1 *Studies and approaches*

The typo-morphological studies have assumed since the mid-twentieth century an important role to understand the dynamic of the urban fabric. They reveal their physical and spatial structure based on detailed classification by types of the elements that shape its urban form - open spaces, buildings or streets (Moudon, 1998).

It's composed by an analytical and a classification process that is important to explore according to the studies and approaches of the different urban

morphology schools with particular focus on Italian, Anglo-Saxon/German and French.

The morphological analysis is framed within the analytical process of reading, being realized from a common procedure in this field - the morphological decomposition. Reading the city from the decomposition of the urban system in morphological elements - streets, squares, buildings, plots, topography, etc. - connecting them to each other and relating them to the context, can be seen in the work of authors such as Lynch (1960) and Cullen (1961) as a way of perception the built environment. If the morphological elements compose and organize the urban fabric, study their mutual relations contribute to the explanation of the city.

The typological analysis as a classification process aims to differentiate the Types, recognizing and systematizing its characteristics, differences and their relationship with the urban context, historical period and the society that originated it. This allows us to build a typological framework that makes easier the interpretation of the different elements that shape the city. The construction of the Type, and its corresponding typology, should not be seen only as a systematic act of classification, but also as an important design tool, as advocated by Carlo Aymonimo (1966).

The initial studies of typological analysis, linked to urban morphology were conducted by the Italian school, which is characterized by understanding the city as an "architectural organism" (Muratori, 1959). Taking the present as a starting point, the study begins with an interpretation of the urban fabric as a result of an evolutionary process shaped by the changes of the architectural typologies.

The work of Muratori (1959) is an important reflection about the physical component of the Italian city, especially for the definition of analytical tools based on the concepts of urban fabric, type and typology. In this study, Muratori stabilizes the concept of typo-morphology, based on the reading of physical form as a result of an evolutionary process. The concept of Type (Building-type) is understood as a theoretical and abstract exercise, a kind of interface between the real object and the man mind. This is an exercise that allows us read, but also conceive. The Type is a starting point for the creative and design process. These settings were at the genesis of several works in Italy and Europe.

On the other hand, the Anglo-Saxon and Germanic school is based on the analytical characterization of a particular space in a certain time or over several times. M.R.G Conzen is probably the main reference with several morphological studies of small towns or British urban areas, especially the analytical reading of Alnwick in 1960. In this study, Conzen mainly uses the plots structure, but also the street and the buildings, as basic elements for understanding the urban form. This methodology would have a signifi-

cant impact on the Anglo-Saxon world, on authors such as Jeremy Whitehand or Ivor Samuels, Micheal Conzen and Anne Vernez Moudon in the North American continent.

The French school as the Italian arises in the 70s in response to the modernist principles and models, with important methodological contributions. Issues such as the evolution of the urban fabric and the organization of the plots structure (Castex; Celeste; Panerai, 1980); the fragmentation process of the closed urban block to the modern building (Castex; Depaule; Panerai, 1997), and the relationship between the built element, plot structure and public space; or the urban form classification by different deformation processes (Borie; Micheloni; Pinon, 1978), are all issues worked by a large group of authors who belong to this school.

In this context, it is important to refer two essential and complementary studies for understanding the city. The first - "Analyse Urbaine" - reveals the city form through its decomposition by extracts, fragments or samples. The second one - "Projet Urbain" - Panerai and Mangin indicate a more operational sense. The analysis of the different urban elements, and its diversity and classifying processes, reveals indirectly some projectual suggestions that can generate new systems of urban production.

The French school introduced a new methodological dimension, a more refined critical sense, differentiating the design theory "as an ideal" from the design theory "as a practice". Thus, the French school studies provide essentially working tools to guide the project design (Panerai, 1999b). It makes more valuable the role of typo-morphological method in the city understanding and project.

3 URBAN BLOCK

3.1 *From shape to type*

A reading that addresses the issue of the urban block, through a typo-morphological study, allows us to stabilize in a ordained way the knowledge about the processes, rules and models that build the private city. More than that, it is relevant for the understanding of the multiple design possibilities that this element offers to the contemporary urbanism, a result of its different evolutions and changes over time and space.

