

Finding the changes in movement orders by using the axial maps in heritage fabric

Khawla Kareem Kawther¹, Ghada Al Slik²

¹ lecturer, Department of civil Engineering, University of Technology, Baghdad, Iraq.

E-mail k.kawther1204@coeng.uobaghdad.edu.iq, 40232@uotechnology.edu.iq.

<https://orcid.org/0000-0001-9474-119X>.

² Professor University of Baghdad, Baghdad, Iraq. Ghada.alslik@coeng.uobaghdad.edu.iq.

Abstract

The problem of research is the Lack of clarity of transformation in traditional urban path of evolved with modern urban planning in Al-Shawaka, Al-Karkh in Baghdad. The aim of the research was to clarify these shifts, and the paths of transformation to take advantage of them in developing the future vision of the city. Finding changes in movement orders and the changes that occurred in the last century, in order to benefit from them in the effective upgrading programs of the heritage urban fabric. The research hypothesis: Deciphering the new relationships between masses and space in urban fabric, where it is possible to know the types of movement orders through the use of the axial map

Keywords: *changes, movement, orders, axial maps, heritage, fabric, urban paths.*

Introduction

Historic regions face many challenges, such as the acceleration of globalization, structural, social and demographic changes, as well as environmental problems and urban growth, and since urban growth is a dual process, the concentration of population in urban areas because of the services provided to them, and through urbanization, people ignore their identities and traditions in search of it provides adequate services and a better way of life that leads to the disappearance of the existing urban fabric that creates an indefinite urban pattern, and the right balance should be struck between restoring and preserving the unique cultural heritage to enable urban development that does not safeguard the future, and therefore the movement and roads are among the most important pillars of my wishful process. The research will study the morphological changes that have taken place in the area with a view to finding suitable development policies in the future.

The methodology:

studying the specificities of heritage urban fabric context historically and morphologically, Morphological analysis: This is a method that studies the spatial characteristics of settlements, the understanding of the spatial organization of the settlements is carried out through the analysis of functional and size planning, the collection of data about the area, the historical study, and the evolution of the place over time. The analysis of the settlements: this model of the analysis through the structural analysis (2D) between the primary cells or buildings and the movement orders, the aim of the analysis. It is to allow the quantitative analysis of spatial patterns, through spatial analysis and geographic information systems. The research used these methods to find the kinematic coherence and its change during the past hundred years of the selected study area in Al-Shawaka, Al-Karkh in Baghdad.

That the urban fabric possesses the system and the order, the search for this system and order, in the traditional fabric cannot be given a form except by defining the contextual background of this fabric, the interaction between the order and the structure, which is necessary to form the character of individual places, and the urban structure can be used as a basis To design sustainable urban orders on the basis of synchronization (simultaneous) of layers of urban function or land uses with the spatial structure (urban structure), and there is a strong coincidence between levels of spatial integration and the importance of the urban component in terms of attracting people or accommodating activities.

Urban paths:

As Lynch (1960) They are the channels through which people pass and move about in daily life, which are represented by pedestrian corridors, various transportation routes, and corridors.

In almost all cities and regions, there is an order, a Tissue model, that is to say, a series of relationships between building masses is the solid form and the perimeter of open areas is that which forms the spaces.

The urban space is depicted in all the previous theories as having different but integrated components; Voids - spaces, streets, and solids - buildings, and the analysis of the relationship between the figure and the ground constitutes the first stage of the formal classification of the relationships between the building block and the surrounding spaces.

Trancik (1986) classifies the formal relationships of typical urban spaces into six different groups as follows: grid, angular, curvilinear, concentric, axial, and organic. (Organic) as in (Figures 1). In almost every urban space, one or more of these categories may have a presence on different levels and relationships, and in this sense the Earth-shape theory plays a major role especially from the point of view of urban pattern analyzes. This approach is particularly important in order to define the urban-

public spaces that operate in the urban structure and subtract the level of their effectiveness in shaping the urban structure as in (Figures 1, 2).

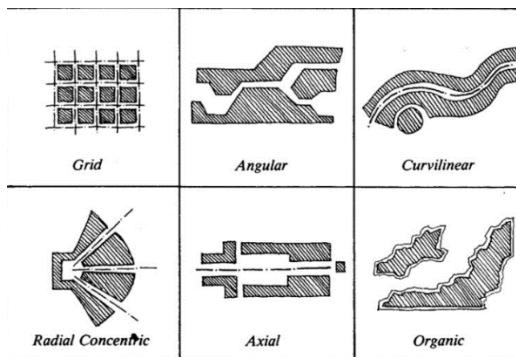


Figure 1. Six Typological Patterns of Solids and Voids, Trancik (1986).



Figure 2. Figure-ground plan, Piazza del Campo, Siena. Trancik (1986).

Fumihiko Maki classification of types of spatial relationships, and according to this classification, there are three types of connectivity schemes in urban areas; Formative shape, mega shape, and group shape. Connectivity theory can also be done as an analytical approach in a spatial method. The linkage theory, characterized by organizing lines, fits well with the second approach to urban design. Movement and communication became a major center of attention. Fumihiko Maki (1964) said: "Linkage is simply city glue." Actual "lines" can be part of a compositional form, mega form or natural form. A (natural form), or group form, link theory was popular in the 1960s when urban planning was done on a large scale, (see Figure)3

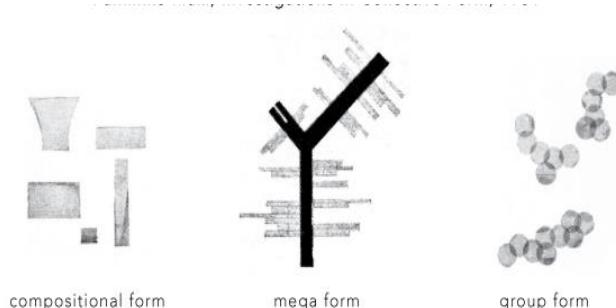


Figure 3. Three types of group form according to Fumihiko Maki (1964)

Between mass and space is a kind of binary opposition and the "winner" or "loser" is determined by choosing the observer. Unorganized outdoor spaces around tall towers and other areas of unused space, and vice versa is positive urban space or found space.

