From Maps to Diagrams. A Morphological Tool to Unravel Transitional Processes

Chapter 8
From Maps to Diagrams. A Morphological Tool to Unravel Transitional Processes

Rossella Gugliotta

Abstract Studying the regeneration and revitalisation of urban tissues involves addressing transitional changes as processes occurring over time. Traditional methods in the Italian morphological theory aim to develop a qualitative and conjectural approach to uncover transitional laws within the city. In these methods, maps play a fundamental role in studying the process providing a first interpretation of what changes and what remains fixed inside the city. However, a gap exists between traditional studies and emerging quantitative methodologies. This research investigates maps developing their diagrammatic components to bridge traditional approaches with new perspectives in the field. The starting point is the analysis of maps of the cities of Venice (Saverio Muratori), Como (Gianfranco Caniggia), and Turin (Augusto Cavallari-Murat). By decomposing these three maps, it becomes possible to define the temporal, symbolic and diagrammatic components that make these maps a tool for studying urban change with a forward-looking perspective. The research enhances map components that can help visualise the qualitative method, working on diagrammatic elements of the tool. This approach is a starting point for developing a methodology and a tool to read morphological transitional events. The final output is a diagram that bridges the gap between traditional methods and innovative AI tools.

Keywords Regeneration · Tools · Urban morphology · Diagram · Italian school

8.1 Introduction

The regeneration process of the urban tissue aims to preserve memory while embodying new significance within the urban environment. The concept is defined as a multidisciplinary space merging different dimensions of the urban environment across scale and agency (economy, social, norms) involved in the process. In disciplinary literature, urban regeneration is defined as area-based interventions targeting

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places and communities affected by a state of decline intended to produce ongoing improvements in social, economic and physical conditions (Trisciuoglio et al. 2021). The concept of urban regeneration, like the concept of evolution, is based on the possibility of reusing some aspects as potential tools that can be adapted to new functions. According to Francois Jacob, evolution behaves like a bricoleur who continuously modifies his work over a very long time. Similarly, urban regeneration processes can be based on long-term processes or sudden developments in a specific area of interest (Pievani 2008). Together with the term regeneration, another aspect of urban change is brought to light: the dynamicity of urban transformation (Trisciuoglio et al. 2021). Two basic terms come into play in this context: the transition of form as a process and time as a parameter (Pievani 2008). The concept of transition, quite different from transformation, is understood as a passage from one state to another through two different states of equilibrium (Kemp et al. 2001). Viewed in this way, the term describes a process that occurs through a non-linear and dynamic transition supported or hindered by an external system of forces (Easterling 2019). In summary, a transition is a transformation process between points A and B. In this analysis context, there is a continuous passage from one state of equilibrium to another. A balance that is not defined as an exact moment in time (Neyant 2019). On the other hand, the concept of time is a constant of reality affecting various fields of study. The continuous temporariness of human life is reflected in the need to construct and experience space through time. Time is a variable that intersects with and measures space, defining its evolution, detecting its limits and conditioning its changes (Ulisse 2022). The city defines itself through multiple times in which past, present and future intertwine. Together, these three moments make up a fourth moment, the simultaneous time, within which design operates by designing between the synchronic and diachronic phases (Mei 2015). In the impossibility of defining a synchronic time as a single event, questions arise regarding the human being's ability to read what is not explicit in reality but remains latent and can be found within mechanisms of relationships. For this reason, it is necessary to expand the study to tools able to show the complexity of the urban transformation and read the transition of urban form as a matter of time and space. Within this framework, the definition of time is intrinsic to the space's construction process (Ulisse 2022) and to the concept of transition. This perspective can already be found in the morphological school that studies the city's shape and transformation on a different scales. Both the English, French and Italian schools define the concept of transition as central to studying the urban fabric (Marzot 2002). Specifically, the Italian school, with Saverio Muratori, defines the study of the morphological aspects of the city as operational. It aims to identify the stratifications and changes of an urban system (Muratori 1959), introducing the concept of the typological process (Caniggia and Maffei 1979). On the other hand, the study of forms, as defined by Goethe and cited by contemporary morphologists such as Kropf (2009) and Batty (2018), focuses on the study of the transition of forms, identifying invariants and permutations. The main objective of reading this succession over time is to discover the "laws of continuity within a transformation process" (Marzot 2002) from a design perspective. Morphology is the study of a form in the making, looking at tools capable of reading, representing and visualizing

the city and its dynamism. The diagram prefigures itself as a valuable tool for this type of reading. Rather than considering the diagram as the image representing a specific aspect of the urban transformation (and consequently its regeneration), the diagram is seen as a tool grounded on a specific logic. By interrogating this tool, the expected output is not strictly project-related. Instead, it contributes to constructing a theoretical/methodological matrix capable of revealing the multiple configurations that the project might have.

Within the city's vision as a collection of possible configurations, the research enters into the domain of complexity theory (Morin 2011). If the city is considered a complex system, the diagrammatic representation can show the multiple possibilities of transforming the urban environment without prescribing a specific solution. The interrogation of the tool does not take place in the classical direction of the term: from descriptive analysis to project. However, from project to descriptive analysis, there is a process of continuous exchange. By definition, there is no single visualization of the diagram but many spatial visualizations. In this case, the tool should be understood and conceived as something other than functional to the project. However, during the design process of transformation, the tool is questioned, shifting the direction of the arrows that go from analysis to design and vice versa. The ultimate goal is not a prediction but a visualization of the possibility of different scenarios in a single urban regeneration project.

The diagrammatic reasoning applied to the urban analysis and with it to design future urban regeneration leads to defining a specific study frame. In the research presented in the following article, using the map in urban morphology study is a starting point for a brother investigation in representing the transition process.

