

Built Form of the Souq Waqif in Doha and User's Social Engagement

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Abstract The Souq Waqif is located in the heart of the old downtown of Doha, the capital of the State of Qatar. The Souq Waqif is one of the most important heritage sites in the country. Over the years this market became abounded until his highness Qatar's Emir Sheikh Hamad bin Khalifah al Thani and his wife, her highness Sheikha Moza bint Nasser, recognized the importance of protecting and restoring this heritage site by funding the heritage restoration project of the Souq Waqif. It's a wide-open outdoor space with air-conditioned shops. The users spend most of their time in the outdoor space where most social activates take place. This research study explores how the urban form of the Souq Waqif contributes to the formation of social interactions, and how its urban form can be implemented. The key factor of this research study is the impact of the urban morphology on the thermal comfort of the users in the hot-arid climate of Qatar. Other controlling factors in this process will be explored as well. The research question is answered by adopting both qualitative and quantitative methods. The research study is developed through three steps: (A) theoretical study, (B) analytical and applied study, and (3) interviews. Finally, an approach to enhance open spaces at the Souq Waqif is revealed: namely, the use of more vegetation, the formation of more shaded spaces for more thermally comfortable environment, and the development of a well-designed signage system contribute to implement the users' social engagement.

Keywords Doha, Built form, Built heritage, Social engagement, Thermal comfort

1. Introduction

The State of Qatar has witnessed a turning point during the second half of the 20th century. Its capital city Doha has been transformed from a small fishing village to a global city hosting international events. This booming change is referred to the economic transformation from pearling and fishing based economy to oil production economy. The economic growth process has affected all sectors within the capital city; the population has been increased between 2004 and 2010 from 750,000 to 1.7 million inhabitants. The city of Doha has become a well-known city due to the hosting of different international events such as the 1995's World Youth Cup, the Asian Games in 2006 and the upcoming 2022's World Cup. Nowadays, this upcoming event is having a significant impact on the city's urban development, in both infrastructure and architectural projects [1, 2].

As a result of city's globalization, wide road networks were constructed, old courtyard housing were replaced with modern building, the high rise business district (CBD) was established, and a few shopping malls were planned around

the city [1]. All of the above led to demolishing, and therefore losing, a consistent number of Qatar's heritage buildings, which gave Qatar its own identity.

The Souq Waqif is the most significant and vital heritage site of Qatar. It dates back to more than one decade and it used to enclose private houses. It was afterwards transformed by their owners "merchants" plot by plot to shops, with the aim to creating a hub for the trading of different sorts of goods. Over the years this market became abounded, due to the construction of large shopping malls, until his highness Qatar's Emir Sheikh Hamad bin Khalifah al Thani and his wife her highness Sheikha Moza bint Nasser recognized the importance to restore this heritage site by funding the renovation-project of Souq Waqif. The Private Engineering Office "Mohamed Ali Abdullah" was appointed to design, renovate and plan the heritage site in the period between 2004 and 2007. By 2008 this project was completed. All buildings constructed after 1950's were demolished, while the older ones were preserved. The new designed buildings reflect the theme of fishing village heritage "local Qatari architectural style". For instance, 75% of the structures were turned into the 1930's era architectural style using the traditional methods of construction, based on the use of mangroves roofs, bamboo poles bonded by clay, which act as insulation from heat and natural stones with clay. For this reason buildings do not withstand heights above 6 ½

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feet [3, 4]. The purpose of this research study is to investigate how the form of the Souq Waqif influences users'

social interactions and how its urban form can be improved.

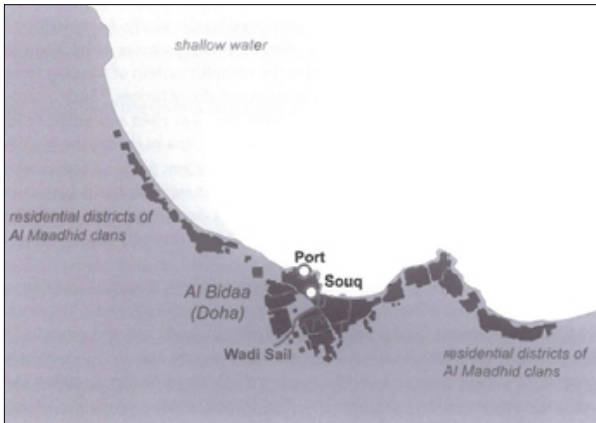


Figure 1. Doha's pre-oil settlements in 1947's [2]



