

# Urban Dynamics in Historic Marketplaces: A Network Analysis of Traditional Bazaars in Baghdad, Iraq

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## Abstract

This research examines the vital role of traditional bazaars in the historical urban settings. It specifically examines the bustling area of Old Rusafa and Al Nahar Street, in the district of Rusafa, Baghdad, in the context of social and cultural landscape. This street is noted for its heritage-rich architecture which serve as key facilitators of social interactions and contributes to its cultural and communal identity.

It assesses a one-square-kilometer area surrounding the Al Nahar Street utilizing the Urban Network Analysis tool. It scrutinizes crucial urban network metrics such as reach, betweenness, closeness, gravity, and straightness, in order to discern their relationship with the architectural environment. The findings provide detailed insights into the interplay between the network indicators, the patterns of human movements and architectural layouts.

The study concludes that traditional bazaars, set within historical urban contexts, are not merely economic locales but also pulsating centers of social and cultural activity. Through an in-depth urban network analysis of Old Rusafa, the research offers essential perspectives for maintaining and enriching the cultural and economic dynamism of the area. These findings are crucial for effective urban planning and development strategies, presenting a framework for the preservation of unique heritage and the sustenance of the vibrancy of these historical urban hubs.

**Keywords:** Urban Network Analysis, Traditional Bazaar, Handcrafts, Intangible Heritage, Baghdad.

## Introduction

Globally, traditional bazaars are recognized as more than mere commercial spaces; they are crucial cultural and social centers embedded within the community. These markets, diverse in their offerings and locations, form an essential part of urban landscapes (Hakim, 2013; Iqbal et al. 2022). The larger bazaars, often located near the city gates cater to a wide range of needs, while smaller markets nestled in the core of the city meet the everyday needs of the locals (Lekagul et al., 2002; Selma, 2017; Albayaty, 2023; Heydari et al., 2023). For generations, these bazaars have symbolized the unique cultural identities and lifestyles of communities, transcending economic activities to represent a rich blend of cultural diversity, tradition, and

craftsmanship (Kalan & Oliveira,2015; Khalil,2016; Timothy, 2018; Bianco, 2023; Mazzetto and Vanini, 2023).

In Baghdad, especially within the historic Rusafa district, bazaars extend beyond their commercial functions to become dynamic centers of economic, social, and cultural exchange. These markets, reflecting the area's rich history and varied texture, act as communal gathering spaces. Here, the trading of traditional foods, drinks, and handicrafts contributes to a distinct cultural environment (Alobaydi,2017; Alobaydi et al., 2020; Al-Saffar, 2020; Abbas & Hussein,2023; Albabely & Alobaydi,2023; Albayati & Alobaydi, 2023; Alsaffar & Alobaydi, 2023) In this setting, bazaars are not just places for shopping but vibrant social arenas that capture the essence of community life and cultural identity (Tareq & Hussein, 2017; AL-Sadkhan & Ibrahim,2022).

Focusing on the AL Nahar Street and its surrounding area in Old Rusafa, this research delves into the location's architectural, economic, social, and cultural prominence (Al-Ghalib & Al-Assadi, 2018; Alani, 2023). AL Nahar Street, with its diverse shops and bazaars, stands as a testament to the evolving preferences and needs of the community. This street represents a fusion of history and modernity, where the design and architecture of the shops and bazaars are intimately tied to the lives of merchants and patrons. These spaces are more than commercial sites; they are ingrained in the community's collective memory and cultural fabric (Al-Saffar 2017; Aziz et al. 2020; Jameel &Alobaydi, 2022).

This research focuses primarily on exploring the complex characteristics of the urban fabric of Old Rusafa, specifically concentrating on Al Nahar Street. Its aim is to uncover critical insights into the enduring significance and dynamism of these traditional marketplaces within the modern urban landscape. Thus, it examines its architectural elements, the functionality and aesthetic aspects of its shops and bazaars, and their effectiveness in meeting the requirements and expectations of both the shopkeepers and the customers. Its objectives are:

- To ascertain the nature of the social fabric of Al Nahar Street.
- To assess its role as a central hub for the community.
- To identify the bonding and cultural representation that exist there.
- To ascertain how social interactions in the urban space of Al Nahar Street and contribute to its unique cultural identity and local character.

