

APPLICATION OF SPACE SYNTAX IN DEVELOPING. A regeneration framework for Sharjah's heritage area

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Abstract

In 1998, UNESCO selected the Emirate of Sharjah as the cultural capital of the Arab World. At present though, Sharjah's historic area (Al Mureijah and Al Shueiyheen) is suffering from traffic congestion and environmental degradation that make it unattractive for visitors and inhabitants. These issues need urgent attention in order to reverse any further degradation of the historic city center, achieve economic and social gains, conserve the environment, and preserve the cultural heritage.

This research addresses the challenge of revitalizing historic Sharjah by identifying, understanding and providing solutions to problems that have emerged through its recent rapid growth. The main goal is to develop an analytical framework that will be utilized for future development strategy and urban design guidelines for revitalizing the historic core of Sharjah.

The proposed research will use Space Syntax as a diagnostic tool to understand how the history and evolution of the city's structure had led to patterns of density, land use and socio-economic settlement. We hope to identify spatial causes of what are seen as barriers to social cohesion and develop a priority list of objectives for future development in Sharjah's heritage area. We aim to scientifically evaluate the current problems, determine which land uses are appropriate for the continuance of economic and social gains, and develop priorities for: safeguarding cultural heritage; protecting the environment; increasing livability for visitors and inhabitants.

The fundamental achievement of this research will be an analytical framework that will serve as a guideline for future urban regeneration of Sharjah's historic area. The findings of this study will shed fresh light on future research in the field of urban design and conservation and can be used to evaluate proposals to regenerate historical city centers that are under threat or have lost their economic, social, environmental and cultural vitality.

INTRODUCTION

The modernization process that the cities in the Arabian Gulf is experiencing has led to a rapid growth. In varying degrees each Emirate in the Gulf exhibits a desire to modernize by growing rapidly and facilitating the emergence of global urban projects. This has led to destruction and/or degradation of historic waterfront, landscape, and the built environment.



Figure1: Sharjah and other Al Khalij portal cities

Sharjah is the third largest emirate in the United Arab Emirates, and is the only one with ports on *Al Khalij* and the Indian Ocean, thus occupying a crucial access to global trade routes, and ensuring its place as a centre of international commerce.



Figure2: Views from Historic Sharjah

Sharjah shares with other port cities of *Al Khalij* three aspects of historic urban development: it naturally fit in and was open to a body of water; it was protected from the desert edge by a wall and a fort; and it maintained a diverse and multi-functional life connected to the waterfront.

As one of the cities located on both sides of Al Khalij, Sharjah is quite distinct from traditional "madinas" of the Arab-Islamic world. While most "madinas" were typically developed as, and actively participated in, trading activities across land, *Khaliji* port cities relied on across the water exchange and only secondarily traded with the nomadic hinterland. While inhabitants of most "madinas", even when they were situated on a river, considered the water as a vulnerable edge of the city requiring forts and towers for protection, most port cities in eastern Arabia considered *Al Khalij* as a "friendly" zone and, in contrast, heavily protected the desert edge of the city from the tribal nomads.

The traditional "madina" in the Islamic world that have inspired large corpus of academic literature (Fez, Damascus, Aleppo, etc.) originated as "Polis"¹ and their growth continued some aspects of pre-Islamic conceptions of "Islamic urbanism".² In contrast, most port cities in eastern Arabia were urbanized due to mercantile activities along the water edge and in most cases had their "backs" to the desert. The eastern Arabian port cities historically do not have the origination, configuration or management system of the traditional "madina". Since port cities in eastern Arabia were settled by people from different origins from the "land" that occupied the settlement, the patterns of land tenure, ownership rights, and control of space were very fluid. We still do not know how these patterns affect the configurations of buildings, streets, and the alignment of shops in commercial areas and markets, but we do know that they were distinct and less defined than has been noted in cities of the Arabian Peninsula and Northern Africa.³

The process of land demarcation and subdivision in the early formation of "madinas"⁴ is quite distinct from the process undertaken for allocating land to public and private uses in port cities of eastern Arabia. The allocation of public land to private individuals preceded the consideration for the layout of public right-of-ways. Moreover, merchant patrons financed development of residential areas and the provision of services for the population, including the establishment of mosques for *ma'tam* congregation for the *Shiah* muslims.⁵

While the institution of *Waqf*⁶ functioned in "madinas" from the early Islamic period, its existence in eastern Arabia is very recent (post 1930s). This lack of a public authority to develop and monitor religious buildings is at the heart of a distinct typology of port city impacting buildings and by extension urban form, where the merchants were directly responsible to develop public services and institutions. The impact of "waqf" as controlling authority for a large number of buildings and real estate in the "madina" as a whole is well studied,⁷ but there are no studies of the origination and maintenance of public institutions in port cities of *Al Khalij*. As we can imagine, distinct processes of "merchant-led" development and maintenance of public buildings and urban open spaces produces a distinct type of port city.

¹ Akbar, Jamel. *Crisis in the Built Environment: The Case of the Muslim City*, Concept Media, 1988.

