

Urban Morphological Studies (Concepts, Techniques, and Methods)

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ABSTRACT

Urban morphological approach (concepts and practices) plays a significant role in forming our cities not only in terms of theoretical perspective but also in how to practice and experience the urban form structures over time. Urban morphology has been focused on studying the processes of formation and transformation of urban form based on its historical development. The main purpose of this study is to explore and describe the existing literature of this approach and thus aiming to summarize the most important studies that put into understanding the city form. In this regard, there were three schools of urban morphological studies, namely: the British, the Italian, and the French School. A reflective comparison between the three schools has been conducted in order to recognize the main critical points among them. Therefore, a theoretical framework is derived.

Keywords: Urban morphology, urban form, structure, function.

دراسات التشكل الحضري (المفاهيم، التقنيات، والطرق)

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الخلاصة

إن لدراسة المورفولوجية الحضرية بين المفهوم والتطبيق دوراً مهماً في تشكل وتطور مدننا ليس فقط من حيث المنظور النظري ولكن أيضاً في كيفية ممارسة وتجربة نمو المدينة من خلال التشكلات الحضرية للبيئة المبنية. أن المورفولوجيا الحضرية تركز على دراسة عمليات تشكيل وتحول الشكل الحضري بناءً على تطوره التاريخي. أن الغرض الرئيسي من هذه الدراسة هو استكشاف ووصف الأدبيات ذات العلاقة بهذا النهج، وبالتالي تهدف إلى تلخيص أهم الدراسات التي وضعت لفهم شكل المدينة. سلطت الدراسة الضوء على ثلاث مدارس للدراسات المورفولوجية الحضرية، وهي: المدرسة البريطانية والإيطالية والفرنسية. أما الهدف الآخر لهذا البحث هو إجراء مقارنة بين المدارس الثلاث من أجل التعرف على نقاط التباين والالتقاء الرئيسة فيما بينها ومنه بلورة إطار نظري.

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الكلمات الرئيسية: المورفولوجيا الحضرية، الشكل الحضري، الهيكل والوظيفة.

1. INTRODUCTION

There is comprehensive growing of the urban morphological ideologies of the city structure and the sorts of progressions and approaches that are adopted, not only as physical objects, but also as essential controls. All these topics and aspects have become a substantial feature in addressing both the city's urban structures and functions, that support who lived in the city. Following the assets of a city to comprehend the identity of the physical setting leads to several types of method and that experienced the development of three foremost schools of urban morphology, namely the British, Italian, and French. Understanding the morphological processes of a city and its development would contribute to recognizing the transformations that have taken place during the modern era and their consequence on the old parts of cities including the subsequent the changes to its urban life and social interactions with the surrounding built environment. Reducing the main gap between the physical built environment and urban life has become increasingly need, expressly, in the modern pattern that follows the modernism ideology. This would be not the first attempt to address the urban, but rather a considerable number of scholars have experienced and examined the interrelationship between the built setting. In this respect, one can refer to, for example, (Jacobs, 1961); (Whyte, 1980); (Al-Azzawi, 1996); (Thompson, 2002); (Burton and Mitchell, 2006); (Evans and McDonald, 2011); (Zako, 2015); (Khder et al., 2016); (Alobaydi, 2017); (Alobaydi and Rashid, 2017); (Al Waer and Illsley, 2017); (Su et al., 2019), (Al-Saaidy, 2019); (Al-Saaidy, 2020). This study highlights the role of morphological measures and techniques in analyzing and describing the complex forms in architecture and urbanism based on their historical development. The main objective of this type of studies is to break down the system, product, or process problem at the existing conditions into its essential dimensions and to place them in multi-dimensional layers (streets, plots, and buildings). Another objective here is to categorize the existing literature based on the main three approaches, which will describe in the next. Since the urban morphology term builds the core of this study, an explanation of the term (origins and disciplines) is needed.

2. DEFINING THE DISCIPLINARY AREAS

The term 'Morphology' emerged as a distinct sub-branch within the discipline of linguistics. It represents an explanatory and intermediary approach and studies both form and internal structure. (Booij, 2005) stated that, "morphology [does] not only deal with the analysis of existing words into their constituent pieces. The language user is able to make new words or forms of words ... [as] ... morphological operation". Historically, the term was first used in 1859 by the German linguist August Schleicher (Booij, 2005). However, according to (Anderson, 2018), "by the 1980s and 1990s, as a result of developments ..., morphology had emerged from under the waters of syntax and phonology and once again taken place as a legitimate - and substantive - domain of inquiry within grammatical theory".