The focus is on examining the street as a key venue for social interactions and cultural exchange. It explores how Al Nahar Street promotes community involvement and maintains its lively atmosphere. To achieve these aims, an extensive review of pertinent literature is essential, aiming to provide a holistic view of the roles that traditional bazaars play in molding the social and cultural dimensions of historical urban areas.

## Theoretical Framework

The theoretical framework for the current study integrates key concepts from spatial network analysis and urban studies. This framework is rooted in the understanding of urban morphology and the dynamics of space utilization within historic marketplaces, drawing upon the insights, models, and techniques from many theoreticians (Porta et al. 2006; Sevtsuk & Mekonnen 2012a, 2012b)

First, the framework adopts the primal approach to network analysis, as advocated by Porta, Crucitti, and Latora (2006), where intersections are treated as nodes and streets as edges. This approach is crucial for capturing the authentic layout of the Baghdad bazaars, mapping the physicality of the space, and understanding pedestrian movement and interaction patterns (Porta et al., 2006). By focusing on the physical layout, the framework gains insights into how spatial configurations impact social and economic activities, a concept central to urban morphology studies.

Second, the incorporation of the Multiple Centrality Assessment (MCA), as detailed by Porta, Crucitti, and Latora (2006) enables a comprehensive analysis of the dynamics of the bazaar. Utilizing various centrality indices such as Closeness, Betweenness, Straightness, and Information Centrality, the framework provides a multifaceted understanding of urban dynamics. Each index reveals different aspects of the functionality and vitality of the

marketplaces, highlighting the intricate balance between spatial structure and urban activity (Porta et al. 2006). Finally, Sevtsuk and Mekonnen (2012b) provide the urban network analysis tools for ArcGIS informs the methodological approach. Their toolbox allows for the practical application of network analysis in an urban context, facilitating the exploration of how spatial configurations of the bazaars in Baghdad contribute to their socio-economic vibrancy (Sevtsuk & Mekonnen, 2012b). This integration of spatial network analysis with socio-economic factors is pivotal in understanding the role of historic marketplaces in the urban fabric and in shaping strategies for their preservation and revitalization.

This theoretical framework thus merges concepts from spatial network analysis with urban morphology and socio-economic studies. It provides a structured methodology for analyzing the complex interplay of physical space, social interactions, and economic activities within the historic bazaars of Baghdad, drawing upon the foundational works of many scholars (Crucitti et al. 2006; Porta et al. 2006; Sevtsuk and Mekonnen 2012a, 2012b; Sevtsuk 2018)

## Review of Literature

There exists extensive research on traditional bazaars, particularly within Arab-Islamic urban contexts, which highlight their integral role as centers of commerce, social interaction, and cultural significance. For example, Hakim (2013) and Elsayed (2013) have focused on the architectural variety within these markets and their integral role in shaping city identities and preserving local traditions, emphasizing their importance in the collective urban memory and cultural heritage (Hakim 2013; Elsayed, 2013). Moreover, Pourjafar et al. and Mehdipour and Nia have examined the unifying aspect of bazaars as social spaces, contributing to social unity and reinforcing cultural identities (Mehdipour & Rashi, 2013; Pourjafar et al., 2014).

The challenge of integrating traditional bazaars into contemporary urban development has been a key focus in the works of Major and Tannous, as well as Al Hashimi and Alobaydi. They illuminate the need for a balanced approach to both preserving these historical areas and ensuring that they remain sustainable and relevant in the modern settings (Major & Tannous 2020; Al Hashimi & Alobaydi 2023). Further expanding on this theme, Farhan et al., Albayaty, and Alsaffar and Alobaydi explore the significance of bazaars in urban growth and tourism, illustrating their role beyond just commerce (Farhan et al. 2022; Albayaty R 2023; Alsaffar & Alobaydi 2023)

From a wider regional perspective, Moosavi emphasizes the multifaceted roles of bazaars in Iranian urban environments, touching on their economic, social, and cultural impacts (Moosavi 2005). Similarly, Zandieh and Seifpour (2020) advocate for the preservation of these markets as part of the intangible cultural heritage, especially in the face of increasing tourism demands.