² Bonine, M. E., "Islamic Urbanism, Urbanites, and the Middle Eastern City," in Choueiri, Y.M. (ed.), *A Companion to the History of the Middle East*, Blackwell, 2005.

³ Bennison, Amira K and Gascoigne, and Alison L., *Cities in the pre-modern Islamic world: the urban impact of religion, state and society*, Routledge, 2007.

⁴ Abd Al-Kader, Ali. "Land, Property and Land Tenure in Islam," *Islamic Quarterly*. (1959): 4-11.

⁵ Fuccaro, N., *Histories of City and State in the Persian Gulf*, op.cit., 73-75.

⁶ The Arabic term *Waqf* (plural *Awqaf*) means a philanthropic institution developed in the Muslim world during the early days of Islam, firmly established by the 10th century in most of the Arabian Peninsula, making a significant contribution to the development of early Muslim societies. *Waqf* refers to the permanent dedication by a Muslim of any property for any purpose recognized by the Muslim law as religious, pious or charitable. See Chapra, M.U. "Ibn Khaldun's theory of development: Does it help explain the low performance of the present-day Muslim world?" *Journal of Socio-Economics*, Volume 37, Issue 2, April 2008, Pages 836-863.

⁷ Owen, R., *New perspectives on property and land in the Middle East*, Center for Middle Eastern Studies of Harvard University by Harvard University Press, 2000; Leeuwen, R., *Waqfs and urban structures: the case of Ottoman Damascus*, Brill, 1999;

To summarize, *Khaliji* portal cities did not originate as "Polis" and their growth primarily took place at the hands of Muslim merchants. Moreover, "waterfront" in *Khaliji* portal cities is not the "vulnerable" edge, and these cities are heavily protected from the desert maintaining an open space for secured interaction with the tribal hinterland.

Though it has been recognized that existing models on spatial and functional evolution of ports and cities are mainly derived from European and American cases, attempts thus far have introduced evidence from an Asian perspective, focusing on the particular case of global hub port cities such as Hong Kong and Singapore.⁸ The unique historical development of pre-modern "portal urbanism" in many Eastern Arabian cities is in the 'blind spot' of academic literature.⁹

Though UNESCO in 1998 selected the Emirate of Sharjah as the cultural capital of the Arab World, Sharjah's historic area (Al Mureijah and Al Shueiyheen) is suffering from environmental degradation despite the fact that it encompasses a vibrant community of residents, inhabitants, visitors, shopkeepers and workers.

This paper addresses issues of heritage conservation by investigating problems in the historic area of Sharjah through the application of the Space Syntax method. The methodology of the study includes Space Syntax analyses, physical structure analyses and observations on existing pedestrian movement patterns and activity schemas. Through the evaluation of analyses, we aim to identify, understand and provide solutions to problems in the historic area that have emerged through the recent rapid growth of Sharjah.

A SHORT HISTORY OF THE CITY OF SHARJAH



Figure3: Gulf Coast

The city of Sharjah is one of the port cities of eastern Arabia. The distinct but inter-connected spaces that historically emerged in Sharjah's urban form are directly related to *Al Khalij*. The water body, called *Al Khalij* in both Arabic and Persian, was historically the space for interactions between buyers and sellers, and exchange between indigenous cultures and the subsequent empires (both regional and European). Each *Khaliji* city was a portal to the land, playing a significant and distinct role in facilitating the primacy of the Indian Ocean trading route from the seventeen through the nineteenth centuries. This water body until the mid-20th century was a unifying agent facilitating the development of the city of Sharjah from a small fishing town to a settlement and then to a portal city.

⁸ Lee, S-W., Song, D-W and Ducruet, C., "A tale of Asia's world ports: The spatial evolution in global hub port cities," *Geoforum*, Volume 39, Issue 1, January 2008: 372-385.

⁹ With the exception of a recent study on Manama, Bahrain: Fuccaro, N. *Histories of City and State in the Persian Gulf: Manama since 1800*, Cambridge University Press, 2009.



Figure 4: Sharjah 1976 Air View

The 1970s planned modern interventions not only disrupted and disconnected the traditional spaces, their planners imagined a new city with its back to *Al Khalij* and for the first time in its history settled Sharjah encountered the desert, as opposed to historically defending itself from its nomadic inhabitants.

A strategic move to pull the urban growth of Sharjah internally toward the desert and away from the waterfront led to the development of the University City and the ensuing residential development around the ancient Muweilah site. The waterfront that once provided a vital foreground and a primary entry point to Sharjah acts as an industrial backdrop for the larger metropolis. Sharjah now presents itself as a primarily a landed community with water inlets as a source of recreation, as opposed to a vital portal city along *Al Khalij*.

In the 1990s, the loss of place identity resulted in the documentation and restoration of the historic buildings, demarcation of the Heritage Area, and the reconstruction of select lost structures, including the Hisn Fort and the city wall. There are 85 listed buildings in the Muriejah and Shuweihin areas that are constructed before the 1970s, 44 are unrecorded and 37 have been restored since 1990.