The city of Lisbon presents itself as an exemplary space of practice and manipulation of the urban block design. It is evident the tension between diversity and unity; urban fabrics that have suffered long processes of sedimentation (Alfama) and others designed as an integral unit (Baixa Pombalina); operations who reject the idea of urban block (Olivais); others more recent representing the recovery of urban block as an element of urban composition (Parque das Nações); between different development

phases of the city; and even between different natural supports (hills, valleys, river front). It is in the actual city shape and its evolutionary process that we recognize their different dynamics of urban production.

The aim of this topic is not to find the types of Lisbon urban blocks, being that the purpose of one of the PhD thesis in development, but rather to reveal the methodological framework that will contribute to its identification.

The typo-morphological study of the urban blocks unfolds in two different phases, complementary and essential to read this element: the morphological analysis - individual approach to the subject of study; and the typological analysis - comparative approach. It's the aim of this topic to explain with more detail each of these stages, using some representative examples of Lisbon urban blocks.

3.2 Morphological approach

Two types of readings - the Decomposition and the Evolution, will support the morphological characterization of each urban block selected as representative of Lisbon urban fabric.

The first reading seeks to decompose the urban block through the study of the different elements that gives it shape and the relationships established between them: the building relationship with the plot; the plots structure with the shape of the urban block; the relationship of the dwelling organization with the built fabric; the relationship of the built fabric with the urban block shape; the urban block relationship with the shape of the city.

Assuming these relationships, six elements were considered as able to reveal their complexity - the Topography, the Perimeter, the Plot structure, the Built Fabric, the Courtyard and the Building.

The Topography, because it is repeatedly the constraint and generator of the urban block design and the urban fabric diversity, established in the combination of different natural supports - hills, valleys, river fronts, among others. The Perimeter, by the definition of the urban block boundary and the physical form of public and private city, organizing the buildings from the street and articulating built and empty spaces, public and private domains. The Plot Structure, because it is one of the main supports of the urban block dynamic and organization. It is shaped from different plot aggregation types- regular or irregular - regulating the form and density of occupation. The Built Fabric as a result of the buildings aggregation that defines the built shape of the urban block and at the same time the nature of its interior space - Courtyard - which can be public or private, built or empty. Finally, the Building - singular or common -, by the relation between the interior organization of the architectural typologies and the shape of the urban block built fabric.



Figure 1. The six urban block elements. The urban block decomposition in Avenidas Novas.

For each of these elements we will find the rules that define their own shape, size, that explain their location within the urban structure and, above all, the rules that influence the shape of the urban block.

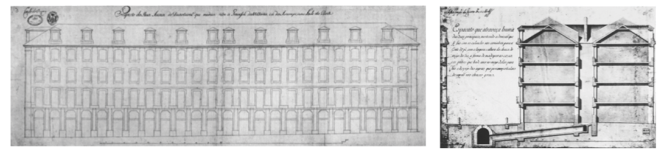
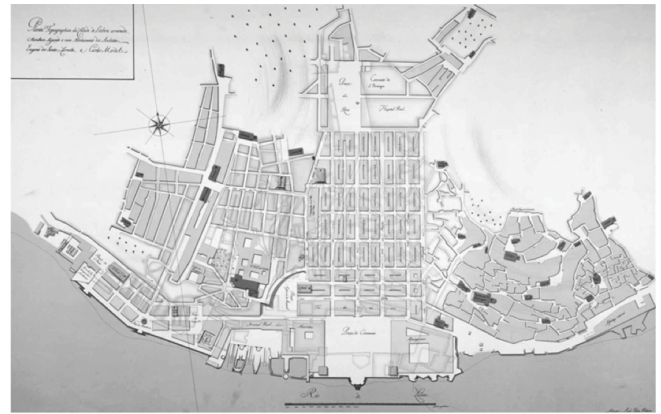
The second reading – the Evolution – is related to the action of time on the urban block, understood as the result of a dynamic and continuous process of urban production, a space where the elements that give it shape, move in time at different velocities. Therefore, the urban block will be analyzed and interpreted not only in the actual crystallized state but also over time through the reconstitution of its evolutionary process. It can have a very variable time cut, depending on the period of the urban block production.

In this regard, four main phases were identified in the urban block evolution process - the Production, the Sedimentation, the Transformation and the Resistance.