Open spaces appear through building blocks as a continuous flow that connects the internal and external spaces as well as activities and events. Voids are created in a block and the space becomes an object in itself, and the focus is on the resulting horizontal direction in flat building blocks, the goal is to create a front, interspersed with empty spaces, this position is the opposite of the modern approach where buildings predominate over their 'environment', (see Figure)4.

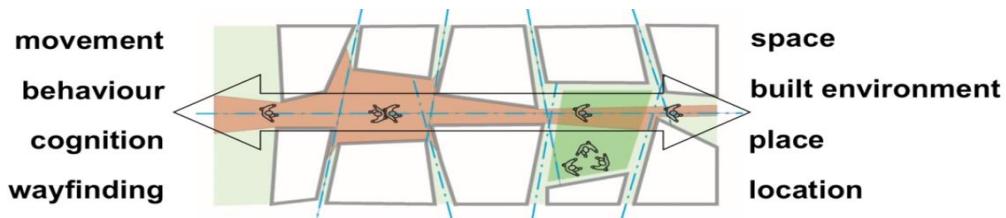


Figure 4. Space – people paradigm and space syntax approach

The place theory emphasizes the contextual meaning of space derived from its social, cultural and emotional historical content (as a place). This theory requires the study of the (historical) identity of a place in relation to the needs of its contemporary users. The type of urban development related to this theory is mentioned. Earlier by Christopher Alexander and others Christopher Alexander (1987, 2004), it was classified as "organic", based on the idea of a growing whole, the practical implications of place theory, according to Trancik, at best "limiting" Minimal interference in the social and physical environment. "Often times, designers' findings who are not primarily historians have given the way to redefine old patterns and styles. The result was excessive design and excessive planning, (see Figure)5.

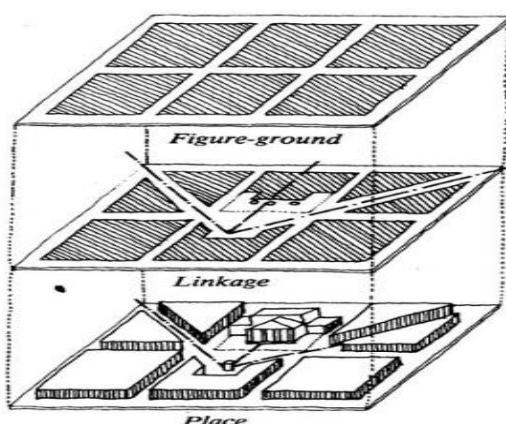


Figure 5. Three main layers in urban design according to (Trancik, 1986)

The linkage theory is based on scrutiny of roads, roads, footpaths and other open areas linking different urban areas.

In this regard, traffic and relationship systems become a standard for arrangements for organizing and designing places and sub-regions with different characteristics within urban space. In this theory, one can speak of a graph of motion rather than a spatial graph in the -shape theory

Among the theories that dealt with the organization of paths and the distribution of nodes by Kevin Lynch (1960) in his book, *The Image of The City*.

In Bill Hillier's study, (*Hidden Geometry of Deformed Grids: Or, Why Space Syntax Works, when it Looks as Though it Shouldn't*) Covert Geometry in Distorted Networks: He argues that he did not ignore the geometric and metric properties of the lines in the axial map and that they were absorbed into its structure from line drawings, thus allowing line drawing analysis to capture the non-local, or external, characteristics of the spaces that They are crucial to the dynamics of the movement through which city structures and infrastructures have evolved.

The space order in Hillier (1996, 1999) concepts is a geometric and logical concept, and the structure is a topological concept and refers to the functional patterns, meaning that the structure is a non-geometric concept, the geometric order is another dimension of the urban structure, and it is constructively linked to the patterns of the structure that have proven useful in deciphering The relationship between space and function in cities, through the study, we find that it is possible to know the degrees of order through the axial map, so the research used the analysis of the structure of space for the purpose of knowing the degrees of the geometric order in the practical study, and it found that the orthogonal network and the radians network found in traditional fabric are idealistic rational orders, and that these two "ideal" as Hanson (1989), notions of ordinary urban systems are not just rational types shaped by speculative ideas, but are found or inferred as deep structures in ordered systems are much less straightforward. Two types of consistency that we have observed as diffuse urban systems - radial-angled sequences obtuse and close to the right angle, local complexes - are both products of the natural geometry of motion that act on the line group operations that evolve the structure of the settlement space. All that we need to consider is an old and familiar principle: the need to make movement as efficient as possible by reducing the average flight length, the study emphasizes movement orders. The degree of agreement between the length of the lines and their connection is one of the foundations of coordination in the urban system.

Practical study

The research problem is finding the changes in movement orders of the heritage urban fabric in the ancient Karkh city of Baghdad. So the main streets and bridges, paths, were illustrated, and its historical development, and then a morphological and spatial analysis was done, see Figure ()6.

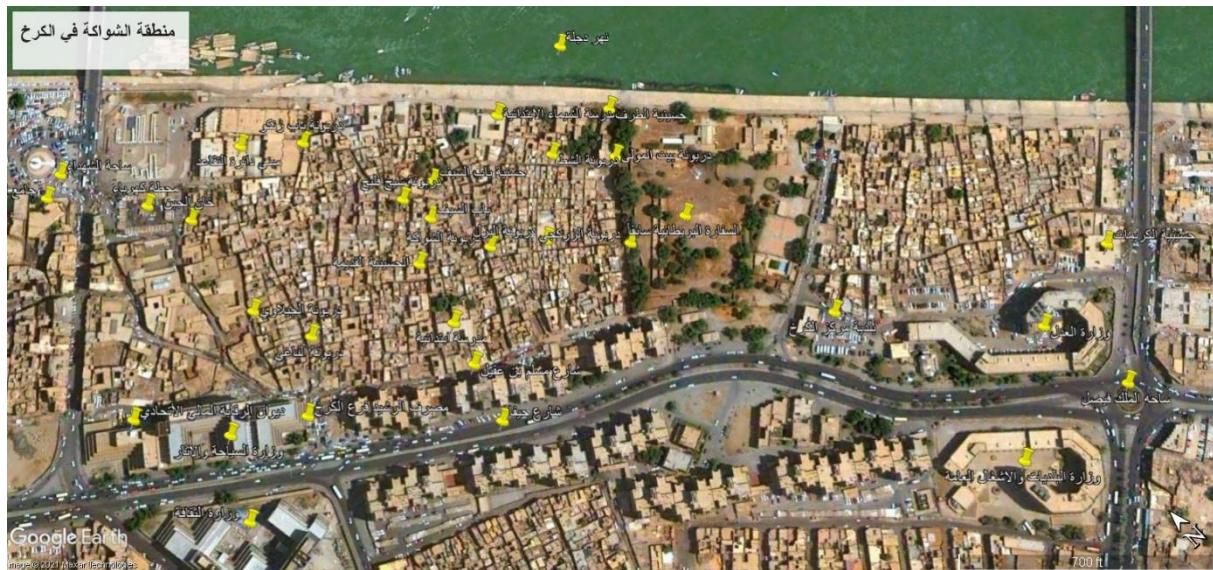


Figure 6. A satellite image showing the names of the important buildings and alleys.