8.2 Background

The main field in which the analysis is conducted is the Italian morphological study, focusing on the maps used to represent the urban transition. The map, in the reference bibliography, can be understood as a cartographic object representing both the built and natural landscape (Hall 2006). Each map is a unique story composed of its authors, methods and information (Brown 1979). It represents one of the fundamental objects through which we make sense of the world by shaping a part of scientific discourse (Hall 2006). The map does not directly imitate of the object nor return a certainty of representation; instead, it constitutes dynamic images of the same object. The map, therefore, has an operative purpose, serving a specific functional objective (Palma 2001). However, in a certain sense, it can also be understood as having a propulsive value. Analyzing the term "transition", variables emerge that can be used to read and understand the map. First, time and its systematization: what time frame can be used to study the transition? Second, the scale of representation: at what level is the transition studied, and what information is recognizable? Third, the deviations: how are changes and transformations made explicit from an initial and final state? Fourth, the structure of the urban layout: how is the fixed part of the

transformation identified? Finally, the point of view: what is the position of the map maker concerning the transient phenomenon.

The maps of Venice (Saverio Muratori) and Como (Gianfranco Caniggia) establish the theoretical foundations and the development of operational tools for morpho-typological analysis, forming the foundations of the Italian morphological school (Moudon 1997; Sheer 2016); in the same way as Muratori's map of Venice, the work done by Augusto Cavallari-Murat for Turin is also credited with having elaborated the theoretical foundations that led to the development of operational tools for the representation and reading of urban organisms (Merlo 2021). Although they use different approaches in the way of understanding and representing the transition of urban systems, commonalities exist in the objectives and essential references. Together, the three cases are emblematic taken as a whole because they allow us to see the map as a tool but above all to see it concerning the transition. Each of these maps addresses the real city and its transition differently, identifying three approaches or transition variables: successions, deviations and relationships. These approaches define a degree of diagrammatic thought of the growing map (starting from Venice up to Turin) as they incorporate the diagrammatic component and the concept of the city in transition in a different way, as well as aiming to achieve a different objective in each cases.

Each of the three case studies above mentioned (Venice, Como and Turin in specific, San Bartolomeo, Via Rovelli and Piazza Palazzo di città) deals with and defines specific behaviors with respect to these variables. They interrogate the map not only on its application but also on the information it conveys in order to be able to understand, expand and delineate the characteristics necessary for studying of permanence and permutations, that is, of the transition of the urban fabric. Therefore, it is essential to specify that each graphic contribution is accompained by an explanatory methodological text in the cases analyzed.

8.2.1 Case 1: The Map of Venice by Saverio Muratori

The maps of San Bartolomeo were drawn up for the study of Venice contained in the book "Studi per una operante Storia Urbana di Venezia" (Muratori 1959) in which the expansion of the city was systematized from the parish nuclei to the late Byzantine settlements, up to the years of the study.

By defining the first time variable, it is possible to identify that the transformation of San Bartolomeo has been reconstructed in relation to the four phases of Venice's expansion:

- Phase I. Considering the eleventh and twelfth centuries, diring which the parish building and the late Byzantine expansion were realized.
- Phase II. Between the thirteenth and fourteenth centuries, when the late Byzantine settlements were consolidated, and expansions in the northern part of the island were set up.

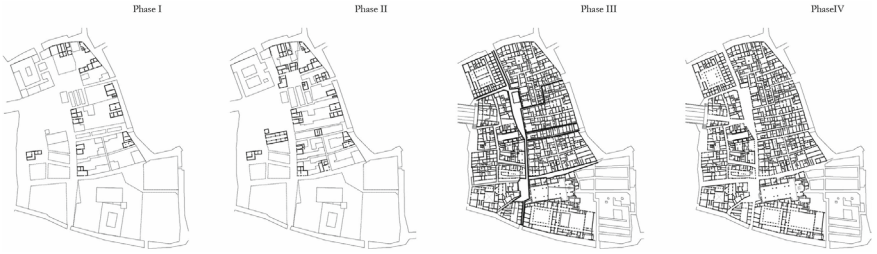

Fig. 8.1 San Bartolomeo in Venice remake from the study of Saverio Muratori, Studi per un'operante storia urbana di Venezia, 1959 (drawn by Gugliotta 2023)

– Phase III. Considering the eighteenth century, during which there was the replacement of medieval constructions with masonry structures.
– Phase IV. The current survey phase from the 1950s.

The four phases are represented on a scale of 1:1000, which is the scale designated to describe the districts of Venice, including San Bartolomeo (Fig. 8.1). The other scales of representation vary from a scale of 1:10,000, in which the districts are represented, to a scale of 1:4000, in which the systems by urban sectors are identified. Further in-depth studies on a scale of 1:500 present the buildings' plans, sections and elevations to provide typological restitution of their transformations over the centuries. The deviation between the initial and final state of the four phases under analysis is obtained by the overlapping of layers of the different maps, each representing a specific moment of development. The process is conducted by deduction and is not immediately readable as no summary map brings together the four development phases. However, each phase represents the state of the art at the time of the survey and retrieval of cadastral sources. The result of this overlapping is the deviations (i.e., what changes over time) and the structure (i.e., what remains fixed and recognizable) of the urban layout in order to define what, for Muratori, are the "constants of change" (Muratori 1959, p. 37). Moreover, in the reconstruction of each phase, each map was drawn up, looking directly at the predetermined phase without relating it to another. The reading perspective conveyed on the individual map also depends on the sources used to make it and the strong relationship Muratori wants to create between the individual and society by acting on the structural component (Pigafetta and Muratori 1990). This led to the need for further reading to identify relationships, recurrences and changes.