The Production refers to the first moment of the urban object, the moment of its creation. This process can start from very different principles, for example, the Baixa Pombalina plan in Lisbon, drawn up following the 1755 earthquake, was created with a clear idea of urban production based on a compositional logic of urban layout, plots structure and building. The Sedimentation, in turn, is connected with the urban block development processes that follow the original principles of composition. The densification process is an example of it, because there is no structural change in the shape and organization of the urban block, only an integration of new buildings within a consolidated structure. The Transformation, however, has to do precisely with changes that are structural and are easily recognizable in the reconstruction of urban fabric evolutionary process. The urban block of Monumental, in Avenidas Novas, reproduces clearly this process, taking into account that between the late nineteenth/early twentieth century and the mid-twentieth century suffered a significant change in its morphological structure. This it was driven by a reorganization of the road system that included the removal of a street and the opening of another. Finally, the Resistance refers to elements that survive the urban block transformation process. In the examples, we recognize clearly the influence of pre-existing structure had, in the case of the Avenidas Novas urban blocks, in the definition of their perimeter and, in the case of Campo de Ourique, in their plots structure.

Therefore, for each of the evolution development phases we will identify the processes that are representative of the urban block dynamic in Lisbon.

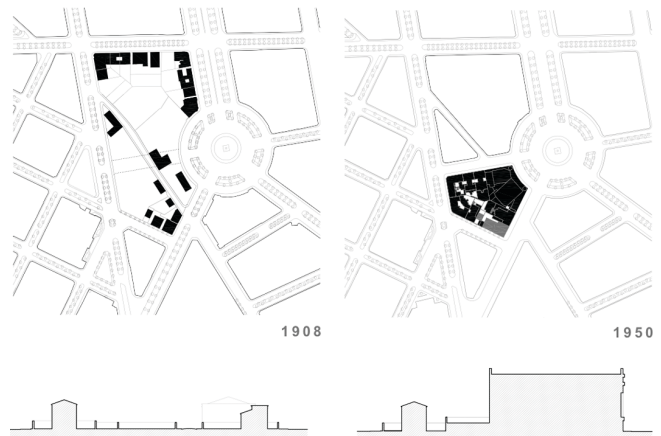
These two types of reading - the Decomposition and the Evolution - that support the morphological analysis of the urban block in Lisbon, will produce a set of essential results for the type identification.



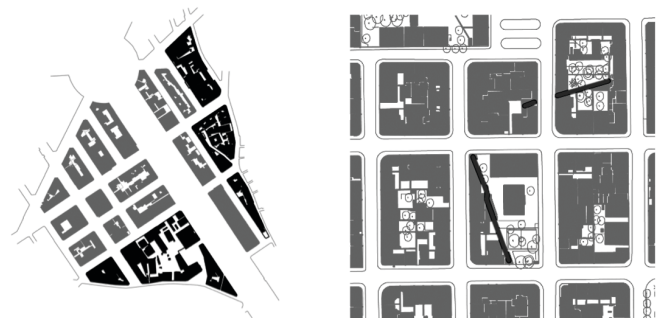
Production . Baixa Pombalina



Sedimentation . Avenidas Novas



Transformation . Monumental urban block in Avenidas Novas



Resistance . Avenidas Novas

Campo de Ourique

Figure 2. The urban block evolution phases.

3.3 Typological approach

The typological analysis gives meaning to these results through a comparative reading of the worked urban blocks. Knowing the specificities of the study objects we can compare them and aggregate them to common morphological matrices that show particular characteristics of their nature.

In this sense, the Types are established according to the morphological reading, allowing the support of a comparative study between urban blocks that are very different from each other. However, they can be understood together when reduced to their essential elements, making the understanding of particular characteristics of the urban object clear and objective. This means that after defining the Types, you can explore relationships of different nature between them, an ordering procedure of isolated types that reveals the urban block typology.

This methodological construction based on a typomorphological reading of the urban blocks does not end in a typology definition, because it is supposed to develop an interpretative and conceptual framework that gives it a more operational sense. This is useful to the actual discussion about the urban production, allowing us to inform the emerging issues about the intervention on the urban fabric. In this (re)design process of the city, the urban block may have an important position, because it assumes an extraordinary versatility and allows increasing the existence of new models, new spatial concepts and new production processes. It assumes an essential role in the urban fabric restructuration or even as a conceptual support on the sedimentation process.

4 STREET

4.1 The emergence of others configurations

The consolidation of the major mobility axis as essential elements for the structuration and aggregation of the urban fabric causes big changes in actual urban paradigms.