Figure 5: Sharjah, 1994 (left) and 1996 (right) air views

As Sharjah evolved from a small fishing village to a permanent settlement, it facilitated maritime trade and transactions of goods between port dwellers and the interior *bedouin* tribes. The continuous port activity along *Al Khalij* waters generated a linear pattern in the initial urban form. Four types of distinct but interconnected spaces had emerged to support the internal dynamics of urban life. The internal market districts (*souqs*) spread along the creek (*sahil*) through almost the entire length of the settlement. A gated protective wall with the Hisn Fort marking the central entrance comprised the defined outer limit of the settlement. Immediately outside the Hisn Fort was the space of the external market (*saht Al Hisn*) where the settled community came in contact with nomadic families of the hinterland. The residential quarters (*fareej*) between the *souqs* and the wall were generally divided into two main (uneven) sectors located to the east and west of the Hisn Fort.

Though the introduction of vehicular road and loading/unloading activities have disrupted the former relationships with and access to the water; the lost spaces along the *sahil* have persistently been used as places for interaction by Sharjah's diverse inhabitants. Currently, the port function has been discontinued. The *souq* continues to exist, along the *sahil*, despite its disjointed state due to the introduction of a main thoroughfare.



Figure 6: A view of Sharjah historical core

The Bank Street, with its precarious island housing the reconstructed Al Hisn fort, divides the historic core into two distinct zones: *Al Mureijah* Heritage Area and *Al Shuweyhein* Arts Area. Two distinct types of commercial activities characterize each part: the reconstructed *Souk Al Arsah* with largely staged traditional handicrafts commodities that attracts tourists and the evolving old souk that is maintained by individual shop owners bringing the city's inhabitants along the cornice to search for objects of daily life. The objects

sold and the *souq* display techniques have certainly changed over time, but its link to the *sahil*, and its persistence and its evolution to cater the changing needs of Sharjah's inhabitants is an important element of urban continuity.

Across the Bank Street, as we encounter the official "Heritage Area", the *souq* is maintained more as a relic of the past as opposed to an evolving urban continuity. Introduction of modern architectural interventions along the Bank Street resulted in the demolition of major part of the historic district. It is the *fareej* and its community of inhabitants living within a tightly knit dense urban fabric that has mostly been lost reconstructed and cleansed for the benefit of Sharjah's visitors.

The *Saht Al Hisn*, the open space outside the Al Hisn Fort, has survived through the three centuries of Sharjah's existence along *Al Khalij*. Until last year, it functioned as the only all inclusive public space in Sharjah called the Rolla Square.



Figure 7: Sharjah, Views from Sahil and Saht

While only the continuity of district names mostly based on the affiliations of its original inhabitants commemorate the lost *fareej*, the *sahil*, *souq* and *saht Al Hisn* have persisted and evolved as urban continuities throughout the history of this exemplary *Khaliji* portal city.



Figure 8: Sharjah, View from Souq area

METHODOLOGY

The methodology included three strategic steps to conduct this research. The first step was to survey the pedestrian and vehicular activity in Sharjah historic center in order to understand current movement patterns. The second step was to analyze physical structure based on understanding the spatial configuration of the historic center, for which Space Syntax method has been utilized. Data obtained from the analyses

generated a multi-level, electronic database of urban form and function, containing: levels of spatial integration in the current street networks; levels of pedestrian and vehicular movement. In the third step of the study, the results achieved from the analyses have been comparatively evaluated. This evaluation leads to better understand the reasons of the decay of the historic area.

ANALYSES

The first step of the research, as mentioned above, has been carefully observing how people and vehicles are flowing through Sharjah historic area at the present. This has been done by counting pedestrian and vehicular flow rates at numerous locations in Sharjah Historic area. The survey of pedestrian and vehicular activity to designate the relations between movement patterns and the function areas has been done using the gate method. To define daily densities in both working days and holidays the counts has been conducted;

1. On a day on weekday, (14th April 2011)
2. On a day on weekend, (16th April 2011)
3. And on Friday, (15th April 2011) weekend and an Islamic religious holiday.
4. In two-hour time periods, to define peak hours (08:00 – 10:00; 10:00 – 12:00; 12:00 – 14:00; 14:00 – 16:00; 16:00 – 18:00; 18:00 – 20:00)
5. For five different categories of people (adult men, adult women, elderly, teenagers, children) and one category of vehicle



Figure 9: Study Area within the city of Sharjah (left) and Gates Observed in the study area (right)

Pedestrian and vehicular movement levels were recorded at 130 locations. Each location was observed from 08:00 to 20:00. The observed pedestrian and vehicular movement levels have been digitized to create the movement database. Using ArcGIS software, the movement database then has been related to a map document showing the locations of observation points.