Bridges and streets surrounding the site

Al-Shuhada Bridge and Street

In an article by Imad Abdel Salam Raouf, about Ali Bey's journey to Baghdad, mention that, Al Shuhada Bridge is one of the oldest bridges, as it was the only Baghdad Bridge that connects its two sides in the Ottoman era. It is also liked to be called by the Baghdadi people, then it was called the Bridge of Al Shuhada, which is a picture dating back to (1916). It can be seen that the location of the old bridge is not exactly the current bridge, but rather near it. It is exactly the location of the river police, which was inaugurated in the eighties of the last century. As for what appears on the left side of the Karkh side of a roofed building, it is the darkest market in which the first Beirut café is located, after which there is a bus stop near it, Then, Al-Shuhada Square, (see figure 7, 8, 9, 10, 11, 12,)13.

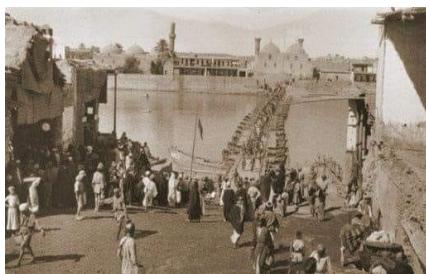


Figure 7. Al-Shuhada Bridge or Al-Doub Bridge in (1919) Al-Asfiya Mosque appears on Al-Rusafa side



Figure 8. Al-Shuhada Bridge, on Al-



Figure 9. Al-Shuhada Square 1956, Al-azlim

Karkh side, shows the bus stop, and on the other side a part of Al- Shawaka market, which was removed and became a parking lot for the Pension Department's cars



Figure 10. Al- Shuhada Bridge is under construction 1939.

<https://www.flickr.com/photos/kalboz/>.



Figure 12. Al-Suq Al-Masquf (Al-azlm) near Al-Shuhada Square

Al-Shuhada, Al-Wsia, or Al- Nasr Street:

It is the street extending from Al-Shuhada Bridge to the intersection of Haifa Street with the Ministry of Culture, there are those who describe it as extending from Martyrs Square and ending near the old Baghdad cinema and the Allawi Al-Hilla area, this is before the construction of Haifa Street, which cut the street and left it on its current reality with its straight, short line different from others. But the carved back space no longer looks like it, as it still bears the sights of old Baghdad and the features of its shops and the scent of drains that abounds with the good spirit of Baghdad and that beautiful architectural style with its balconies, hooks and decorations.

As Article published in Al-Shabaka Al-Iraqiya magazine, the street had an old royal name, Prince Abd al-Ilah Street, in honor of the guardian of the throne of Iraq, Abd al-Ilah. On both sides of the street there are two porticos. The number of columns bearing the roof of the portico are (60) columns, (30) columns on each side, while some areas of it were from Without these columns, it seems that the new building did not depend on the pillars, and the length of the shariah is approximately 200 meters. The street extends from the Al-Hanan Mosque opposite the Martyrs Square, adjacent to it on the right is the (Al-Saada) district with the ancient Baghdad features, and to the left of it (Al-Shawaka) that is connected to it by a road A small sub-branch was closed while the small darbounah on a southern side was closed for reasons related to the Financial Control Department, while its head from this northern

Suq, and the old Beirut café at the head of Al-Shuhada Bridge



Figure 11. Al-Shuhada Bridge and Al-Asfiya Mosque in the 1970s

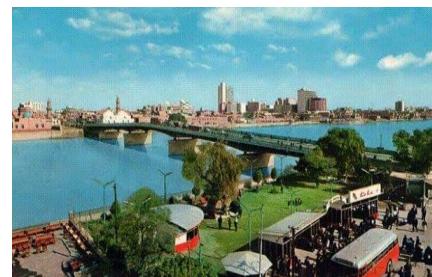


Figure 13. Previously, Al-Mamoun, Al-Suwaidi Square, now: Al-Shuhada Square

side approaches (Bab Al-Seef) and the place has become a fish market for the most part, and it is bordered on the south by Haifa Street. (See Figure 14, 15, 16).



Figure 14. Al-Shuhada , or Al- Nasr Street



Figure 15. Al-Shuhada , Al-Wsia , or Al-Nasr Street 2008



Figure 16. Al-Shuhada, or Al- Nasr Street
October 2020



Figure 17. Al-Shuhada, or Al- Nasr Street
October 2020

Al Ahrar Bridge

It was previously called Mood Bridge. It was a wooden bridge named after General Stanley Maud, who entered Baghdad at the command of his forces on March 11, 1917, and had a statue located near the main door of the British embassy, and later a statue of King Faisal I was erected in the square. The list is at the intersection of Al-Salhiya Street with King Ali Street, which starts from the Radio building and Haifa Street (formerly Salah al-Din) heading towards Al-Shawaka. This square was later called Gamal Abdel Nasser Square, and today it is called King Faisal Square again, (see Figure 17, 18).

Al-Salhia Bridge and Haifa Street

It was previously called (Souk Hamada) Street, and before the change took place in Haifa Street and the building of modern buildings, Shawaka and its stores were among the most important economic and political centers in Baghdad, but Haifa Street hid these stores after dividing them into two halves, cutting them off from Suq Hamada Street, part of Al-Ajimi Street and another The locality of Al-Mushahida and part of Al Samarra and Jaafar, see Figure 19, 20, 21, 22.