8.2.2 Case 2: The Map of Como by Gianfranco Caniggia

The maps of Como and Rovelli Street were drawn up for the study "*Lettura di una città: Como*" (Caniggia 1963). Also, in these maps, the temporal definition is given through the identification of a succession of phases defined concerning the degree

of organicity and the position of reciprocity in the unitary process of the city's development (Caniggia 1973). Three cycles city development are thus identified for homogeneous characterizations:

- Cycle I. This concerns the phase of the city's implantation within the city walls. Within the cycle, five expansion phases are in turn identified, dating from 196 B.C. to the fifth century A.D., which make up the complete analysis contained within the study:
  - Phase I. Considering the Roman settlement or Castrum Marcello phase.
  - Phase II. Considering the Roman implantation or phase of the Castrum of Cn. Pompey or colony of C. Scipio.
  - Phase III. Identifying the Novum Comum.
  - Phase IV. Defining the polarization towards the lake or imperial complexes.
  - Phase V. Highlighting the presence of the early medieval belt.
- Cycle II. This concern the hypotheses on the development of villages, the definition of religious cores, the replacement of specialised buildings with mercantile buildings between the sixth and thirteenth centuries.
- Cycle III. This concerns the hypothesis of reinforcement of the conventual nuclei, the intense industrialisation and the multipolar city-territory between the thirteenth and twentieth centuries.

The maps of Como and Via Rovelli are temporally located in Cycle I and Phase II (Fig. 8.2).

Unlike Muratori, Caniggia's study of Como is more organic and continuously relates to different scales. Each map is drawn at a decreasing scale. However, the ones analysed for this study are the 1:1000 scale representing the ground plan structures of the various development phases and the 1:500 scale sampling the urban

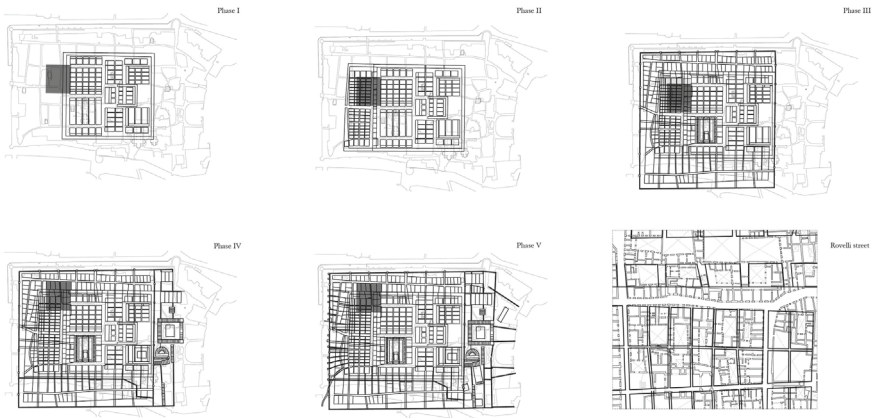

Fig. 8.2 Como and the case of Rovelli street remake from the study of Gianfranco Caniggia, Storia di una città: como, 1963 (drawn by Gugliotta 2023)

fabric of five transformation areas of the city corresponding to the five temporal development phases listed above. Specifically, the Como map of the various phases is related to the 1:500 scale map of Via Rovelli representing the transformation area of the city's second development phase. The deviations are therefore identified as dynamic in which the purpose of overlapping the maps is to define how a specific extension of Como's Roman phase influenced the future development of the urban fabric and how some elements remain within the city and can be reconstructed through analogies and archaeological surveys. The structure, in this case, is well identified through the use and direct overlapping of the Roman extensions with the road layout of the late 18th-century survey of Como. This also defines a specific point of view concerning which the map was drawn; in fact, the construction of the map compares each time the current phase of the city's development with various phases of expansions with a retrospective look on the city. The diagrammatic character takes on greater significance than the Muratorian construction of the map. In addition to the evidence theorized within the books, it is possible to frame the two methodologies as process studies that aim to bring to light the transitory character of the urban fabric at different scales of representation.

8.2.3 Case 3: The Map of Turin by Augusto Cavallari-Murat

The map of Piazza Palazzo di Città was drawn as part of the study entitled "*Forma urbana ed architettura nella Torino barocca*" (Cavallari-Murat 1968) conducted by the Institute of Technical Architecture of the Polytechnic of Turin, whose referent is Augusto Cavallari-Murat. The fabrics analyzed within the maps refer to three different expansion phases:

- Phase I. Considering the existing urban fabrics in Turin between 1719 and 1750.
- Phase II. Defining the urban fabrics within the city walls in the last quarter of the eighteenth century.
- Phase III. Considering the urban fabric of the nineteenth century in the south-east area of the city.

The map of Piazza Palazzo di Città analyzed for this study only includes Phase I and II of the transformation of the urban fabric (Fig. 8.3).

The scale of representation is 1:1000 and is always constant between the phases of comparison, resulting in a diagram of relationships. The deviations between one phase and the next are therefore not made explicit through the map. However, the mathematical construction of the graphs makes it possible to identify the relationships between the parts. The settlement's development structure can also be indirectly reconstructed from the system of relationships and the comparison between phases. The maps of Piazza Palazzo di Città, on the other hand, also define the altimetric development of the fabric and its ornament of the façade. Finally, the aim of the map is to reconstruct through the use of primary sources the development of a specific phase. Therefore, the points of observation are always different, thus identifying