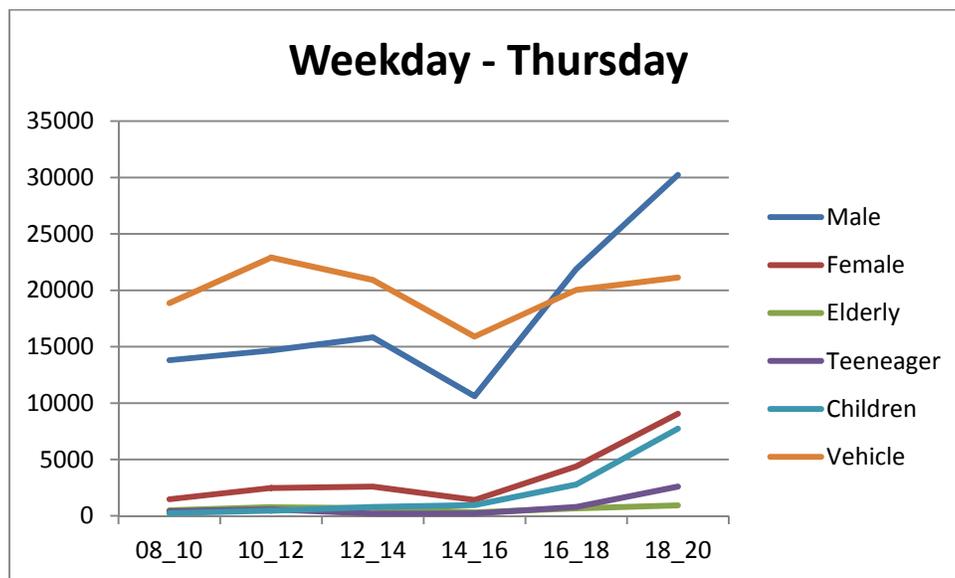
These surveys have been complemented by a 'spatial modeling' study that has analyzed the accessibility of linkages through the area. Space syntax method has been used to analyze the spatial configuration of Sharjah Historic area. A segment map has been constructed showing all the accessible space in the study area. The segment map has been processed using the Depthmap software and integration and choice values for each line on the axial map has been calculated. These values of the spatial structure have been superposed with the pedestrian and vehicular movement levels. By this superposition, integration and choice values of the lines standing on each observation point have been conveyed to the GIS database. Also, an axial map of the entire city of Sharjah has also been created in order to see how the study area that of the historic center of the town is related to the city in general.

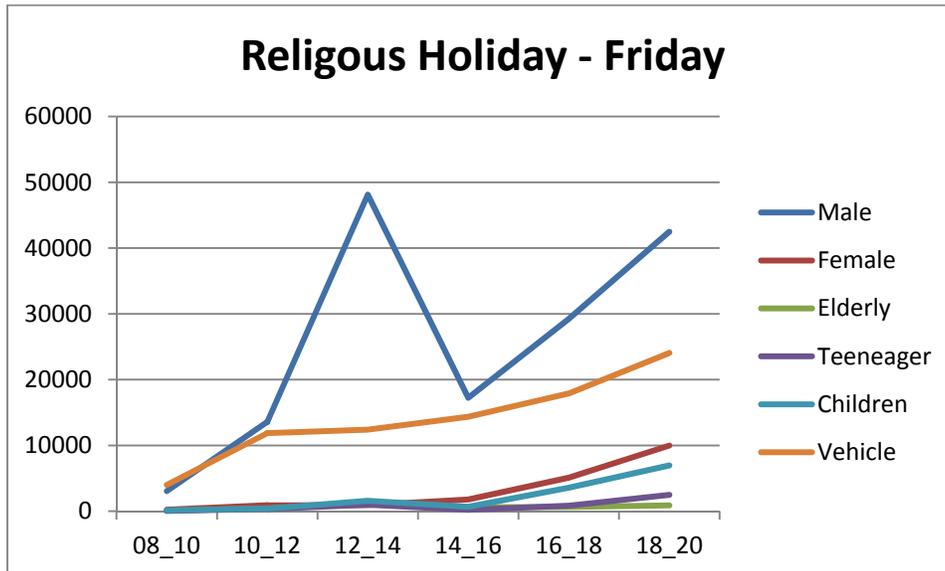
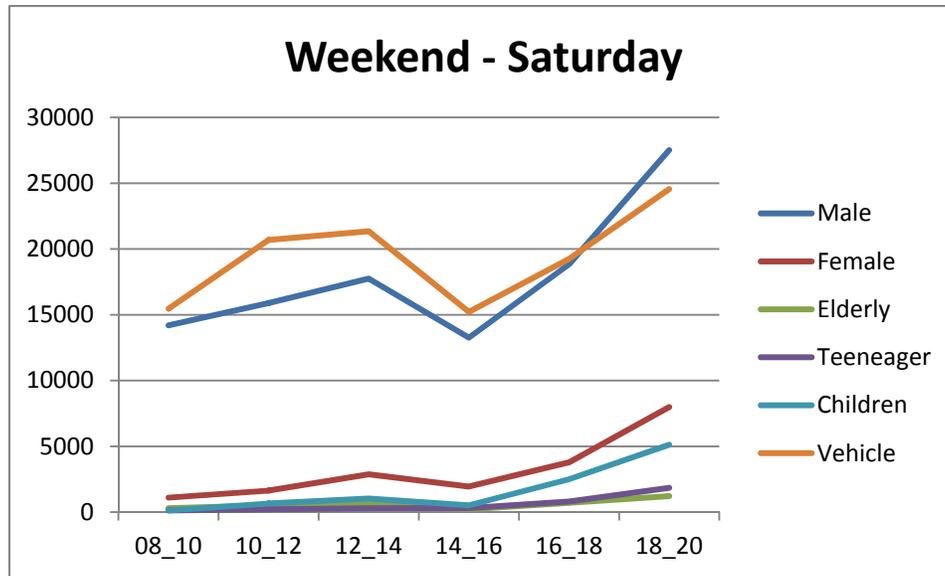
The next stage of the study was to comparatively evaluate the pedestrian and vehicular counts and spatial analyses. In the evaluation, the overall observation data for all three days are compared with the spatial integration and choice values. This comparison has been conducted through statistically analyzing the correlation between the pedestrian and vehicular movement levels and the values of the spatial structure. SPSS software has been used for the correlation analysis. In order to comprehend if a specific time period or a category of users correlates better with the spatial values, a series of correlation analyses has been conducted.