Figure 18. Al-Salihiya Bridge showing the Al-Suwaidi house from Al-Salihiya side



Figure 20. Haifa Street. 4/29/2011 AD / Google Earth

Figure 19. Haifa Street and Buildings that border Al-Shawaka area



Figure 21. Haifa Street Buildings 2011 / Google Earth

When studying the Shawaka area, I found the emergence of new spaces such as the spaces surrounding the buildings of Haifa Street on the one hand and Muslim Ibn-Aqil Street, which represents the main street of the Shawaka area now, in addition to the presence of movement joints that were used as an exit to the area see Figure 23, and in addition to spaces that were important to those adjacent to the British Embassy Previously, it became a quiet area with many market noises as shown in the figure 24. see Figure 25, 26, 27, 28.



Figure 22.
A kinetic space linking Muslim Ibn-Aqil Street and Haifa Street has become an entrance and exit for the residents /



Figure 23. The end of Darbona, Bab Al-Seef, a covered road



Figure 24.
Al-Zarkashi Street parallel to the British Embassy (formerly) leading to the river and Husayniyah Al-Tarifa / source researchers



Figure 25. Al-Jada Street parallel to the river



Figure 26. Covered roads in Al-Shawaka Darbona Al-Baghi



Figure 27. Al-Nasr Street or Al-Shuhada Street



Figure 28. The intersection of Al-Nasr Street with Haifa Street

source researchers

Morphological analysis of Al-Shawaka region

The research adopts the stratigraphic approach in analyzing the structural characteristics of the urban fabric to explain the extent of compatibility between the holistic characteristics of the urban structure and based on its compositional characteristics, as the greater the compatibility, the higher the order index or the urban pattern and the less the chaos index.

Through a procedural analysis

Movement urban orders are the relationships extracted through systematic stratigraphic analysis in the morphological analysis of the urban fabric, which depends on the merging of two or more structural characteristics and relationships in order to reach a comprehensive explanation of the hidden relationships, which are the generating characteristics of the urban form and its apparent orders.

Table 1

Indicators of spatial awareness of the person moving within the area (the resident and the visitor) - Movement urban orders

Spatial and spatial indicators	spatial characteristics	Analysis variables in the model syntax
structure complex		
The journey through the city is interesting	Spatial permeability	Connectivity value
Dead ends - closed end		
Roads and streets are well connected	Spatial connectivity	Control value
Frequent visits		
high spatial coherence		
spatial compactness	Spatial compactness	Mean depth value
Mobility and mobility efficiency		
There is a clear main road	Spatial accessibility	Integration value

There is a large gathering center Spatial publicity

The possibility of identifying
and identifying the place

The spatial functional division
of the block is clear

Spatial identifiability

Intelligibility value

Clarity of use and clarity of
mass

Study area analysis 1917

By analyzing the old map of Al-Shawaka in Al-Karkh 1917, which is part of a map for all of Baghdad, (see Figure 29, 30, 31).



Figure 29. A map of the old Al-Karkh area, 1917



Figure 30. A satellite image showing the paths of movement according to the satellite image for the year 1917, the axes in the region after the work of (DOIT)



Figure 31. Reference Axles (INDEX MAP) 1917. Al-Shawaka area

It notes the importance of the dark coffee-colored path, which became Salah El-Din Street (currently Haifa Street), as well as the importance of the Bab Al-Seif Sharia law (blue color), which was considered a port and a commercial center for the rest of the regions, surrounded by boxes that stored grain and the rest of the materials Al-Shuhada Street and Al-Shuhada Street, followed by Darbona Al-Shawaka and Al-Zarkashi, noting that Tarraf Mosque was and is still located at the end of the Al-Zarkashi Darbona, which is a wide path opposite which is located (Kazim Pasha's house) the British Embassy after that.

In addition to the fact that the old mosque of Al-Shawaka is located in Darbona, Bab Al-Seef, which means that the religious center had an impact on finding places to live around it. On the side of creams, we also note the presence of the Husseiniya of creams, which is located on the line with coffee-colored. Next is the Pink Line, on which the Regent Cinema (Andalusia after that) was built. It was demolished and became the current Ministry of Justice. It should be noted that Al-Jada Street did not exist, as each house on the river bank had its own Sharia, so it was specific to each house facing the river, which is considered a private space. It was called, for example, Al-Kashi Sharia, or Al-Mawla Sharia, etc. (see Figure 32, 33, 34, 35, 36,)37.

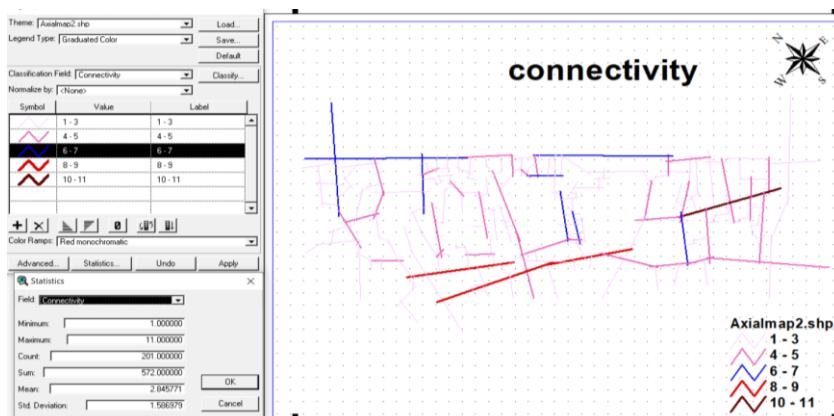


Figure 32. The Connectivity map of Al-Shawaka area 1917

Finding the changes in movement orders by using the axial maps in heritage fabric