One of the issues it takes, in recent times, has to do with the (re) interpretation of some linear urban systems as emerging forms of streets. The existing accessibility and the strategic positioning within a network, enables the urbanization development along certain infrastructure mobility axis, reconfiguring your identity. The established dynamics between this marginal urban fabric and its own formal characteristics generate transformation processes on the previous infrastructure, modifying and creating another urban element.

The characteristics of these linear urban elements that emerge, brings us to some features normally associated with the urban element Street, for example: the urban fabric support; the connection between at

least two locations (Panerai, 1999b) and the regular compactness of a building fronts (Bohigas, 2004).

In this sense the use of the typifying process in these elements allows us to decode them, identifying their main characteristics and thus allow a deeper understanding of these emerging urban settings that assume an increasingly and an ever greater importance in the structuring and referencing of the contemporary urban territory (Mangin, 2004).

4.2 The case of the Strip N117

The case of the road N117, located in Lisbon Metropolitan Area illustrates a type of street configuration that emerges in the actual Portuguese urban context. This road initiated in the late 80th of the twentieth century an intense metamorphosis process, becoming during the following decades in a *Productive Strip*ⁱ.

One of the urban components that most has changed over this evolution process was the urban layout. Starting from a filamentary base with some connections to the territory, it presents nowadays with a great complexity and composed by two systems: the primary circulation channel and a roads complementary network. The symbiotic relationship that is established between these two systems enables the maintenance of high velocity, through the central corridor, and the support of the plots and building structure. The surrounding buildings, which colonized the margins of this infrastructure, produce this secondary network and through it connects with the central structure of the element.



Figure 3. The road N117.

4.3 Composing the urban layout type

In order to confirm the characteristics observed in the road N117 reading was used the methodological principle of typo-morphological analysis.

For this, it was made a comparative analysis between the N117 and other two elements of the same typological family, the A44 in Vila Nova de Gaia, and the A25 in Aveiro area. With this process we were able to identify the common features between the three urban layouts.

So, observing the urban layout of the three elements we could see that, despite the own deformation of each infrastructure, all shows a consistent network that intertwine the main axis. This network,

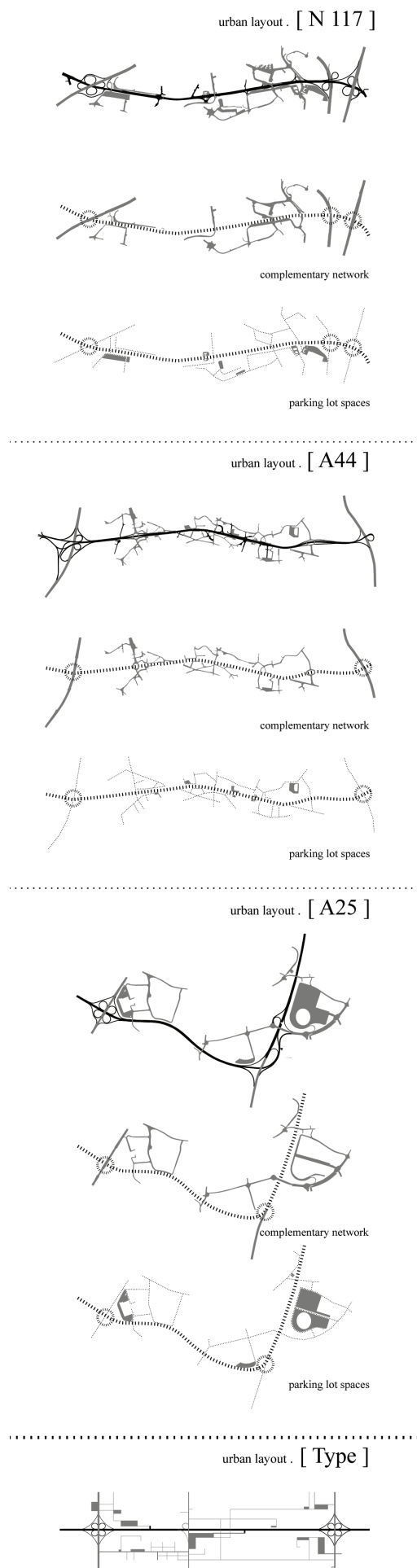


Figure 4. The urban layout type

not necessarily structured and rationally designed, serves as an access to the plots around the main axis and at the sometime introduce more complexity to the urban layout as a whole.