FINDINGS

Pedestrian and Vehicular Movement: The different categories of people (men, women, elderly, teenagers and children) as well as vehicles observed in the study area have a similar pattern in distribution of movement but there is a significant difference among their volumes of movement.

Table 1. Pedestrian and Vehicular Movement Volumes for each day observed



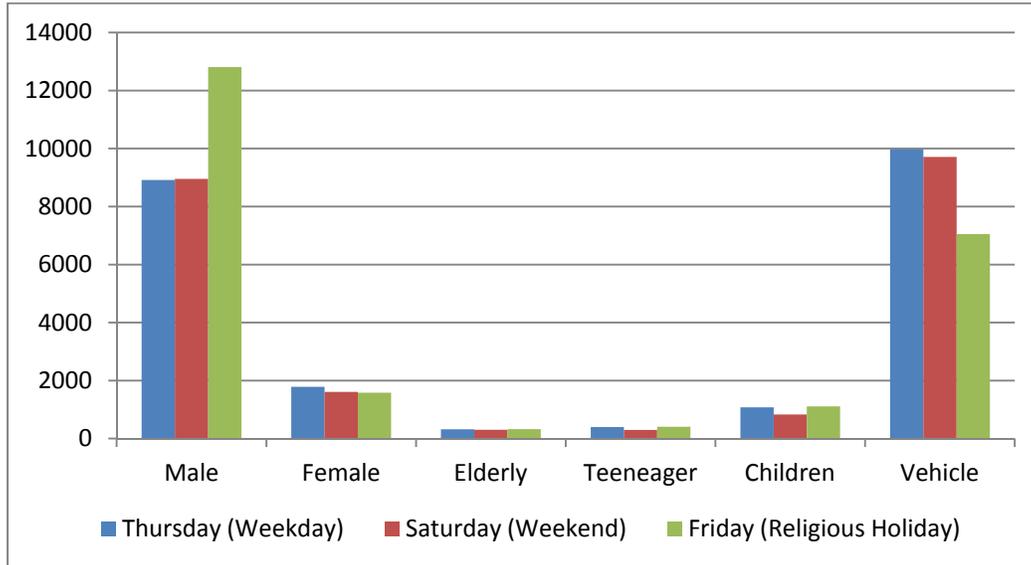


Most of the time, the vehicular movement is dominant except Thursday late afternoon and Friday all day when the male pedestrian volume is higher than the vehicular volume. The female pedestrian volumes, on the other hand, are always lower than the male figures. Female volumes starts low in the mornings and are usually higher in the afternoons. The male pedestrian volumes make a peak on the religious holiday, Friday. Especially after 10:00am, male pedestrian volume is drastically higher than the others and it is especially higher during the Friday sermon period, between 12:00-14:00pm and similarly high between 18:00-20:00pm. This is expected as the Friday sermon is a must for Muslim males while females usually stay at home during this period. On Friday late afternoons both male and female pedestrian volumes are higher.

The relationship between pedestrian movement volumes for different categories of people and vehicular movement volume is summarized in Table 2 below. As can be seen the vehicular movement dominates the weekday and weekend followed by male movement rates. The pedestrian volume for male is the highest for

the religious day Friday followed again by the vehicular movement volume. The female pedestrian volumes are the second highest pedestrian group for movement volumes. Movement levels of children follow them and the categories elderly and teenager is rather weak.

Table 2. Total Pedestrian and Vehicular Movement Levels Compared



Axial Analysis at the City Level:

When we look to axial analysis (rN) at the city level, we see that the roads running parallel to the waterfront and connecting Sharjah to Dubai city such as Second Industrial Avenue and Al Nahda Street and in addition the streets such as King Faisal and King Abdulaziz Streets that run perpendicular to these are found to be the most integrated streets. We can say that these integrated streets show a gridal pattern, as important streets in terms of the intensity of activities are properly highlighted showing some “structure” in the urban grid of Sharjah. What is interesting about this gridal pattern is that, inside of each integrated gridal road system the center, where the residential neighborhoods are located, is segregated reflecting the characteristics of an Islamic city emphasizing the importance of privacy of neighborhood for the society. This reasoning is also supported when we examine the structure of the integrated streets of the industrial area located on the southern part of the lagoons.