Furthermore, the Oxford English Dictionary (1993) defines the term as, "The structure, form, or variation in a form (including formation, change, and inflection) of a word or words in a language; the branch of linguistics that deals with this ."Morphology within different disciplines deals with the relationship between entities that give the final form to an object, and the rules that govern this formation. According to (Whitehand, 2007), it first originated from the work of German-speaking geographers, and it might be argued that the father of urban morphology was the geographer, Otto Schlüter, who conceived that the city could be realized as part of a more extensive landscape



(Whitehand, 2007 cited from Schlüter 1899). In the first three decades of the Twentieth Century and due to Schlüter's inspiration, the urban landscape took a central place within human geography. However, in belonging to the field of geography, urban morphology, dealt with the urban landscape in terms of its distinction, characterization, and explanation **(Whitehand, 2007)**. Linguistically, the origin of the word 'morphology' comes from the Latin word that is represented by two words morph and logos. Morph denotes form, while logos stand for logic or description. As a result, the term 'morphology' means the form in terms of its shape and its internal structure. Lexically, the Oxford English Dictionary (1993) defines the term as the "shape, form, external structure or arrangement, esp. as an object of study or classification. Also: a particular shape, form, or external structure, esp. of (a part of) an organism, landform, etc." **(Brown, 1993)**. The consideration of morphology in planning, urban, and architectural disciplines has increased considerably over the past two to three decades. There has been significant growth in the number of publications in this area. However, scholars aspire to address the hiatus between morphology as an objective method and other aspects of the urban field that involve different scales. The primary definition could be derived from other fields of knowledge, which stipulate that it is the study of the formation of an object and its internal structure and the determination of the mechanism that governs its relationship with other objects. The city can be experienced as a complicated entity that combines different embedded elements, both natural and artificial. Also, transformative progressing within the city over time is an essential consideration in morphological studies, for both urban cores and urban edges **(Southworth and Owens, 1993)**. The morphology of a city, however, is not isolated from other aspects of city life, whether tangible or intangible. For example, the demographic situations and social distributions can be changed, in terms of relocation, in relation to the political influences in the city **(Alobaydi and Rashid, 2015)**. As the city emerged to serve humans and has been produced by the people themselves, it is in a continuous process of meeting people's demands. Moreover, the static and dynamic interrelationship between the city components, in terms of the built forms, shape, and are shaped by the open spaces and streets. This dynamic state of the city and the ruling relationship between its components has encouraged scholars and morphologists to adopt the term urban morphology **(Moudon et al., 1997)**.

3. URBAN MORPHOLOGY SCHOOLS

3.1 The British School

Within the United Kingdom, the term morphology is employed in different kinds of studies. Despite this, they tend to address the physical forms of the urban context. The Conzenian School of morphological analysis originated by M.R.G. Conzen at the end of the Nineteenth Century **(Whitehand, 2001)**. Conzen was considered the father of urban morphology in the Twentieth Century; however, Schlüter began to use the term 50 years earlier and was considered the fundamental instigator of the field. He was a German geographer who migrated to England before the Second World War, where he studied and practiced urban planning **(Moudon et al., 1997)**. **(Conzen, 1960)** conducted a town-plan analysis on Alnwick, Northumberland. **(Whitehand, 2007)** praised Conzen's approach by stating that, "Conzenian thinking has, in recent years, begun to influence urban landscape management and has been one of the principal stimuli in the origin and growth of an international, inter-disciplinary group of urban morphologists, the International Seminar on Urban Form (ISUF).



In Conzen's terminology, there are three levels of urban form. The first is the ground plan that includes the street pattern, plots, and block plan of buildings. The second level is the building or building fabric and thus deals with three-dimensional forms, such as building types and their spreading patterns. The third level is the land utilization pattern, which is a phenomenon that links morphology and functional realization (**Conzen et al., 1960, 2004**). A further key contribution is Conzen's conceptualization of the process of urban development, which analyses the burgage cycle (**Whitehand, 2007**). In 1974, J.W.R Whitehand formed the Urban Morphology Research Group (UMRG) at the University of Birmingham to develop a new research base with greater concentration on morphological studies and the ability to attract different scholars from various disciplines under the same umbrella. The UMRG became later an active center involving various urban morphology researchers, including T.R Slater, Peter Larkham, Karl Kropf, and Keith Lilley (**Moudon et al., 1997**). In the British School, the main aim of studying urban morphology was for explanatory and descriptive purposes. By summarizing Conzen's method of dealing with morphological analysis, there are some patterns (plot, block, street, building types, and land use) that represent the main ingredients of morphological analysis. These include transformative processes in terms of the burgage cycle and the fringe-belt. These urban elements can be addressed in terms of how they are constituted and reconstituted.