Khan, Tabassum, and Kusumowidagdo et al., delve into the spatial and physical characteristics of bazaars, proposing enhancements to public spaces and analyzing the physical attributes that attract tourism (Khan & Tabassum 2021; Kusumowidagdo et al. 2023). Moreover, Al-Saaidy and Alobaydi examine the impact of spatial design on cultural diversity and the functionality of urban spaces, underscoring the importance of spatial planning in promoting cultural interactions in marketplaces (Al-Saaidy & Alobaydi 2021).

While this research corpus is broad and varied, it often misses combining quantitative and qualitative methods. This study seeks to fill these gaps, furthering the understanding of bazaars as essential elements of urban environments and providing new insights into the study of traditional markets.

## Research Methods

In the study of traditional bazaars, with a focus on AlNahar Street in Old Rusafa, Baghdad, a thorough methodological approach was employed, encompassing both the quantitative layout aspects and the qualitative social and cultural dynamics. The research utilized a case study methodology centered on Al Nahar Street, facilitating an intensive analysis within its distinctive historical and urban setting.

A pivotal instrument in this investigation was the UNA tool, developed by Sevtsuk and Mekonnen, which assessed crucial urban network metrics such as reach, betweenness, closeness, gravity, and straightness. This tool shed light on the bazaar's integration within the larger urban network (Sevtsuk & Mekonnen 2012).

Simultaneously, detailed field surveys and observational studies were undertaken in Old Rusafa. These involved meticulous mappings and architectural evaluations of key buildings, coupled with direct engagement with the locale. Such ground-level interaction was essential to grasp the intricate operational dynamics of the bazaar and the socio-cultural exchanges it nurtures. Furthermore, the incorporation of Geographic Information System (GIS) technology into the research was critical. GIS allowed for spatial analysis through aerial imagery and intricate mapping, offering a thorough visual record of historic structures and their spatial interconnections.

This methodology amalgamated data from a variety of sources to form a comprehensive understanding of AlNahar Street's function within Old Rusafa's urban network. The approach enabled the research to determine how traditional markets, embedded with historical and cultural significance, can be integrated into contemporary urban development while preserving their distinct characteristics. As a result, the study yielded practical insights for the conservation and rejuvenation of Al Nahar Street, contributing to its ongoing relevance and dynamism in the modern urban fabric. The methodology effectively blended quantitative analysis using the UNA tool with qualitative insights from field observations and GIS technology, presenting an all-encompassing view of traditional bazaars in the context of Arab-Islamic urban environments.

### The Case Study: AL Nahar Street

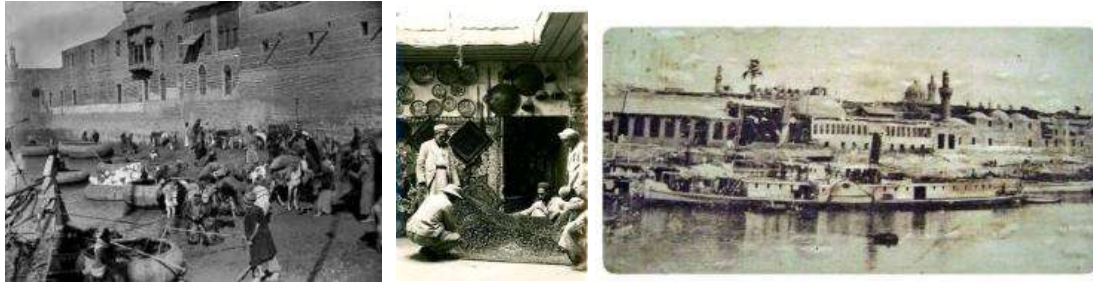
Al Nahar Street, located in Eastern Baghdad, has been a key commercial and cultural center since its inception in 1910 (Figure 1). Positioned near the Tigris River, this bustling street has historically attracted a diverse range of shops and artisans. It is known for its eclectic mix of products, including high-end international brands for weddings and events, as well as a variety of locally produced and imported carpets, antiques, and handmade apparel (Ibrahim 1992; Jameel & Alobaydi 2022). Beyond its commercial appeal, Al Nahar Street is also a noted tourist attraction, distinguished by its rich architectural landscape featuring historic sites such as the Al-Mustansiriya School and numerous mosques, along with unique Khans.