Figure 10: Axial Map of the city Sharjah Showing Global Integration (rN)

The progressive isolation and decline of the old city center, the heritage area including the traditional suq, from the newly developed sites can easily be read from these axial maps. The spaces in the heritage area of Sharjah city, instead of being a focus for pedestrian activity, are largely empty for most of the day, thus making the area seem dangerous for pedestrians. Despite the lively neighbourhood surrounding the study area and the effective landuse activities within the study area such as museums, art galleries and the souq, the heritage area remains disjointed and rigidly separated from the rest of the city. Thus, this historical site of Sharjah is in the process of deterioration.

At the global level, there is no indication of the “edge effect” as the properties of the axial lines near the borders of the map are no different then the ones within the map. Only the border where the lagoons are located show a disjointed effect.

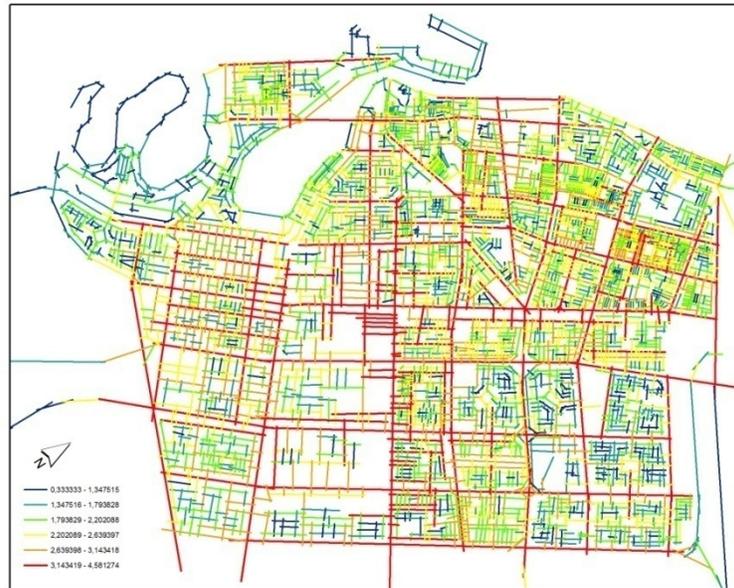


Figure 11: Axial Map of the city Sharjah Showing Local Integration (r3)

At the local level (r3), we see that the integrated gridal system effect is emphasized. In relation to the heritage site, the area where the historical Old Wall Mosque is located is defined as one of the integrated spaces even though the surrounding area around the mosque is still one of the segregated areas.

The following maps show the axial maps colored by choice value.

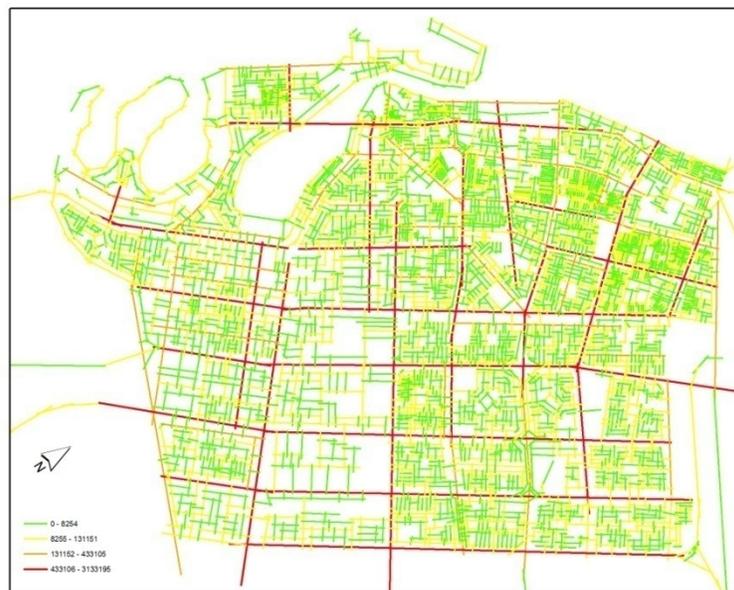


Figure 12: Axial Map of the city of Sharjah Showing Global Choice

The choice map seems to highlight the integrated gridal system of the axial integration: The streets that create the gridal system are much more clearly differentiated than the ones within the grid. Moreover, the choice map is even less sensitive to edge effect and the values look more properly distributed among space.

so that some important streets are more clearly highlighted even if they are located in the periphery of the map, such as Al Meena Street on the waterfront.