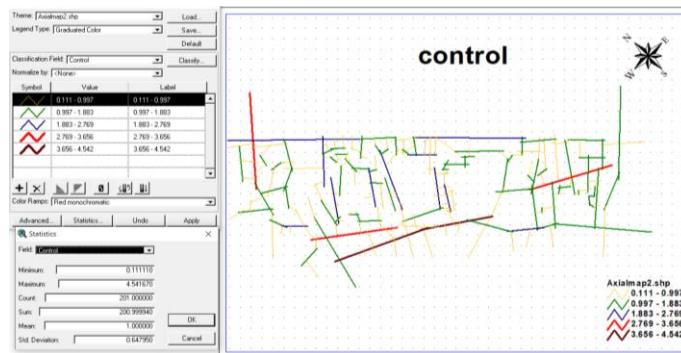


Figure 33. The control map of Al-Shawaka area 1917

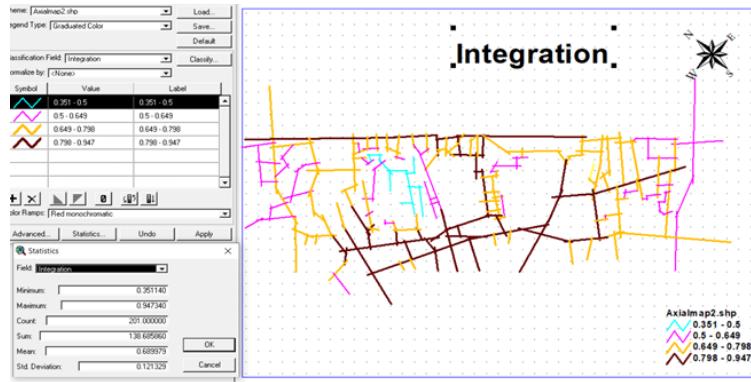


Figure 34. The integration map of Al-Shawaka area 1917

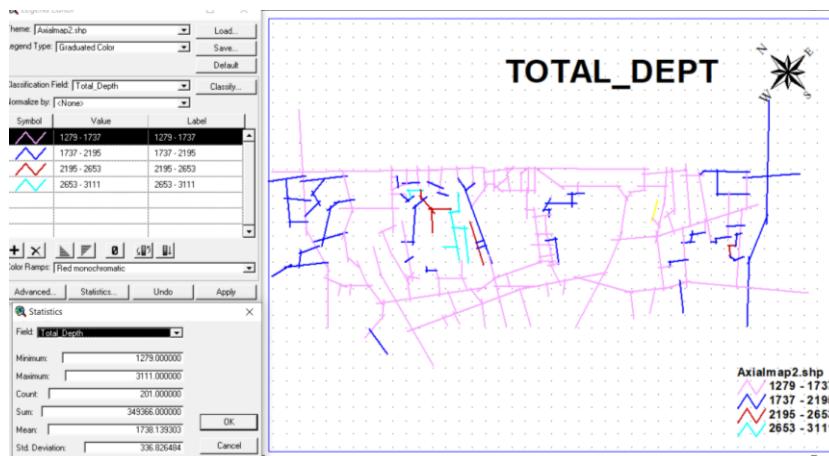


Figure 35. The total depth map of Al-Shawaka area 1917

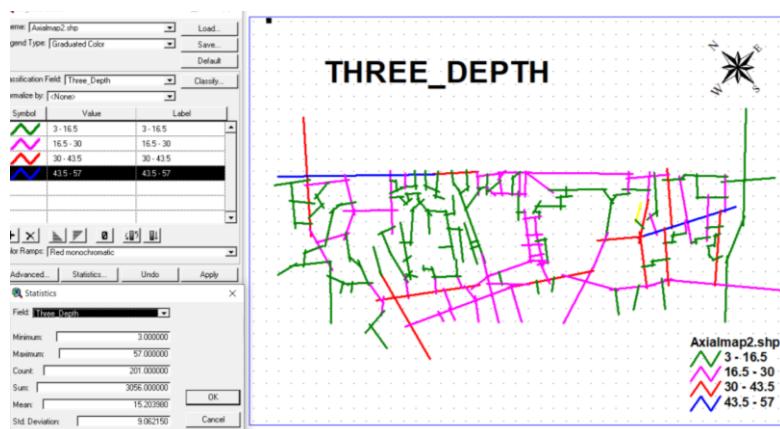


Figure 36. The three depth map of Al-Shawaka area 1917

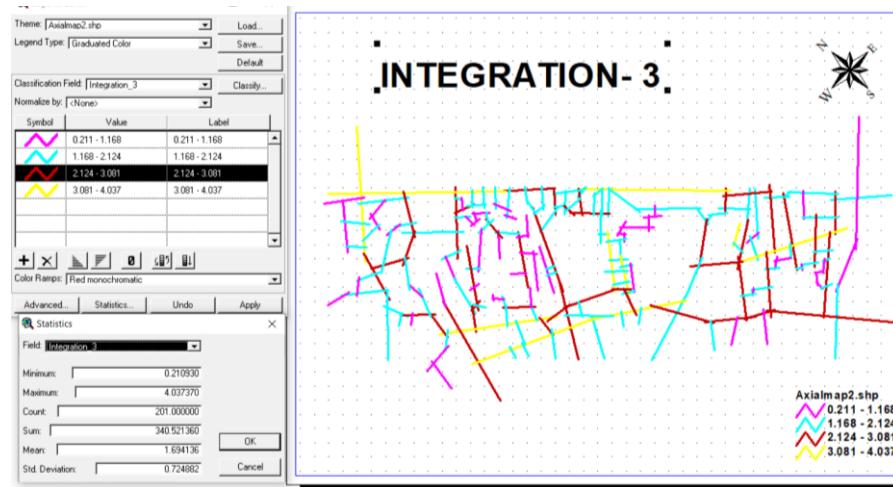


Figure 37. The integration-3 map of Al-Shawaka area 1917

Study area Analysis, Index Map for Al-Shawaka 2020

By analyzing the new map of Al-Shawaka 2020, which is part of a map for all of Baghdad, (see Figure 38, 39, 40).