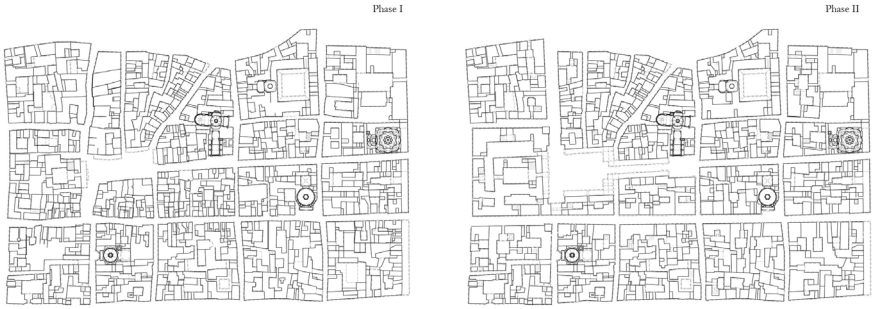

Fig. 8.3 Piazza Palazzo di Città in Turin remake from the study of Augusto Cavallari-Murat, Forma urbana ed architettonica nella Torino Barocca: dalle premesse classiche alle conclusioni neoclassiche, 1968 (drawn by Gugliotta 2023)

variations that cannot be attributed to the transformation of the fabric but rather to the use of documents.

Each of the three case studies has a different approach to the map as a method of analysis and as an output for future intervention in the city. Moreover, the study of Muratori will be taken into account in his design proposal for the design competition of Barene di San Giuliano (even if not directly), and the work of Caniggia was essential for developing the regulatory plan of Como in 1970 (Piano regolatore urbanistico generale, Variante Città murata) and more in general for the study on the city of Como and its surroundings. However, the first two analyses were used later on for other projects in the same city; only the study of Augusto Cavallari-Murat on Turin had, from the first glance, the intention of building a tool useful for a future development of a norm (UNI norm 7310/74).

Moreover, all the examples have the aim of abstracting and synthesizing the information on the urban environment (Fig. 8.4). These approaches are recognizable from its specific identification of the maps as a diagram representing through signs and symbols more information than a topographic space can show.

8.3 Methodology

Starting from the Italian school of urban morphology (Saverio Muratori, Gianfranco Caniggia) and the maps of Venice and Como that have been used to read the evolution of cities, the study questions the possibility of representing and visualizing a transitory process in continuous development. Simultaneously, with its Turin maps, Cavallari-Murat is interested in defining the relationship between the city's elements in a changing process.

This first modality of graphical investigation is applied to the case studies to decode the reading that Muratori, Caniggia and Cavallari-Murat give of the city, understood as a concrete and material fact, breaking it down into parts that can be

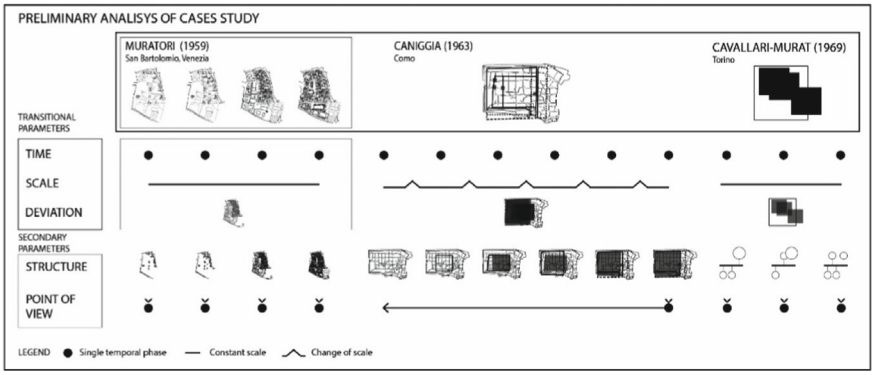

Fig. 8.4 Preliminary analysis of case studies. The dynamic component in the map (Gugliotta 2023)

named and individually examined to understand the multiple appearances of urban transition phenomena: permanences and permutations. From the point of view of typological analysis, attention should not be lost on the deformability of the type, questioning deviations in the process of continuous adaptation to the environment, which is also in movement (Viganò 1999). This position aligns with those of Muratori and Caniggia. They probe the deformations of the type and the modifications in directions secondary to the main ones and use the map to investigate these components. The main objective of the maps under analysis is to "understand whether beyond apparent randomness there is a system of consonances" (Caniggia 1976). There may be no specific order, but a relationship always determines a structure, whether or not it is made explicit. In this context, redrawing is an operative instrument for a critical vision of the map that, combined with a new symbolic translation, identifies a different way of reading reality that has already been filtered at the moment of the map's realization. The object of the new reading is not just the city and its transition mechanisms but the map used to represent it. The instrumentation and the code for this further reading must allow the understanding of the object, the map and how it is made. Redesigning thus allows the object of study to be clarified and made evident. This inevitably subjective process also makes it possible to initiate a new comprehension process through reading as an interpretation of the object of study, but also through the reworking of the maps to construct a diagrammatic tool of the transition map that subverts the pre-established terms that are immediately understandable from the maps to highlight latencies.

Each of the three case studies mentioned above contributes to constructing the diagram with specific parameters to apprehend and direct the study of the urban transition. The work of Muratori and Caniggia, with the maps of Venice and Como, defines the multiscale approach to urban morphology. The reading on the urban tissue and its transition is done considering different information scales: from the building print to the urban tissue representing the ground floor and the internal distribution through the city scale and the territory. Both Caniggia and Muratori, also Cavallari-Murat, conduct their analysis on a large scale, identifying the relationship, the history

and the reason behind a specific urban distribution. The study of territory, city and their development gives the reader of the maps a complete vision of the phenomenon. The choice of studying the city on different scales highlights the connection between the change in the building and territorial scales. However, to understand how to read the transformation process it is not necessary to compare each case study with the same level of consistency; moreover, it is necessary to apply the same rule of reading the urban tissue.