3.2 The Italian School

Saverio Muratori (1910-73) was an Italian architect who devised the term 'operational histories' which has subsequently shaped the theoretical basis of the architectural design studio. He played a leading role in developing the fundamental concept of type, fabric, and the idea of the organism by highlighting the spatial arrangement of the form as a synthetic unit of material, structure and compositional plan. He was devoted to promoting urban themes through concentrating on the organism's order as a mechanism for growing the city (**Cataldi et al., 2002, 2003**); (**Moudon et al., 1997**). According to (**Cataldi, 2003**), the concept of typology requires the adoption within new buildings so they are not conceived as isolated features but rather as parts of an entire historical and linguistic context, and a kind of topological leitmotif. The form-structure binary shaped the crucial character of Muratori's sights between 1950 and 1960 within his four-major works, churches in Pisa and Rome, the office building (ENPAS) in Bologna, and the Christian Democrats' seat in the Esposizione Universal di Roma (EUR).

Moreover, the concept of the architectural organism was also adopted by Muratori, where he defined as the "formal unity of cooperating, cohesive and conspiring structures, subject to transformation in space-time", and considered a transformative process (**Cataldi, 2003**). According to Muratori, the 'organicity' was based on four degrees: s – occasionally serial; S – systematically serial; o – episodically organic, and O – totally organic (**Cataldi, 2003**). Thus, this could be conceived as the spontaneous culture within designers' minds that shapes their experiences towards the built environment through the collective unconscious. Muratori's rejected the understanding of typology as scientific objectivism and instead advocated the reliance on historical building processes as spontaneous data for development in a certain cultural context. Thus, precedence was given to context as well as individual buildings (**Cataldi, 2003**). Muratori also considered territory as a cyclical process of man-made organisms, which was represented within time and space and produced by humans (**Cataldi, 2003**).

**Table 1.** Comparison between two Italian architects' thoughts about urban morphology. (Cataldi, 2003).

Muratori	Caniggia
Theory	Method
Organism	Structure
Organic	Serial
Architectural organism	Building type
Architecture	Building
Territory	Town

Later, Gianfranco Caniggia (1933- 87) adopted Muratori's concept in his study of the city of Como. He continued the Muratorian legacy by using what he called 'procedural typology', which focused on the building type as the elemental origin of the urban form. From this point, a number of scholars and academics continued Muratorian concepts, including; Giancarlo Cataldi, Gian Luigi Maffei, Maria Grazia Corsini, Paolo Maretto, and Giuseppe Strappa (Moudon et al., 1997). For example, Caniggia examined and developed Muratori's thoughts about the type, typology, structure, tissue, series, and seriality. Furthermore, he produced a new concept called 'processual typology' which considered the type, leading type, and synchronic and diachronic transformative typological patterns. Caniggia also developed the concept 'spontaneous utilization procedures of planned structures', which explored the relationship between an urbanism's history and its typological processes (Cataldi, 2003). Cataldi highlights the distinction between the two leaders of the Italian School, shown in **Table 1**. In the 1980s Aldo Rossi's became notable for promoting a return to traditional building types; he adopted another term 'Typo-morphology'. It became a stimulus for others in renewing the historic city and created further interest in urban design. From this point, both Rossi and Aymonino excluded the concept of urban morphology; instead, their vision considered that morphological concepts could distract from current urban problems and modern architectural issues (Moudon et al., 1997). Focusing on how the city could be built, besides the prescriptive design, was the main target of the Italian School, particularly within the historical city.

3.3 The French School

In the late 1960s, two architects, Philippe Panerai and Jean Castex, and the sociologist, Jean-Charles DePaule, established the School of Architecture in Versailles. Similar to Muratori, they took a stand against modernist architecture and its rejection of history and tradition (Moudon et al., 1997). The criticism between the theory of design, as an ideal approach, and the philosophy of design, as a practical approach, plays a key role in comparing what should be built and what has been built in the real human sphere. However, the French School adopted a morphological analysis



to capture the roots of modernism in urban design. Like the Italian School, the French School appeared to contradict the ideological base of the modern movement and its primary opposing trend for the historical and traditional inheritance of the city. According to **(Moudon et al., 1997)**, the French School “benefited at the time from the vibrant intellectual discourse on urban life which surpassed architecture and engaged such powerful critics as sociologist Henri Lefebvre and architectural historians Françoise Bourdon and Andre Chastel”. The second generation of morphologists in France built on the earlier contributions from Castex and Panerai; their detailed publications addressed the city of Versailles, the French bastides, and the city of Cairo **(Moudon et al., 1997)**.