AL Nahar Street's historical importance dates to the Abbasid period and was further enhanced during the Ottoman era due to its strategic location along the Tigris River. This advantageous position has cultivated a vibrant and diverse commercial ecosystem, drawing in both local artisans and notable international brands, especially those related to weddings and events. The street's reputation is also built on its variety of shops and warehouses offering carpets, antiques, and handcrafted clothing, showcasing a fusion of local artistry with global trends (Albayati & Alobaydi 2023) (Figure 3).



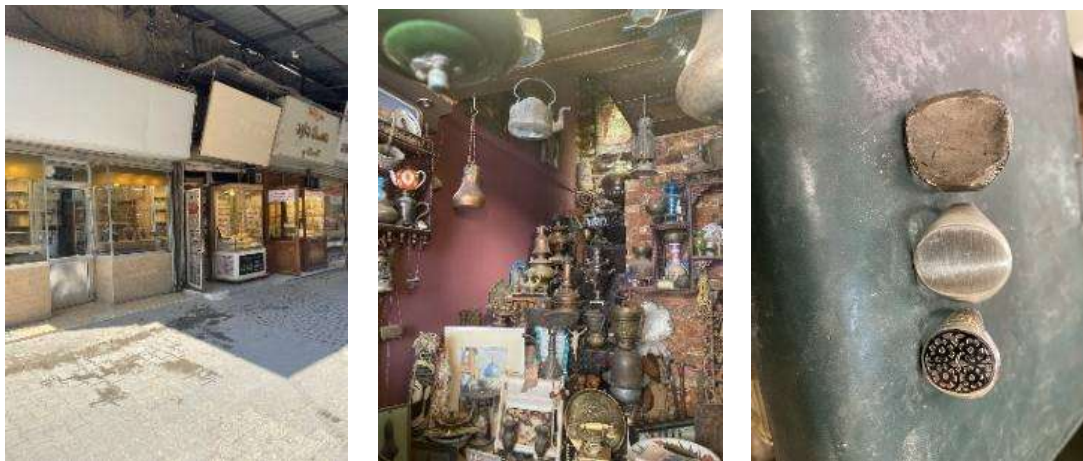
**Fig.1:** Al Nahar street & Khan Al -Shabandar (Khan Jighan)

Source: Baghdad Municipality modified by authors



**Fig. 2:** Al Nahar Street at the beginning of the last century  
Source: Municipality of Baghdad; A. Unloading goods B. Carpet shop C. River

The historical and architectural significance of Al Nahar Street extends well beyond its role as a commercial hub. It houses notable buildings such as the ancient Al-Mustansiriya School, and various mosques including AlAdiliya and AlKhafafin. The area also encompasses cultural landmarks like the Grand Jewish Forum, Khans AlKhudayri, Al-Basha, and the famous Haidar Bath. Its proximity to other historical sites like Khan Murjan, the Abbasid Palace, the Qishla Building, the Latin Church, and the Khulfaa Mosque further integrates it into the historic urban landscape of Baghdad's Rusafa Center (Figure 4).