The central circulation axis is segregated, connecting specifically itself with the same type of roads, mobility infrastructures with higher territorial relevance. The connection nodes are configured avoiding the level crossing of driving lanes, preserving a more fluid movement. The conservation of car traffic as its main function in the central axis is the dominant concern. In all cases, N117, A44 and A25 can be seen on the major axis the use of different height levels. The strongest situation is in A25 where the main corridor is always develops at lower level than the adjacent margins apparently immune to what it happening in the surround area. In contrast, the A44 presents the infrastructural axis most of the time at the same topographic elevation, but using occasionally some barrier elements for separate the centre channel and the other roads.

The different complementary network present an irregular shape, result of different kind of urban processes but without compromise its main function, the supporting of the plots. In the N117 and A25 roads the complementary network is a response to the access needs of big architectural objects and functions that are implanted nearby. This may be a consequence of an industrial or specialized plot subdivision or simply a result of a building construction that immediately create its own access to the infrastructure. The road A44 has a complementary network that is mainly formed by the pre-existing road structure with a rural nature, presenting some parallelism with the main channel. Over the pre-existing structure were being introduced new parts, with wider sections, seeking to serve as interlocutors between the two circulation scales. These added elements make cross-connections between the two sides as well as with the main infrastructure.

In a second moment of analysis we can see on the three case studies the presence of large open spaces, voids associated with parking lots, which supports different types of commercial spaces such as shopping centres; retails or mega-stores. These parking lot areas assume itself as a kind of plateaus showing the attractive power of each big architectural piece and functions, which are associated a long of these urban elements.

The urban layout type emphasizes the existence of two relevant extracts: the first, more basic and fundamental with a infrastructural nature and the second corresponding to the irregular network of roads that suture and link the several urban components, which confers a greater cohesion to the element.

5 TYPO-MORPHOLOGY: A TOOL FOR CITY EDUCATION AND DESIGN

5.1 *The experience of Campolide analysis*

The use of typological analysis is not confined to a decoding tool of the basic characteristics of urban elements and its formation processes. The understanding of this methodology, for one side, as a didactic tool to understand the urban and architectural form, and for other side as a tool generate new forms, is in our perspective something increasingly essential.

In this sense the inclusion of this analysis process in architectural education becomes more relevant, providing more tools to the students and with that improve its creative and design process.

As an example of this process we can use the work of 4th year students, from the Master course in Architecture with specialization in Urbanism at the Faculty of Architecture of the University of Lisbon. They were challenged to make on the first exercise a site analysis and on the second a design project, using as reference the typo-morphological analysis to identify types and urban changing process that were at the origin of a specific territory.

Therefore, taking as a case study the Campolide area in Lisbon, the studentsⁱⁱ were asked to look at the evolution of this territory in 4 periods: 1856; 1911; 1950; 2009. These times correspond to cartographic surveys produced by public services and design by Filipe Folque (1856), Silva Pinto (1911) and Lisbon Municipality (1950 and 2009).

The exercise allowed students to become aware to the urban structure changes, particularly in the urban layout and the building fabric, but also the resilience of some elements over time. They also identified some morphological transformation processes such as: a street opening; integration of pre-existing elements in the urban design; development of architectural typologies and plots structure.

Thus, it became possible for the students understand the site, its history and its evolution process, building a more appropriate and adapted reference frame to the site. This information could be used for the next phase of the exercise - the design. Issues such as the preservation of certain elements or structures are now included in the propositional speech of students. However, it is significance mentioning that such concerns did not mean a copy or reproduction of pre-existing elements or an obstacle to creative and inventive process of an urban design able to dissipate weaknesses or some urban ruptures.

6 FINAL REMARKS

In times where the city and its physical space live moments of some formal and conceptual uncertainty, it is important to look at the typo-morphological