Unlike the Italian and the British School, which benefited from architects and geographers, respectively, in France, the morphological umbrella-covered specialists from various disciplines, such as sociology, history, geography, and planning. They worked with architects to enhance the overall understanding of the city. Thus, the French School expanded the morphological perspective to involve both design and geography, as well as literature and social science. In this respect, the French School can be considered an intermediate between the Italian and the British School in addressing issues that relate to design and the city-building process. Therefore, the French contributions are broader than the Muratorian and the Conzenian schools in terms of their subjects and methods **(Moudon, 1994)**.

Furthermore, the French approach was also driven by the need to typify the main constituents of good city design. According to the Versailles School, there are two categories of the building; the first is consecrated buildings (archetypes and the traditional urban types) that can be seen in different eras of the city’s history, such as Roman Villas and cathedrals. The second is typical plans (prototypes) that relate to the fabric of the city, whereas the consecrated types tend to incorporate monumental elements **(Moudon, 1994)**. Finally, the Versailles School created a separate discipline to study the built environment; this enabled the evaluation of design theory by discussing both methods and philosophy in a multidisciplinary framework. Likewise, according to **(Moudon, 1994)**, the School’s contribution dominated both design application and analysis by using typological and morphological studies to examine the built environment. In this respect, “the Versailles work has taken solid roots in both design practice and research”.

4. A REFLECTIVE COMPARISON AMONG THE THREE SCHOOLS

To consider the city and its entities, it is necessary to develop one platform for morphological studies from the three different orientations. This helps to create a complete picture of the transformation and urban changes of the city over time. Three schools adopted a specific theoretical base when analyzing and classifying the city’s form and generated a practical approach by applying these thoughts and principles. Each school differs from the others and has its own conceptual framework; therefore, the outcomes are likely to be distinct. Nevertheless, the three approaches are not that dissimilar in terms of their primary materials. The plot, building, block, and street are the original elements that together constitute the urban structure of the city in different spatial configuration patterns. **(Moudon, 1994)** highlights significant critical points among the three schools, which note the primary trend for each on how to read the urban structure of the city. According to Moudon, the Italian School adopts typomorphology and design theory and the relationship between them, while the French tend to consider the history of design theory. Also, French scholars identify many different patterns of traditional but not modernist cities, which are subject to a new set of design rules. Based on the view of the Versailles School, “the present



is not [a] complete break from the past, and the past offers several different models for the future” (Moudon, 1994).

In the Italian School, two types can be distinguished; posteriori and a priori, where the former denotes the traditional method of forming the city, and the second refers to a set of designers who formulate the future. Thus, the French consider that existing types represent posteriori, while the original represents a priori. According to (Moudon, 1994), the principle of studying the history of design theory or urban design is based on two procedures. The first considers history as ideas, and the building could be examined along with the history of design theory; this is the Italian School’s view. The second considers the history of design theory as practiced, where history can be an operational and critical process to read and design the city. In terms of their respective contributions, (Moudon, 1994) states that the Italian School established a theoretical basis for planning and design, particularly for old and traditional buildings in the city. The British School advocated an examination of how the built environment is produced. Meanwhile, the French School launched a new discipline that brought the study of the built environment, together with a critical valuation of design theory. In the same context, those tripartite approaches refer to the three programs that include research, planning, and design. These embed the relationship between space, time, habitat, and culture (Moudon, 1994).

Time, form, and scale are three aspects on which to analyze the built environment. The three trends of investigating the city, in addition to the examination and analysis of an existing physical environment, have been processed as tools to monitor the emergence of new types. In this regard, the three schools, British, Italian, and French, establish a robust foundation for a mega-database of forms and form-making processes. Furthermore, considering the origins of these three morphological schools can help to formulate the trend of this study in terms of how to address the city entities and the elements of the urban structure.

5. AN EMERGING THEORETICAL FRAME

The city, its elements, and their relationship to each other have shaped the platform for academics and researchers from various disciplines. However, a difference arises is the method they adopt to analyze these elements and the scope of their studies. While some tend to address the city as a physical form apart from other aspects, such as human behavior, social considerations, and intangible values, others study the meaning of the built environment and how that works to shape our reflections. Moreover, there is a significant challenge to incorporate more than one urban factor and forge a link between the different variables in order to extract the value of the links’ relationships . For contemporary urban studies, it is crucial to understand the relationship between urban forms and the relevance to other aspects, such as people and their demands. (Moudon et al. , 1997) summarizes morphological analysis by considering the following three principles: firstly, it is an urban form that is identified by three elemental physical features: namely, buildings, and their relationship to the street and plots. Secondly, it is an urban form that should be realized and comprehended at different levels of reading depending on the scale and scope of the analysis and by responding to the plot/building, street/block, and city/region. Thirdly, it is an urban form that needs to be understood historically, and its elements should be subject to a continuous transformation and replacement.