Figure 38. A satellite image for Al-Shawaka 2020

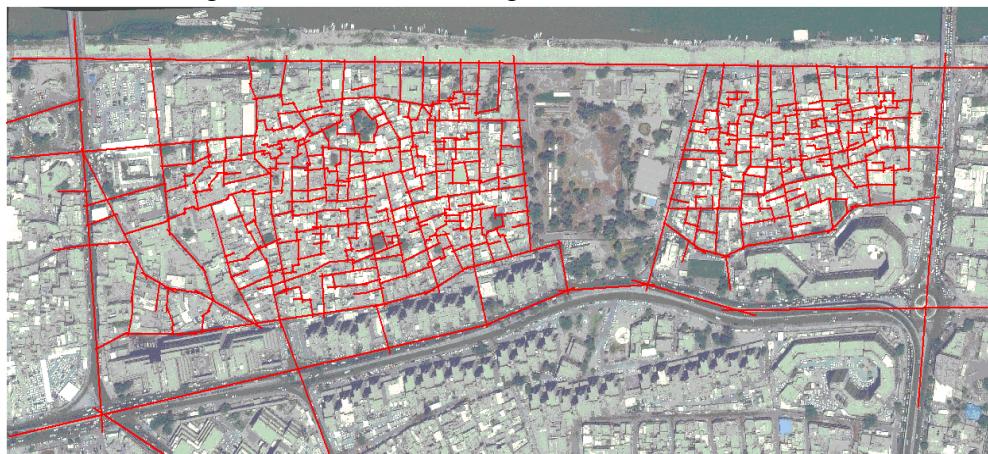


Figure 39. A satellite image showing the paths of movement according to the satellite image for the year 2020, the axes in the region after the work of (DOIT)

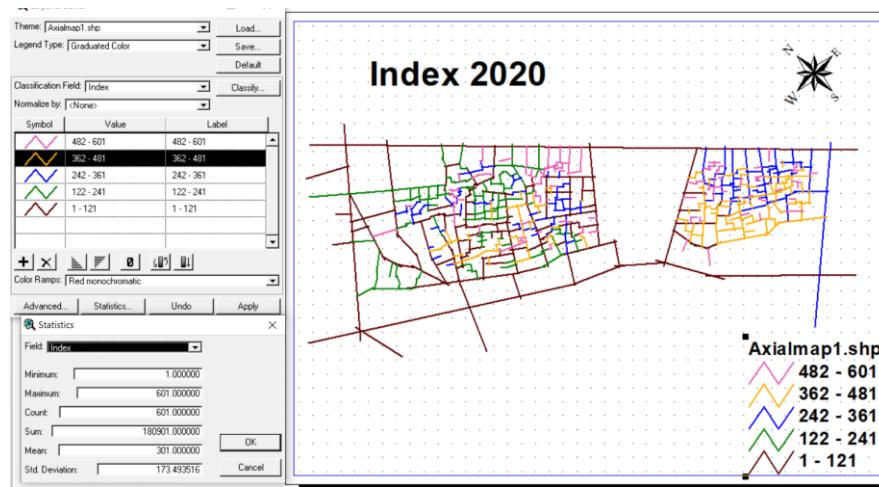


Figure 40. Index Map for Al-Shawaka 2020

By analyzing the shape that represents the correlation coefficient of the urban fabric and according to the 2020 satellite image, it can be concluded that the largest interconnection is on Al-Jada Street, then Al-Shuhada Street and part of Haifa Street near Al-Shuhada Street. (See Figure 41, 42).

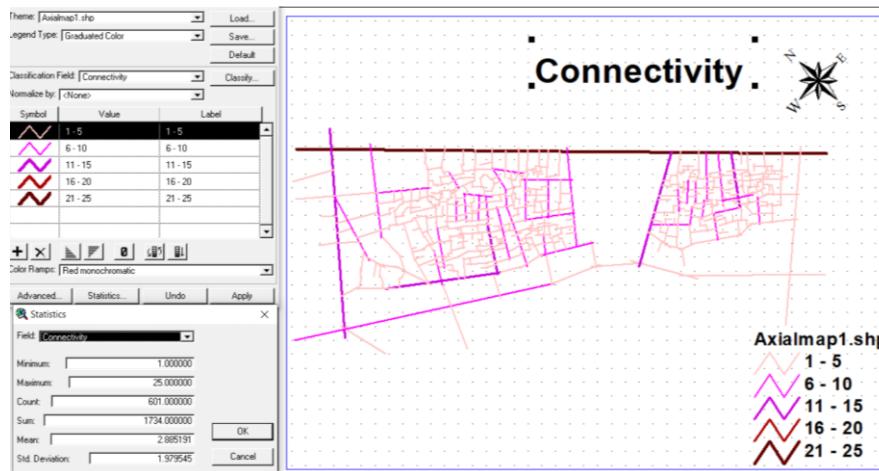


Figure 41. Axial connectivity map showing the gradient in the Movement urban orders
The gradient in the movement orders in terms of control

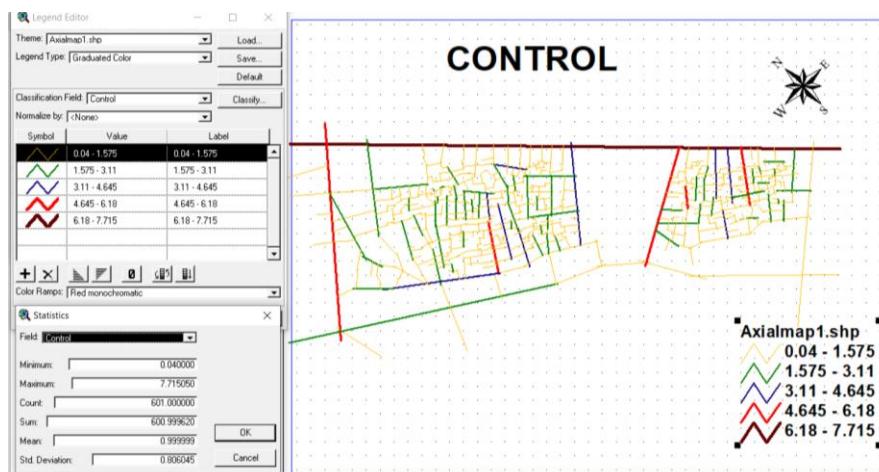


Figure 42. The control map of Al-Shawaka area

The best integrated area on the bank of the river - Aljada Street, see Figure 43, 44, 45, 46.