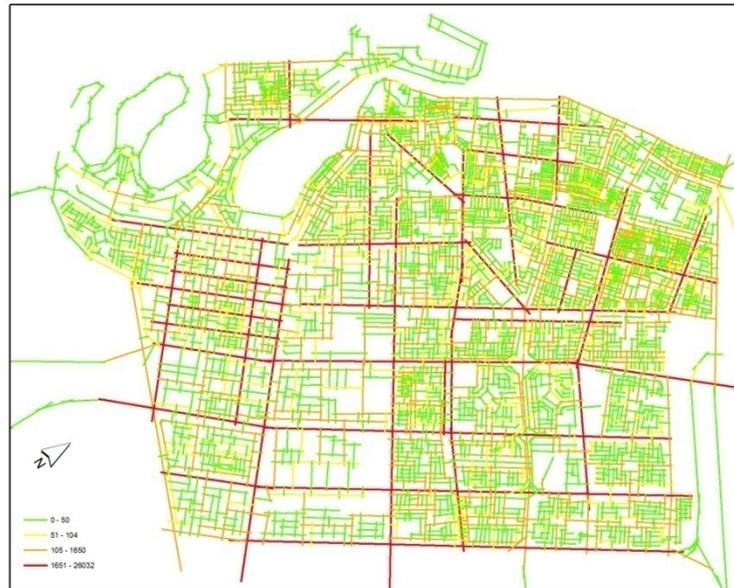


Figure 13: Axial Map of the city of Sharjah Showing Local Choice(r3)

The analysis at the local choice level is similar to the global choice except one major difference which is related to the industrial area located at the southern part of the lagoons.

Segment Analysis of the Study Area:

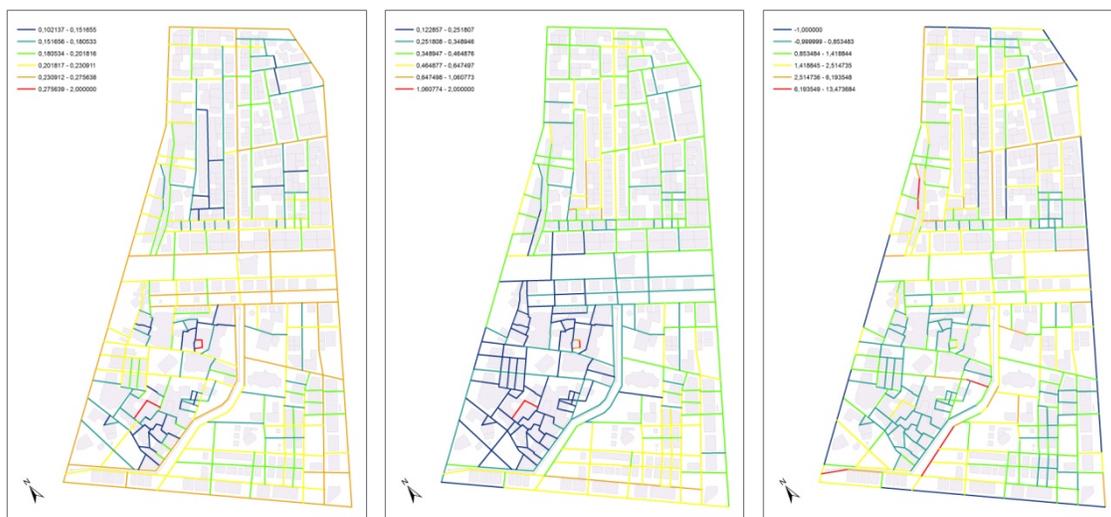


Figure 14: Segment Map of the city of Sharjah Showing Global Integration (rN-left), Local Integration (r500-middle) and Local Integration (r100 right)

When segment maps are analyzed for integration values at the global level, the streets surrounding the heritage area as well as the Hisn Avenue are more integrated. At the local level, Sharjah heritage area located within the reconstructed historic wall is more integrated.

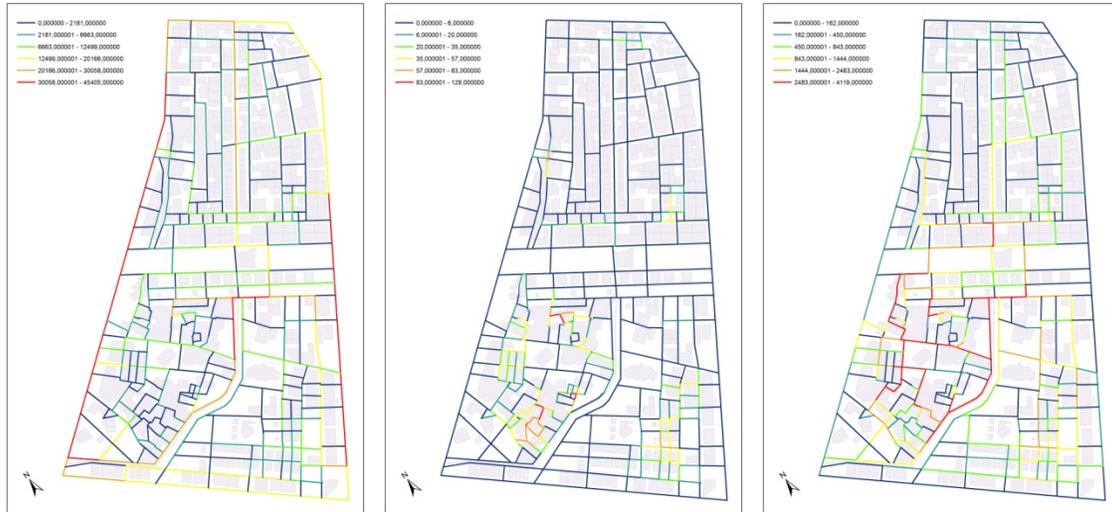


Figure 15: Segment Map of the city of Sharjah Showing GlobalChoice (rN-left) and Local Choice (r500-middle) (r100-right)

When segment maps are analyzed for choice value at the global level, the streets surrounding the heritage area as well as the Hisn Avenue show similar characteristics as the heritage area is less integrated. At the local level, the choice value for Sharjah heritage area located within the reconstructed historic wall is higher than the rest of the historic area.