The process of reading transition is composed of fixed elements, the permanence that can be easily identified through the maps and the permutation (the changes) that remain in the background. The variable "time" in the reading of the city leads to interpreting the continuous evolution of "urban facts" and the constant relationship between permanences and permutations in such a way as to offer a new research tool to the discipline of architectural and urban design, which must confront and measure itself with the becoming of the contemporary city and thus its transition. In both Muratori and Caniggia maps, it is possible to read the permanence of the urban tissue. The analysis carried out on Venice and Como and their maps show directly the relationship between the urban tissue and the fixed element such as the street or, as Caniggia defines, the "special buildings" (Caniggia 1976). On the other side of permanence, it is possible to consider the permutation. These are not defined directly in Venice and Como maps but can be understood and read in the methods' books. It is a concept that leans into the theory of the morphological study but is not directly challenged in the maps. This particular observation in the case study defines the construction of a line of results in the diagram reading the transition.

Another helpful element employed to read the transition, more in the contribution about Turin by Cavallari-Murat, is the study of the relationship between the elements of the city. Although the links defined in the study about Turin are between the neighbouring elements, connecting the elements in different scales (from territory to building) is more than just something to leave to the reader's interpretation. The relationship to the urban environment mentioned can be translated into weak and strong connections relating to the different urban scales and the process of transition that occurs in other parts of the sample analyzed.

The translation from the map to the diagram can be done in three steps leading to a construction of a method.

In the first "interpretation" phase of the analysis, knowledge of the object to be studied takes place. In contrast, in the second phase, the salient points are critically identified in order to be able to work through a diagrammatic translation (Fig. 8.5). In this context, it is possible to refer to the map not as a single object but as a relationship between different representations. Moreover, also the writings (considering that both the map of San Bartolomeo by Saverio Muratori, that of Como and Via Rovelli by Gianfranco Caniggia and the one of Turin by Augusto Cavallari-Murat, as previously mentioned, are part of a methodological collection in which the written apparatus accompanying the map is of particular importance for the understanding. Furthermore, the tools and codes used to read the processes help understand how the city presents itself as a mutation condition. In this context, the need arises to overlap

the map's operational method (valid for defining what is known) with the diagram (helpful in defining what is hitherto unknown).

In the second phase of "re-elaboration", it becomes crucial to understand the information reconstructed from interaction with the map and the text. The problem can be examined by working through the definition of relationships and decomposing the problem into a micro-problem. From the phases identified in the previous section, further micro-steps can be identified (Fig. 8.6). Once the micro-phases of transformation (or fields of interest of the transition) have been identified, the operation to be carried out will be to identify their relationships in temporal and scalar terms. As Caniggia defines the reading of building structures and relationships, the process is carried out on four distinct dimensional scales: type, fabric, urban organism and territory.

Fig. 8.5 Definition of the microphases of the morphological map in the case study of San Bartolomeo (Gugliotta 2023)

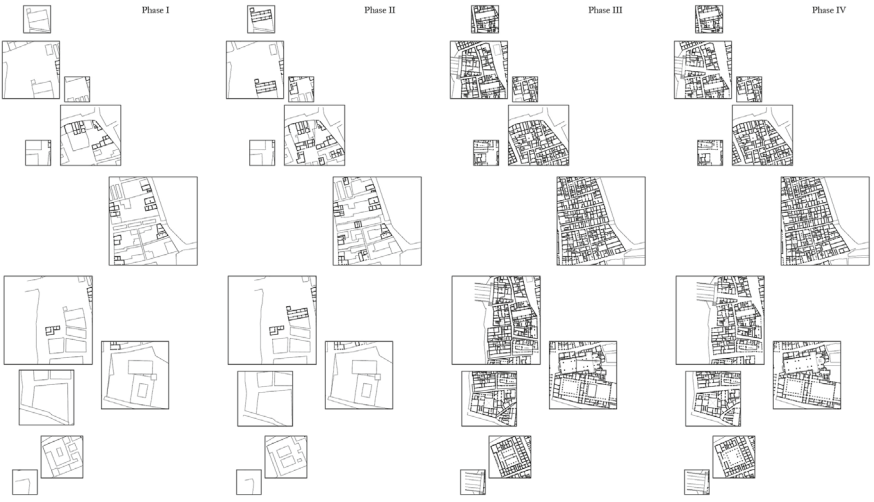

Fig. 8.6 Decomposition of the morphological map in the case study of San Bartolomeo (Gugliotta 2023)

Similarly, a multi-scalar approach has been identified to translate the maps of San Bartolomeo, Via Rovelli, and Piazza Palazzo di Città. However, the representation typically associates its meaning with its origin. In a trans-scalar diagram, origins are irrelevant; what matters is how the relationships between the parts are ultimately attributed (Padoa Schioppa 2015). As a result, the time within which the consolidated fabric is transformed is not only dilated because it defines a transition but, in the long run, is also dilated in the transition narrative.

By decomposing the maps, it is possible to define the temporal, symbolic and diagrammatic components that make these maps a tool for studying urban change from a future perspective on the project. The next step for translating the maps into a more diagrammatic representation of the complexity of the urban transformation is to put each micro-phases into a final matrix.

In order to keep as much information as possible, the diagram is developed considering the notion that Muratori, Caniggia and Cavallari also set in their maps. First, the diagrammatic tool needs to be based along two axes declaring the dimension of the transformation process (time and scale). Transition is used to relate the plurality of contemporary city times that move between past, present and future to define a new character. The mutations that can be found can therefore be described as diachronic if they occur in the same cultural area in the same period; if, on the other hand, the mutations occur in the same instant, taken as an abstraction, they are identified as synchronic. The x-axis contains the diachronic variation in time and thus the succession by phases of changes within the city (diachrony represented by the invariants), the z-axis contains the synchronic variations, and the scalar vertical y-axis contains the variations of the scale. The axes are composed to obtain diagrams inspired by Halprin Lawrence's motion diagram analogy. The time variable in the Halprin-Lawrence is defined as the movement of the people around the city is unfolded within a diagram (analysis tool) to operate through synchronic and diachronic points of view (the axes mentioned above).