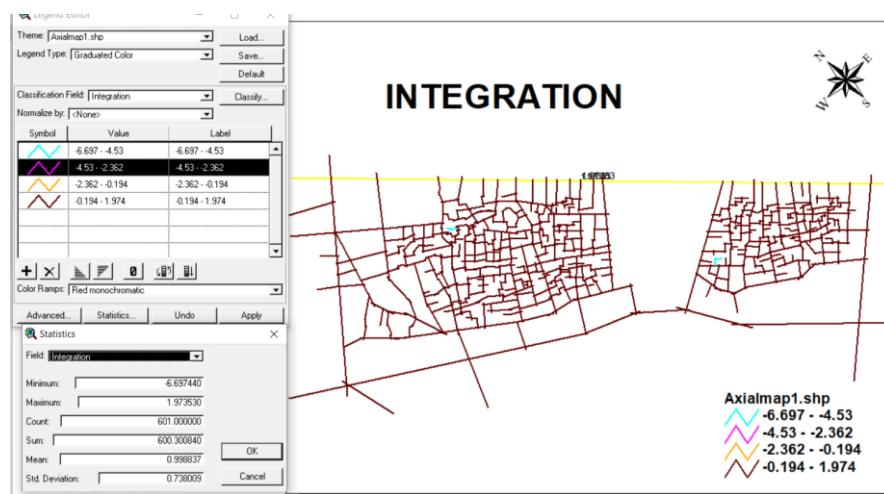


Figure 43. The integration map of Al-Shawaka area 2020

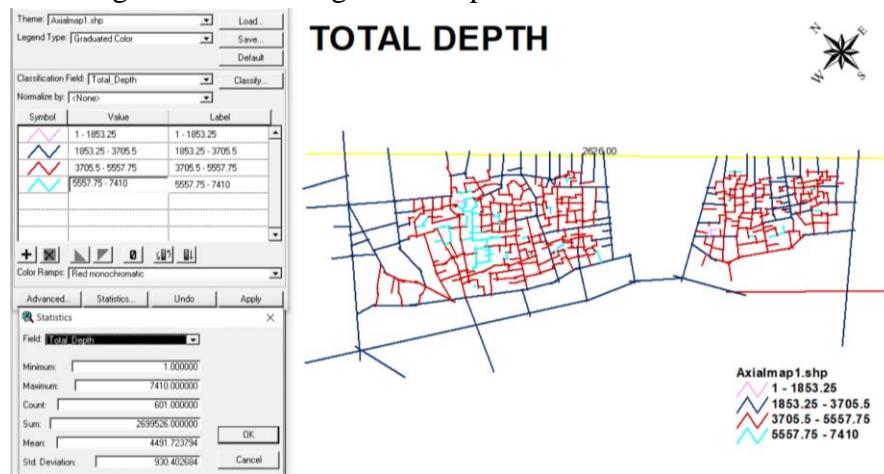


Figure 44. The total depth map of Al-Shawaka area 2020

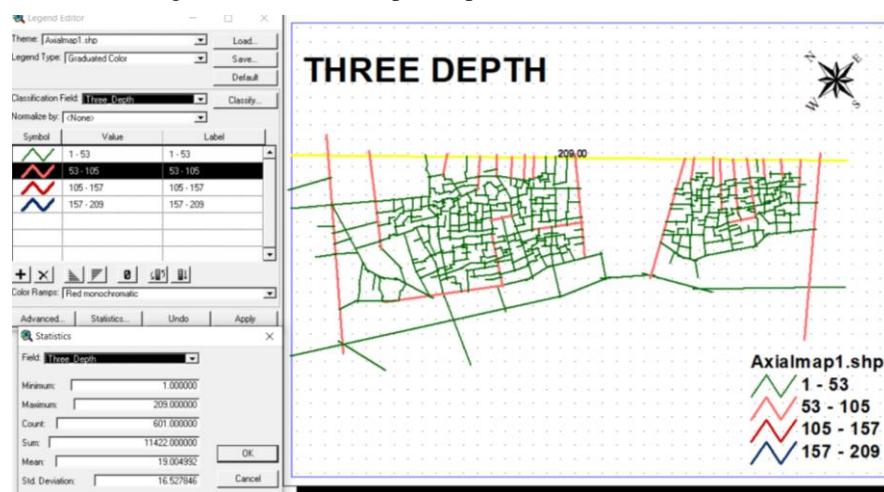


Figure 45. The three depth map of Al-Shawaka area 2020

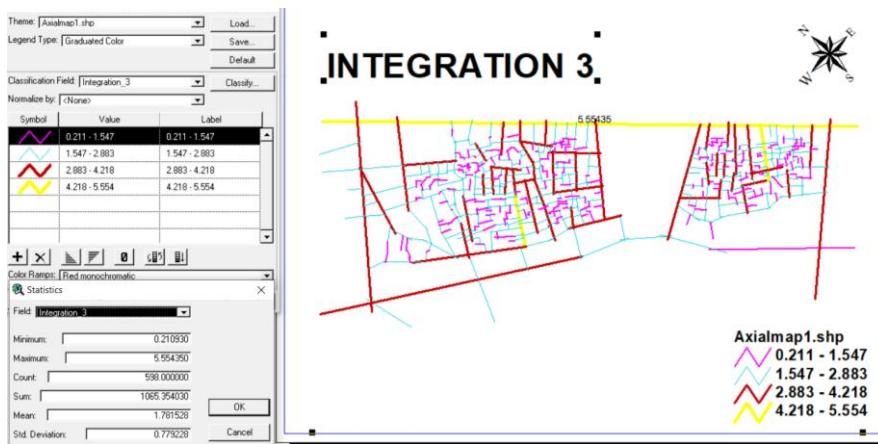


Figure 46. The integration -3 map of Al-Shawaka area 2020

Through the table, we note that the number of closed-end alleys increased with the increase in urban blocks. It is also noticed that there is no significant change in the clarity index despite the increase in the number of urban roads.

Morphological history / year	Axial lines	nondist.	Dist.	Maze index	Intelligibility index
1917	201	20	181	0.51650	0.48349
2020	601	70	531	0.57033	0.42967