Analysis of the Relation Between Movement Patterns and Spatial Configuration

Pedestrian and vehicular movement levels have been statistically analyzed to see how they correlate with the spatial integration and choice values.

Correlation analyses have been carried out for each observed category separately in addition to the total values. Results of the analyses have shown no significant correlation between pedestrian movement levels and spatial values. The only significant result has been achieved with the total number of pedestrians and choice values at the local level (r=500m) for Friday and Saturday counts (Table 3).

Table 3: Correlations between Pedestrian Movement and Choice Values

		Friday Total Pedestrian	Saturday Total Pedestrian	Choice (500 m)
Choice (500 m)	Pearson Correlation	,230(**)	,218(*)	1
	Sig. (2-tailed)	,008	,013	
	N	130	130	130

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

However, results of the analyses have shown that total number of vehicles correlate better with both spatial integration and choice values. Correlations between choice and vehicular movement levels are 0,407 for Tuesday; 0,411 for Friday and 0,382 for Saturday (Table 4). Correlations between integration values and vehicle movement levels are 0,420; 0,417 and 0,422 for the three days, respectively (Table 5).

Table 4: Correlations between Vehicular Movement and Choice Values

		Choice	Tuesday Total Vehicles	Friday Total Vehicles	Saturday Total Vehicles
Choice	Pearson Correlation	1	,407(**)	,411(**)	,382(**)
	Sig. (2-tailed)		,000	,000	,000
	N	130	130	130	130

** Correlation is significant at the 0.01 level (2-tailed)

Table 5: Correlations between Vehicular Movement and Integration Values

		Integration (rN)	Tuesday Total Vehicles	Friday Total Vehicles	Saturday Total Vehicles
Integration (rN)	Pearson Correlation	1	,420(**)	,417(**)	,422(**)
	Sig. (2-tailed)		,000	,000	,000
	N	130	130	130	130

** Correlation is significant at the 0.01 level (2-tailed)

DISCUSSION AND CONCLUSION

Sharjah, as the third largest emirate in the United Arab Emirates, occupies a crucial access to global trade routes with its ports on *Al Khalij* and the Indian Ocean, thus ensuring its place as a centre of international commerce in the region. However, very recently the port on *Al Khalij*, where the historic city center is located, has lost its function. Thus we were not able to include the trade function and its connection to the rest of the city to our analysis. We believe this is one of the crucial reasons why the historic center has been found so segregated in the analysis. Similiar to Margate and Galata studies, we believe that if we could connect the historical core with the movement on the waterfront area, even though it's limited in comparison to when the port was active, will help increase the integration value of the historic core. Thus it would be possible to recreate and strengthen a continuance of waterfront streets between heritage area and the waterfront area and in turn lead to an increase in the vitality of the center and thus create an economically productive historic core.

Another important result of this analysis is related to the historical wall that is reconstructed within the heritage area. The analysis has shown that the wall separates the area within the wall from the rest of the heritage area and in turn in fact operates on the heritage area being segregated from the rest of the city. We can propose to transform some selected local alignments to form a network of larger scale streets, which connect the heritage area with the rest of the city, which would also enable to link the waterfront area with the rest of the city.

The analysis of the pedestrian and vehicular movements in the heritage area has shown that spatial structure of the area has more correlation with the vehicular movement data than the pedestrian data. This result suggests that the spatial structure of the heritage area has more potential for vehicular movement rather than the pedestrian movement. Pedestrian movement is not as much related with the spatial structure of the area. Thus, we can understand that there are other factors at work for directing the pedestrian movement.

Even though there is quite a pedestrian movement in the area, the fact that this movement is not related to the spatial structure indicates that the space itself has low potential for pedestrian movement. The area houses many banks and the increase in male movement indicates that land use characteristics and religion related uses are important factors in the study area. Thus it is important to examine the land uses of the area and compare them with the pedestrian movements as the next step of the study.

Since the land uses are important determinants of the pedestrian movement in the area, any interference with land use might have a significant effect on the movement potential of the area. Thus, it would be important to keep this in mind for any future design proposal for the area; instead of proposing land uses that promotes passive uses such as recreation area, it would be important to have land uses that promote active uses such as services, accommodation and entertainment to protect the vitality of the heritage area.

In conclusion, we are convinced from our analyses that it is very critical for Sharjah heritage area to be sensitively developed as a place that is people-focussed, connected, inclusive & integrated, and that can radically enhance the social, economic and environmental quality of the wider Sharjah city.