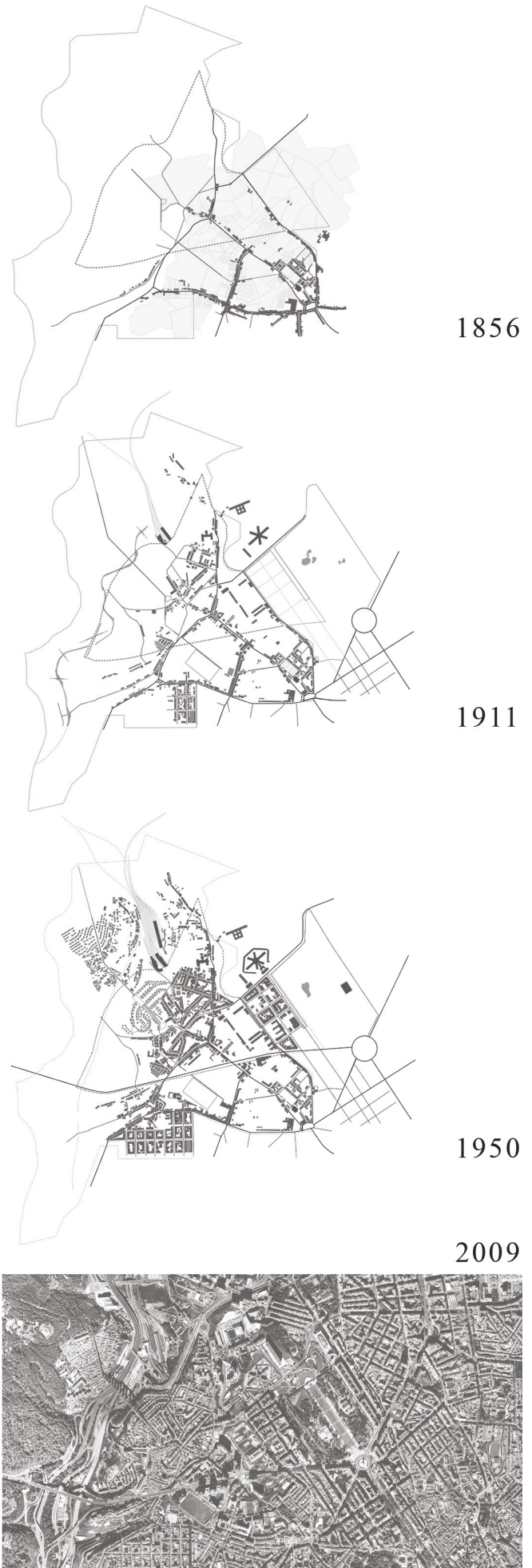


Figure 5. The urban structure evolution [student schemes].

reading process as a tool in the systematization of a set of elementary principles (urban and architectural) that could help in futures design processes.

The exercise of elementary decomposition, as well as the understanding of the formation process allows in a first moment to understand the genetic code of a particular object or urban system.

In a second moment, however, is essential to look for this exercise of typo-morphological analysis as a compose tool of new urban elements which are prepare to answer the needs of the contemporary city. The systematization of types, and it understanding, allows a deep knowledge of the main morphological characteristics of a particular urban system. They become, consequently, more evident certain structures and elements to preserve, as well as fundamental weaknesses to correct.

For this, the type generated cannot be seen as a model to repeat. The type should be an elementary abstraction that allows the development of other objects. These tend, on the one hand, to respect the characteristics and pre-existing compositional principles but, on the other, to work with the object's potential exploring new configurations that could connect different urban objects, or elements, with different kind of times and with that contributed for the urban fabric sedimentation process. It introduces a practical sense to the analytical and criticizes process of classification. In this sense, the urban production and its creative act, is grounded in a tested and stable methodology that makes safer and appropriate the design options.

We understand that is important to share this methodology and theoretical statements in the architectural and urbanism education as a support of a sustained creative process, able to answer the challenges that the contemporary city puts us, as well as in consolidated and non consolidate areas.

The actual urban and architectural design should, in our view, be able to articulate different fragments or spaces, promoting the sedimentation of the urban fabric in all of its dimensions, public and private, while that build spatial references in order to create spaces more legible and usable by everyone.

This methodology is not intended to restrict innovative solutions, but show that the design process should combine new paradigms and configurations with typological/genetic characteristics of the site. In this sense is recovered the sediment city as educational object of conceptual and compositional reference.

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ⁱ The Productive concept it is associated to new principles and to some contemporary activities, which are able to generate economics values. In the actual pos-industrial period some urban paradigms changed and another urban condition appears. The industrial production move to other fields, related to high technology where robotics and electronics prevail. On the other hand, it is possible to identify in the actual productive spaces activities linked to commerce, finances, services, knowledge and technology.

ⁱⁱ The Campolide schemes presented in the article (figure 5) were made by the following students: Giada Spana, Inês Montes, João Mapão, Nuno Pereira, Tomás Nunes.