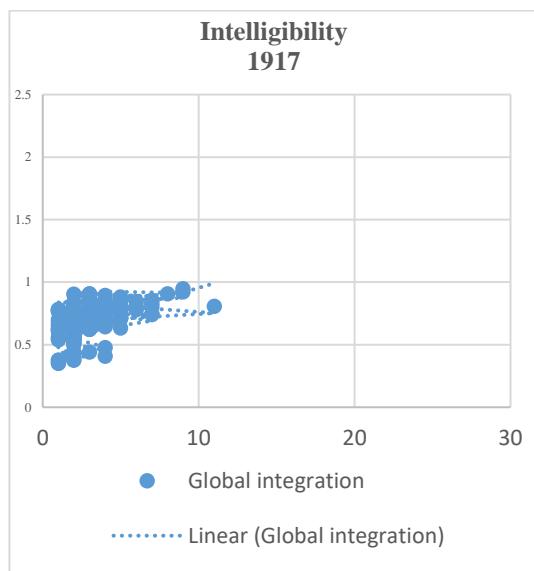


Diagram showing the global integration of the study area in 1917

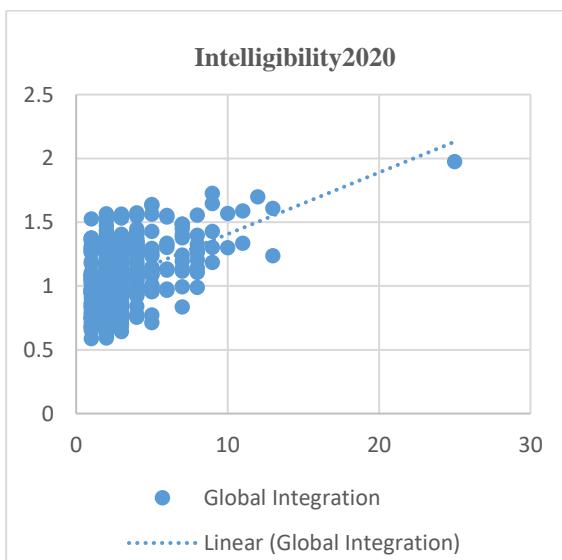


Diagram showing the global integration of the study area in 2020

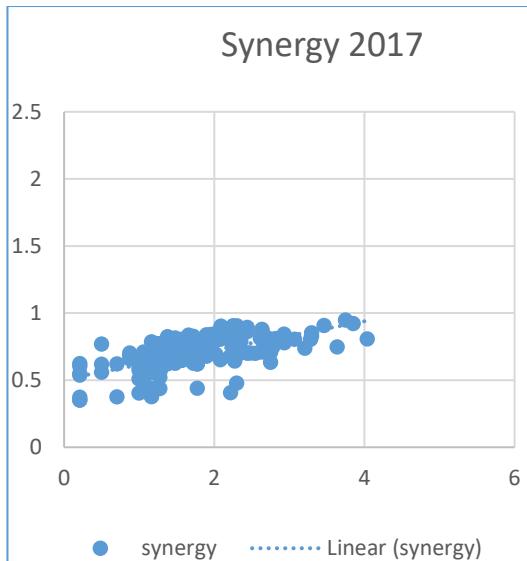


Diagram showing the synergy of the study area in 1917

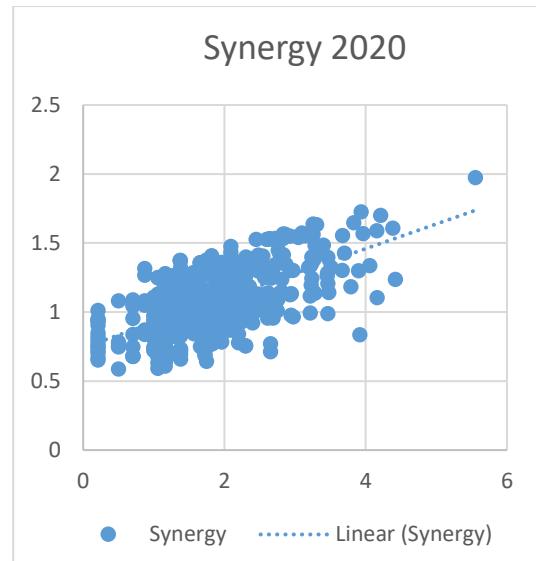


Diagram showing the synergy of the study area in 2020

Conclusions and Recommendations:

By discussing the reality and images and analyzing the space structure, we notice the effect of Haif Street, which was divided into the city. At the same time, we notice that the old alleys have not changed and they have remained the same. The shape pattern was preserved in the same style as the traditional city, but it expanded in the forties of the last century.

We note the preservation of the area on the shapes and patterns of buildings, we suggest that the area be included in the global conservation areas because the area contains many heritage monuments. The area has preserved the heritage alleys and historical axes.

The importance of the old British embassy building can be revived as a cultural and spiritual center for the region, as it links the historical hubs of this region, which is the historical center of Baghdad from the Karkh side.

Acknowledgements

This article is prepared in the context of PhD thesis with the title of “The Hidden-Orders in the heritage fabric in Iraq” studied in - University of Baghdad, College of Engineering- Architecture Department.

References:

- Dickinson, D. (2020). "Christopher Alexander and the Inadequacy of Genius in the Architecture of the Coming Age" *Urban Sci.* 4, no. 2: 17. <https://doi.org/10.3390/urbansci4020017>.
- Hakim, B. S. (2007). Generative processes for revitalizing historic towns or heritage districts, *Urban Design International*, 12, pp.87–99. Palgrave Macmillan Ltd.
- Hanson, J. (1989). Order and structure in urban design; the plans for the rebuilding of London after the great Fire of 1666. *Ekistics* 56 (334–335) 22–42.
- Hillier, B. (1996). *Space is the Machine* (Cambridge University Press, Cambridge).
- Hillier, B. (1996). *Cities and movement economies*. Urban Design International.

6. Hillier, B. (1999). The Hidden Geometry of Deformed Grids: Or, Why Space Syntax Works, when it looks as Though it shouldn't. *Environment and Planning B: Planning and Design*, 26(2), 169–191. <https://doi.org/10.1068/b4125>.
7. Lynch, k. (1990). *The Image of the City*. Copyright © 1960 by the Massachusetts Institute of Technology and the President and Fellows of Harvard College Twentieth Printime, (p.106).
8. Maki, F. (1964). Investigations in collective form, St. Louis, Washington University, The School of Architecture.
9. Memory of a place, Al-Nasr Street. Three names according to the fluctuation of times, Al-Shabaka Al-Iraqiya magazine, 17-April-2018. <https://magazine.imn.iq>.
10. Raouf, I. A. *Ali Bey's journey to Baghdad, year 1301 AH / 1885 AD*, date of adding the article: 27/8/2015, viewing date 10/26/2020. <https://www.alukah.net/culture/0/90952/#ixzz6bvRqK2wu>.
11. Trancik, R. (1986). *Finding Lost Space. Theories of Urban Design*. Van Nostrand Reinhold Company, New York. ISBN 0-442-28399-7.