These three notions work to constitute most urban morphological research, whether by geographers, planners, urbanists, or architects. The attributes of the urban form reflect not only a certain diachronic or synchronic period but also the socio-economic factor and its connection with, for example, culture and economy (Moudon et al., 1997). (Levy (1999) summarises the



fundamental elements of the urban fabric in **Table 2**. Morphological analysis continuously examines a plot (P), street (S), constructed space (CS), and open space (OS), whereas an urban form/fabric is constituted by the reciprocal relationships between these four main elements. In morphological analysis, the theoretical frame represents an active step in studying the urban form. This step defines the scope and scale (micro, meso and macro) of a morphological study, and the urban form elements that should be subjected to the examination. Morphological analysis is not only limited to the physical form and its components, but also includes other factors, such as social, ecological, and economic considerations. Moreover, it could also address the correlations between these factors. However, it is important to realize that morphological studies aim to explore and explain the mechanism of bilateral form, space (plot, street, open space) and form (structured space, buildings) synchronically and/or diachronically. Considering the historical processes when studying urban morphology is another fundamental step to understand the transformative operations of the urban form that axiomatically takes place over time (**Fig. 1 and 2**).

Table 2. Comparison of two Italian architects' thoughts about urban morphology. (Levy, 1999)

Urban element	Plot (P)	Street (S)	Constructed space (CS)	Open space (OS)
Plot (P)	P/OS	S/OS	CS/OS	OS/OS
Street (S)	P/CS	S/CS	CS/CS	OS/CS
Constructed space (CS)	P/S	S/S	CS/S	OS/S
Open space (OS)	P/P	S/P	CS/P	OS/P



Figure 2.(Left) The paralleled pattern. Both the spatial configuration of plots and blocks are regular. (Right) The paralleled pattern illustrates blocks arrayed in a parallel way opposite each other on the longest side. Source: Drawn by the author based on the georeferencing aerial imagery and Base Map Baghdad authorised by (R.S.GIS.U, 2017).

6. CONCLUSIONS

The study has defined the urban morphology and its importance in considering the platform for studying and analyzing the existing urban area. It also has considered its role in formulating different development plans to create or promote a city. Examining the urban structure provided a keymap to understand not only the components of the built environment but helped to determine the nature of the relationship, which binds these urban ingredients in one coherent unit. The city is a long historical series of atrophy and growth processes, with static spatial components and dynamic experience of moving through space over time. Admittedly, people have a comprehension of urban space where is dynamic because it is related to action; hence, what can be performed in a particular space rather than what is observed by passive viewing. Also, the importance of dynamic spatial interactions stands out from their functional purposes and the performance of people. It is necessary to understand the relationship between spatial and functional dynamics and to realize the relationship between structure and function in a city where a 'function-structure' model should be capable of providing a mechanism for interrelating functional and spatial dimensions, and morphological and social dimensions. A symbiotic association can be perceived as a dynamic relationship between the evolving urban structure that is connected to natural movement patterns and human behavior as well as to developing land-use patterns. Consequently, the dynamic of the urban context and its forms can be targeted to connect with other entities of the city, such as the urban form itself, any economic and social considerations, and the environment as a comprehensive perspective.

Three urban schools, the British, Italian, and French, developed three different interpretations of the existing urban form and the growth stages of a city. Even though these three trends of morphological analysis shared the same subject, the method of examination differed regarding the



scale, criteria and correlation between the urban components. However, urban morphology is not independent of the other disciplines but rather benefits from different fields of knowledge. Geography, sociology, anthropology, and history are closely connected to architecture, urbanism, and planning, and similarly, influence street life and social interactions. This study referred to the elements of the urban form as the origin of morphological studies and examined their role in formulating the urban structure as a spatial configurative pattern. The plot, building, and the street system are ingredients of the urban form aside from the potential pattern, which signifies the ability of the urban structure to deal with other aspects of urban context usage, such as behaviour and activities. In this regard, the study has defined a meaningful street life and social interactions, and their relationship with the built environment on different scales. This importance comes from the primary aim of the physical elements of urban patterns, namely, to bind different patterns of viable activities and social considerations and, in turn, to promote urban life.

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