Another aspect developed in the construction of the diagram is its use as a tool to understand the relationship between different parts of the city. The continuous and dotted lines that connect the urban tissue define the direct and indirect relationship answering the question of how a change in a part of the city can interact with another, affecting each other and how different configurations of the past are related to the future. The direct one defines the relationship between the same part of the urban tissue but at different times; the other the relationship between different parts of the urban tissue in time and space.

The diagrammatic result can relate the formal component to the relational component by examining the actions and reactions that occur at the urban level. The aim is to identify invariants and permutations not as specific to individual case studies but as a general rule to be traced within the diagram (Fig. 8.7).

The decomposition of the results of the morphological analysis into invariants and permutations and the reading thought the diagram is done through the critical reinterpretation of the three case studies: Venice (Saverio Muratori), Como (Gianfranco Caniggia) and Turin (Augusto Cavallari-Murat).

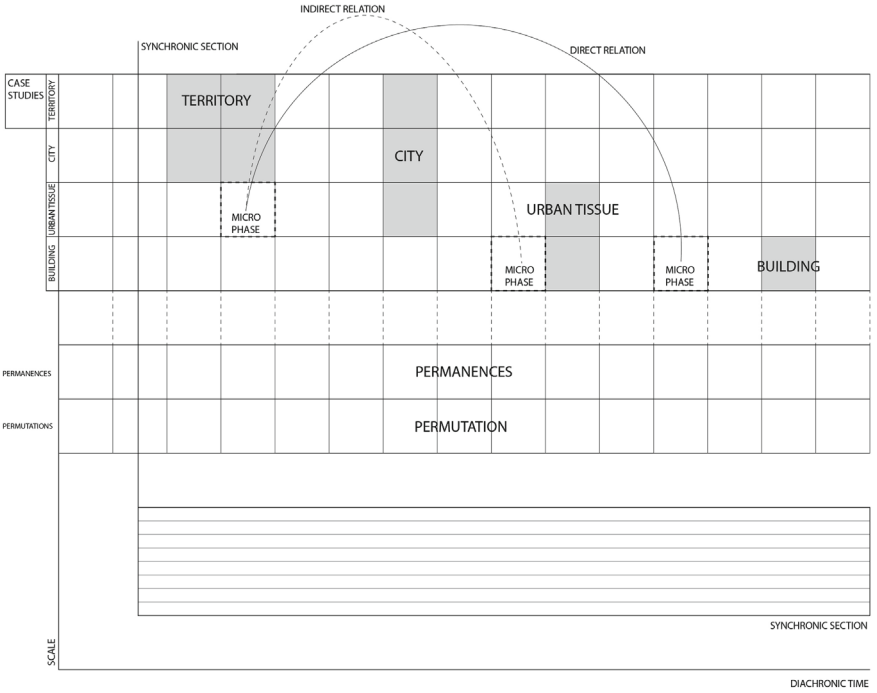

Fig. 8.7 Example of diagram to read the urban transition coming from the principles of Italian morphological school (Gugliotta 2023)

The diagram reasoning process is based on the construction of some formed induction having given rise to the initial symbol's pre-diagrammatic interpretation, then there is the construction of the diagram based on the continuous interaction between the object and the pre-diagrammatic interpretation. After repeated transformation and manipulation coming from continuous observation and reconstruction there is a final status of the diagram. "To sum up, the overall picture of the diagrammatic reasoning process is that it forms a formal deductive reasoning core, embedded, on each side, in the trial-and-error of abductive trials and inductive tests" (Stjrnfelt 2011, p. 105) (Fig. 8.8).

The graphic-synthetic elaborations that come from the morphological reading return the salient theoretical features (Parisi 2015). In attempting to reconstruct the process that led to the definition of the method through the use of the maps of San Bartolomeo, via Rovelli and Piazza Palazzo di Città, of isolated cases within a system of maps, the tool of drawing makes its first appearance. The drawing became a critical design. The rereading of the transition maps is schematized through the elaboration of two main steps: the identification of the key factor provided by the reading of the map and its critical re-elaboration. To complete the experimentation on maps, the analysis process is in turn divided into subways that allow the map to be fragmented and reassembled through a new visualization medium, the diagram.

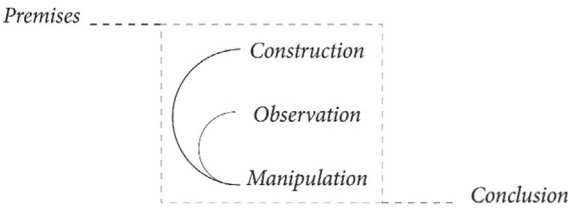

Fig. 8.8 The diagrammatical reasoning process, remake from Stjrnfelt, Diagrammatology: an investigation on the borderlines of phenomenology, ontology, and semiotics, 2011 (Gugliotta 2023)

8.4 Results and Discussions

Complexity theory was born as a systemic theory that goes beyond the analytical-reductionist view, where universal laws are deduced by a linear procedure of summing up the effects of individual components. While it is possible to understand their behaviour, this approach overshadows the emergent properties of systems, thereby reducing attention to their intrinsic capacity to generate new forms of life. In the evolution of a system, complexity is characterized as the intermediate state between stable equilibrium and chaos. In this particular condition, a system manifests intelligent behaviour of adaptation to environmental stresses, exhibiting emergent properties. It is not possible to give an exact definition of complexity; instead, it is possible to describe the attributes of complexity (Padoa Schioppa 2015). The analysis of the urban morphological fabric densifies with complexity, defining a change process. If previously it was sufficient to read a few factors, now the study of the form of cities is thickened with a substratum that interrelates several parts of the project and the city. Although carried out using analogue tools, the practical fallout of this type of analysis is in the discipline's digital realm. The diagram becomes a machine that, as in Cybernetics, mimics the functioning of the human brain, regulated by the circular and retroactive randomness proper of living organisms that are not subject to cause-and-effect regulation mechanisms. The diagram used in this research aims to declare and describe the complexity of urban transformation in the condition of continuous change in dynamicity.