**Fig. 3:** Gold, silver smiths, and antique shops in Al Nahar Street.  
Source: Authors



**Fig. 4:** Historic buildings on Al Nahar Street  
A. Khan AlKhudairi, B. Al-Adelia Mosque, C. Building at the riverside.  
B. Source: Authors

Today, AL Nahar Street stands as a symbol of Baghdad's rich historical and cultural heritage. It continues to play a crucial role in the everyday lives of residents and remains a captivating destination for tourists with its unique combination of historical significance and

bustling market atmosphere. It is not just a commercial artery; it is a vital representation of Baghdad's historical and cultural legacy, an essential component of the city's heritage.

### Urban Network Analysis (UNA)

To analyze the spatial networks, NCM models are used, which consist of five main measures: reach, gravity index, intercentricity, proximity, and straightness.

- **Reach Centrality**

The measure of access centrality is utilized to calculate the shortest distance that can be traveled from a typically located node to all the other nodes (Sevtsuk & Mekonnen, 2012). The access centrality is derived from the following mathematical formula:

$$\text{Reach Centrality } R_r = \sum_{j \in G - \{i\}; d[i,j] \leq r} W[j]$$

Reach Centrality  $R_r$  Research Radius  $r$   
node  $i$  The shortest path  $d$   
graph  $G$  Weight a distance node  $W$

In the context of UNA, “weights” refer to essential numerical factors critical in the evaluation of the target buildings. These include parameters like the size and the intended occupancy of the buildings. The analysis further incorporates the aspect of accessibility, assessing the ease with which one can reach and depart from the building in question (referred to as “i”). This aspect involves determining the number of buildings accessible within a specified radius (denoted as “r”), ensuring that movement to and from “i” is feasible using the shortest paths available in the street network. For analytical precision, this radius is strategically set to encompass a total of twenty sites within a circular area with a diameter “r”.

- **Betweenness Centrality**

The concept of “Betweenness Centrality” is pivotal in understanding the role of a building within an urban network. This metric is calculated by identifying the shortest path between any two nodes (buildings) in the network and assigning appropriate weights to these paths based on specific criteria. These criteria include the number of buildings accessible from the target building “i” within a defined radius “r” within a stipulated timeframe. For a building to be considered as having significant accessibility, it should be able to connect with a minimum of twenty buildings within a semi-circular area with a diameter “r”. Furthermore, the weighting of paths interlinking buildings takes into account their dimensions and connectivity levels. In a network with a rectangular layout, paths sharing equal dimensions are assigned a standard weight, labeled as Weight A. This process facilitates the analysis of the shortest and most efficient paths between connectable nodes, allowing for an accurate assessment of betweenness. When these paths are frequently utilized, it signifies that the building in question (“i”) holds greater influence within the network. This concept is articulated in the equation provided by (Sevtsuk and Mekonnen 2012a) which precisely defines betweenness centrality within UNA:

$$\text{Betweenness Centrality } B_r = \sum_{j,k \in G - \{i\}; d[j,k] \leq r} \frac{1}{d[i,j] \cdot d[j,k]} \cdot W[j]$$

Reach Centrality  $R_r$  Research Radius  $r$ , node  $i$  The shortest path  $d$ , graph  $G$  Weight a distance node  $W$ .

- **Closeness Centrality**

The reciprocal value of the cumulative distance between a specific node (building) and all other nodes in the network is known as inverse access centrality (Sevtsuk & Mekonnen 2012). This value is computed based on the shortest paths and can be expressed mathematically using the following equation:

$$\text{Closeness Centrality } C_r = \frac{1}{\sum_{j \in G - \{i\}; d[i,j] \leq r} d[i,j] \cdot W[j]}$$

- **Reach Centrality**  $R_r$  Research Radius  $r$ , node  $i$  A shortest path  $d$ , graph  $G$  Weight a distance node  $W$

Proximity centrality measures how close a building is to other connected buildings within a certain radius, without considering their weights. Buildings with high proximity

centrality are more centrally located and can save transportation costs and effort. This can lead to higher economic values of land and rent, compared to other sites.