As a result of this experimentation on the three case studies, three diagrams show the multiplicity of representations of urban change and the variety of information the maps offer. However, the aim of developing the diagram is not the final results as the image (the images presented are a draft of an ongoing study) but rather the definition of the logic of reading the urban transition as foundation for future urban regeneration.

The diagrammatic reconstruction of the maps is only one of the possible interpretation. Through decomposition and hypotheses of relationships, it provides a new point of view on the city while offering a starting point for methodological development.

The translation of the map of San Bartolomeo (Fig. 8.2) in a diagram shows the strong interaction between the system of the urban tissue. Furthermore, it gives information about each scale of intervention stressing the densification and the intense

transformation of the area during the four phases analyzed by the map of Saverio Muratori. By intregrating all the transformation stages and their relationships into one drawing, rather than overlapping maps, the reconstruction facilitates identifying both permanences and permutations in the area (Fig. 8.9).

The Rovelli Street maps address a gap in the Venice map: the direct relationship between the changes. Unfortunately, although the permanences can be easily deduced, this is not the case for the permutations that remain concealed in the map, even if they are made more explicit by the deviations between one transformation phase and the following (Fig. 8.3). Translation of the maps into a diagram helps to visualize not only the relationship of a single phase with the contemporary city of Como but, furthermore, highlights the relationship between each phase of transformation (Fig. 8.10). Permanence and permutation emerge not merely as deviation of individual phases but through synthesizing all the information into one diagrammatic tool.

The diagram of Piazza Palazzo di Città is built with less information than the other two case studies because only two macro-phase of transformation come from the map (Fig. 8.3). However, with the diagram translation, the change as the connection between the elements that shape the urban environment is defined, showing how urban elements change and which are the transformation pattern if they are present

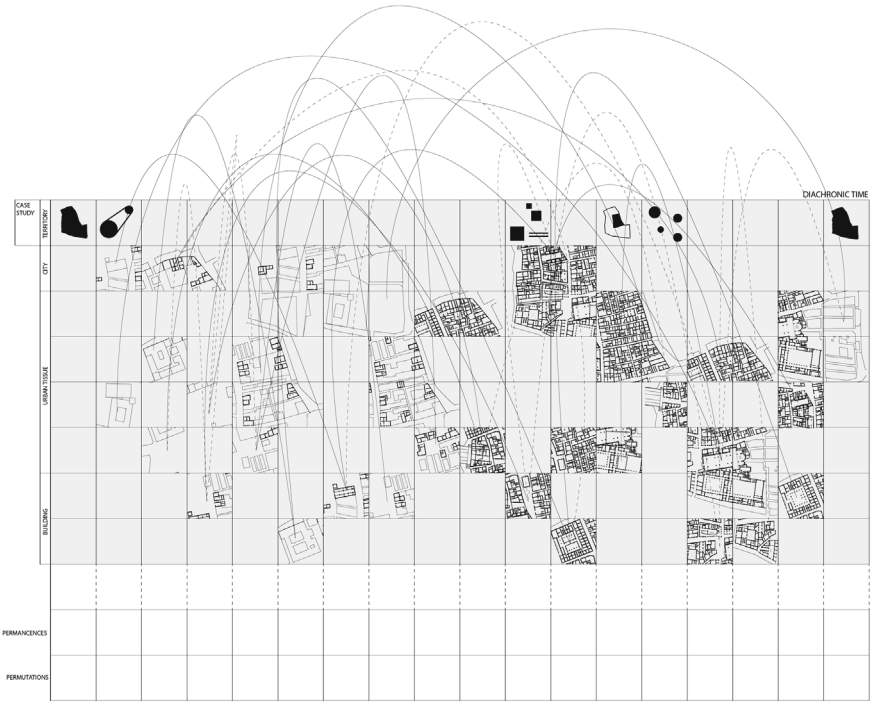

Fig. 8.9 Transitional diagram of San Bartolomeo, Venice (Gugliotta 2023)

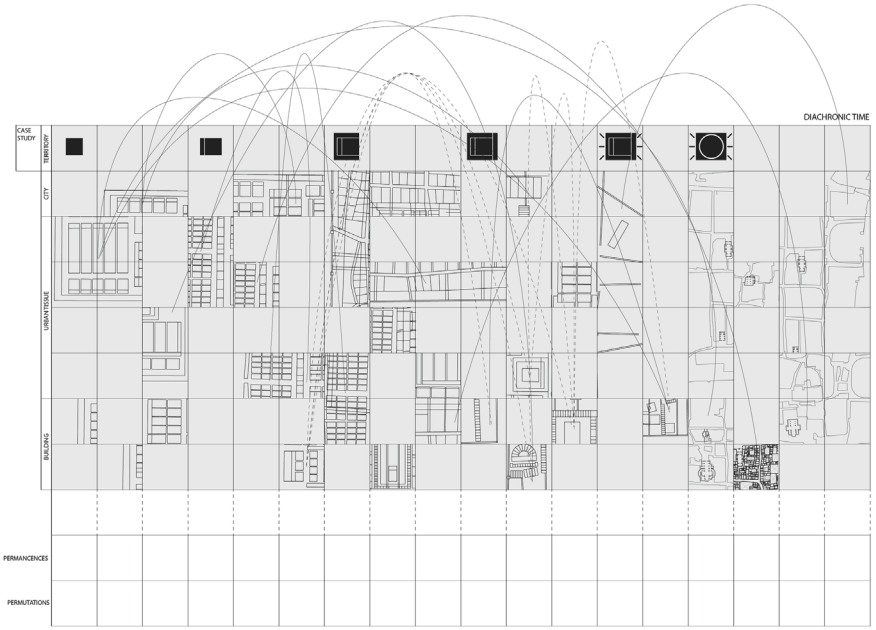

Fig. 8.10 Transitional diagram (in development) of Rovelli Street, Como (Gugliotta 2023)

(Fig. 8.11). This approach stresses the importance of the relations between parts of the city to understand permanence and permutation.

The results of the representations want to emphasize the variety of possibilities in analyzing the transition defining the logical frame of the method. At this initial stage, the diagram does not identify permanence or permutation. Also, the synchronic sections need to be graphically developed, but the principle has been used to structure the diagrammatic framework. In conclusion, the highlight is the logical construction of the diagram that led to a new vision of urban tissue. The diagram as a tool wants to be framed not as a result of software-based analysis but as an element helpful to preparing the construction of a method in urban morphology analysis.

8.5 Conclusions

According to Stewart Brand, the idea of architecture focuses on a specific concept: permanence (Steward 1994, p. 2). The whole idea of permanence is an illusion; however, the term architecture is often associated with the belief in a profound structure that is not prone to change; every object and every piece of architecture, when it comes into contact with time, changes. Architecture, and with it, the city, modifies and adapts even without any particular predisposition to change. This kind of architectural vision leads the architect to think of the complete building as the crystallization

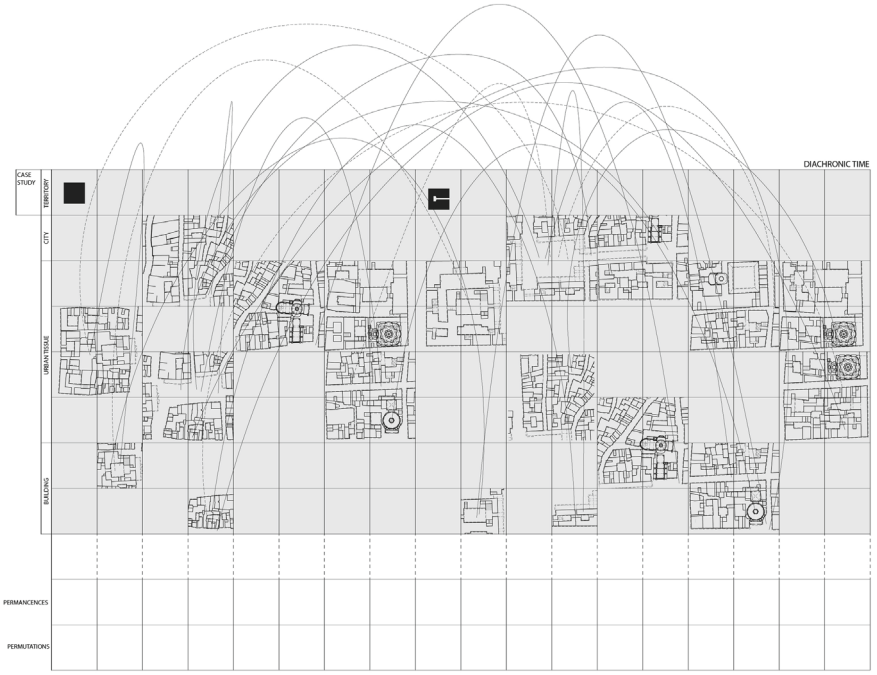

Fig. 8.11 Transitional diagram (in development) of Piazza Palazzo di Città, Turin (Gugliotta 2023)

of the project. Thus the project becomes architecture itself. However, buildings are part of the world, a world that unfolds in its innumerable paths of growth, decomposition and regeneration, leading to ever and continual deviations. Completion is an idealization (Ingold 2019). Instead, the possibility of variation opens up precisely because the replication mechanisms are not perfect (Ingold 2019).

Although the research results are still in development, even if partially covered by a PhD dissertation, some issues can be considered for future engagement with the tool in the regeneration process.

The presented research aims to improve map components that can help visualize qualitative method by working on diagrammatic elements of the tool. Maps are undoubtedly a good candidate for studying the diagrammatic approach to the city's transformation. The maps can be considered representations of the shape of phenomena and, for this reason, a diagram subcategory (Stjrnfelt 2011). Furthermore, the diagrammatic process has entered architectural design as a moment of transformation and generation of new forms of the imaginary. For this reason, the diagram can be considered a medium that allows the translation of perfect shapes into thought and vice versa (Gasperoni 2022). In recent years the fascination of the city for data controlling and AI tools keeps the attention on the possibility of considering the entire urban environment as a computer. However, the use of prediction for efficient city transformation is not considering a series of qualitative parameters

necessary for the definition of urban intervention. Developing a new tool to read and understand urban transition aims to give different points of view on morphological analysis overcoming the critics of the typological method as a prediction method for future development. Moreover, the diagrammatical logic introduces a new value to morphological study by enabling multidirectional exploration during the design process. The approach presented is a starting point for developing a methodology and a tool to read morphological transitional events. The final output is a diagrammatic logic that fills the gap between the traditional method and innovative AI tools.

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