- Gravity Centrality

Spatial resistance of a building “i” was measured from each surrounding side, based on the shortest path distance to other nodes (Sevtsuk & Mekonnen 2012) It varied directly with the importance of these nodes, as expressed by the given equation:

$$C rG[i] = \sum_{j \in G - \{i\}, d[i,j] \leq r} \frac{1}{e^{\beta \cdot d[i,j]}}$$

$$j \in G - \{i\}, d[i,j] \leq r$$

Gravity Centrality  $C rG$  Research Radius  $r$ , node  $i$  shortest path distances, graph  $G$  particular destination

- Straightness Centrality

Straightness Centrality measures the degree to which the shortest paths between a building “i” and its neighbors converge within the extended diameter, indicating the straightness of these paths (Sevtsuk & Mekonnen 2012) It can be defined as the following:

$$C rS[i] = \sum_{j \in G - \{i\}, d[i,j] \leq r} \frac{\delta[i,j]}{d[i,j]}$$

$$j \in G - \{i\}, d[i,j] \leq r$$

Straightness Centrality  $C rS[i]$  as-a-crow -files distance between building, Node (building) Node (i) the shortest network distance between the same building

The NCM measures the centrality properties of nodes in a spatial network graph There are five centrality metrics in the UNA toolbox, and a radius of 500, and 1000 meters was used to measure them in this study.



**Fig. 5:** The map of the Betweenness of the study area, a radius of 500  
Source: Authors



**Fig. 6:** The map of the Betweenness of the study area, a radius of 1000  
Source: Authors



**Fig. 7:** The map of the closeness of the study area, a Radius of 500  
Source: Authors



**Fig. 8:** The map of the closeness of the study area, a Radius of 1000  
Source: Authors



**Fig. 9:** The map of the reach of the study area, a Radius of 500  
Source: Authors





**Fig. 10:** The map of reach of the study area, a Radius of 1000  
Source: Authors



**Fig. 11:** The map of the Gravity of the study area, a Radius of 500  
Source: Authors



**Fig. 12:** The map of the Gravity of the study area, a Radius of 1000  
Source: Authors



**Fig. 13:** The map of the straightness of the study area, a Radius of 500  
Source: Authors



**Fig. 14:** The map of the straightness of the study area, a Radius of 1000  
Source: Authors

## Findings and the Discussions

In this research, the UNA tool was applied to evaluate critical metrics such as Reach, Betweenness, Closeness, Straightness, and Gravity within 500- and 1000-meter radii. These indicators were categorized using a color-coded scheme for straightforward interpretation.

The findings highlight distinct variations in Reach centrality in different areas. Notably, the Northwest showed the highest connectivity, which increased at greater radii. In contrast, the Southwest exhibited a significantly lower connectivity levels. Meanwhile, the Northeast demonstrated moderate to high Reach values, which improved progressively with larger radii.

Betweenness centrality also showed marked differences across the site. The Southwest registered low betweenness, while the Northwest evidenced moderate to high levels, intensifying with the radius increase. The Northeast displayed intermediate betweenness values, which also rose with larger radii.

Closeness centrality was uniformly low across all areas and radii, predominantly marked with green on the site maps. However, Straightness centrality presented more favorable results. The highest straightness scores were observed in the Northwest, with the Northeast also showing moderate to high values. The Southwest, though starting lower, exhibited gradual improvements with expanding radii.

The Gravity metric indicated a limited impact on movement patterns across the site, suggesting a marginal influence on overall urban network connectivity.

Despite some lower scores in regions around AlNahar Street, the area continues to attract significant footfall and maintain its appeal. This enduring popularity is credited to several factors, including the bustling handicraft, goldsmith, antique, and textile markets.

AlNahar Street's strategic position at the heart of the historic commercial hub significantly contributes to its high pedestrian traffic.

The liveliness of AlNahar Street, marked by vibrant social exchanges, stems from its rich historical background, cultural heritage, and varied commercial offerings. Interestingly, while quantitative metrics like reach, closeness, betweenness, and gravity did not record high values, the area's vitality and sustainability extend beyond these measures. The intangible qualities that endow AlNahar Street with its unique charm are difficult to quantify but remain crucial. Although the quantitative data may not completely capture the social essence of AlNahar Street, the straightness measure aligns with global urban study trends. In conclusion, AlNahar Street's cultural and social vibrancy represents a key and distinctive aspect of the city's intangible urban tapestry.

## Conclusions

This research provided substantial insights into the social and structural complexities of traditional bazaars, with a special focus on AlNahar Street in Old Rusafa, Baghdad. Through the application of the UNA tool, critical metrics including Reach, Betweenness, Closeness, Straightness, and Gravity were accurately analyzed, offering an in-depth view of the urban network in the area. The results uncovered a variety of urban network characteristics: Reach exposed different degrees of accessibility and interconnection, underscoring AlNahar Street's pivotal role; Betweenness revealed the crucial significance of certain routes and areas, mirroring activity flows; Closeness gave a glimpse into the tight-knit nature of the community; high Straightness scores in the north and northeast indicated efficient transit, consistent with findings in global urban studies; and Gravity highlighted the impact of particular zones on movement and interactions.

Despite some areas showing lower metrics, AlNahar Street remains a bustling hub of social and economic activities. Its rich cultural legacy and versatility remains intact. The Straightness metric, in particular, resonates with patterns observed in comparable urban settings worldwide. The strength of this study lies in the seamless fusion of quantitative and qualitative data, offering a thorough perspective on urban dynamics, and its contribution to the body of UNA tool research. By concentrating on a specific case study, the research manages a detailed examination of traditional bazaars in a historical urban setting.

For decision-makers, urban designers, and planners, this research provides an understanding of the importance of a well-rounded approach to preserving and rejuvenating traditional bazaars. It draws attention to both the physical and intangible aspects that fuel the vibrancy and endurance of these culturally significant marketplaces. The insights derived from this study are crucial for shaping effective urban strategies and policies and ensuring the ongoing vibrancy and relevance of historical urban areas.

## Limitations of Research

- UNA, while insightful for spatial and topological understanding, may not fully capture the socio-economic and cultural intricacies of Baghdad's traditional bazaars. Its focus on geometric properties and pedestrian movements might overlook the historical evolution and the complex interplay of socio-cultural dynamics, of the bazaar which can be studied by another analytic application like Space Syntax.
- The research emphasis on network analysis might sideline crucial environmental aspects such as microclimate, noise, air quality, and lighting. These elements are pivotal in influencing the functionality and attractiveness of marketplaces, and their exclusion could lead to an incomplete understanding of what shapes the bazaars' vibrancy and sustainability.
- Relying on quantitative network analysis tools could pose challenges in integrating qualitative data like historical accounts, cultural significance, and personal experiences. This might restrict the research's capacity to fully portray the multifaceted character of traditional marketplaces, which are as much cultural and historical entities as they are physical spaces.

However, each of these limitations' points to areas where further research could enrich the understanding of urban dynamics in historic marketplaces, by incorporating a more holistic approach that balances spatial configuration analysis with socio-cultural, environmental, and historical perspectives.

### Recommendations

Following recommendations are proposed based on the findings:

- Despite AlNahar Street's modest ratings in the quantitative metrics of the built environment, its profound social, cultural, and commercial relevance within Rusafa's historic heart must be emphasized. The area is distinguished by its unique architectural features, the quality of its traditional crafts, and the intangible cultural heritage that enriches its everyday life, all of which constitute invaluable assets.
- A comprehensive development approach is necessary to fully harness the potential of the entire Rusafa region. This strategy should aim to improve the area's integration with other parts of the city, address infrastructure needs, and restore its historic buildings. Such efforts are key to re-establishing the area as a prominent urban destination and highlighting its historical importance.
- Leveraging the unique charm and cultural richness of AlNahar Street presents an opportunity to revitalize it as a vibrant and essential component of Baghdad's urban fabric. Initiatives to capitalize on these features can significantly contribute to the area's renewal. The goal of this rejuvenation is not just to draw tourists but also to actively involve
- Encouraging the residents to engage with and celebrate the rich history and lively community atmosphere of the AlNahar Street.

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