Figure 2. Doha's settlement areas in the 1970's [2]

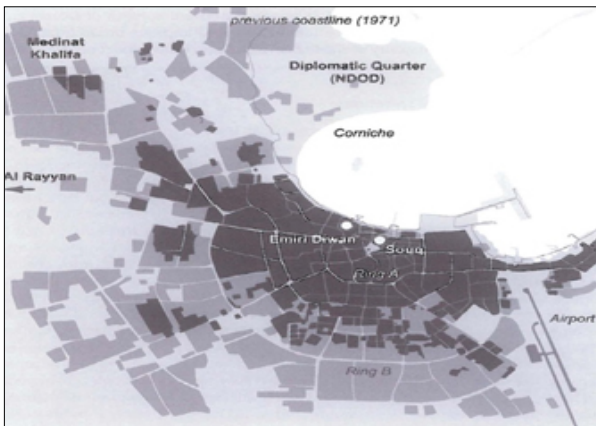


Figure 3. The settlement areas in the 1990s [2]



Figure 4. The past ten year's settlement expansion [2]

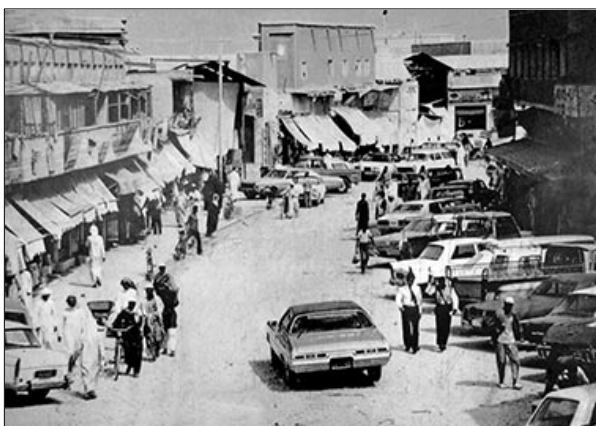


Figure 5. Old souq waqif 1970's [3]



Figure 6. Old souq waqif 1970's (Besmelah Hotel) [3]



Figure 7. Souq waqif after renovation 2013 [5]



Figure 8. Souq waqif after renovation 2015 [6]

2. Background

Urban form influencing social activities

Urban design is the discipline through which planning and architecture can create or renew a sense of local pride and identity. For this research study, the elements of urban design refer to the signage, lighting, parking, landscaping, service areas, building materials, transportation and the public realm (Figure 9) [7]. Public realm is a vital aspect of the built environment since it gives the city its own identity. It mainly consists of public streets, roadways, pathways, sidewalks, parks, plazas, open spaces and civic buildings. A well-designed public realm balances the mobility and access, needed for all users; contributes to the efficient functioning of a city and contribute to the construction of a sense of place. It is important the public realm to be safe, sustainable and enriching, in order to improve the quality of the surrounding built environment [8].

Urban design operates from the macro scale range of planning, zoning, transport and infrastructure networks to the micro scale range of street furniture and lighting (Figure 10). Urban design can be used to inform land use planning, infrastructure, built form and even the socio-demographic mix of a place, when fully integrated into policy and planning systems [9]. Urban design significantly influences the economic, environmental, social and cultural impacts of a locality: how people interact with each other, how they use a place, and how they move around. It affects the balance between natural ecosystems and built environments, and their sustainability outcomes and it determines the physical space and ambience of a place.

The review of the literature suggests that outdoor spaces can enhance social interaction. People go to outdoor spaces because of their need to social interact with other people. Therefore, outdoor spaces are places for potential interactions with other people. These open spaces can create opportunities for people to engage in high-quality level of social interactions. A high-quality level of outdoor spaces helps to improve social interaction by attracting people. Accordingly, the more time people spend outdoors, the more

likely they engage in social activities. Physical features are identified as efficient design elements in outdoor spaces when they contribute to the enhancement of social interactions, which, as a result, attract people to stay outdoors and engage in conversations. The existence of interesting objects or features, such as artificial water scenery and properly arranged seats, also encourages the use of public space. Furthermore, the provision of green areas increases opportunities for social activity. For instance, playgrounds with recreational facilities that are attractive to children are likely to make people more interactive [10].

Urban design spaces affect the quality of the physical environment, perception, economic investment, and success of the City. Pedestrian-friendly areas should be designed to provide a sense of security and safety for people who use them. The quality of the built environment is a key factor that affects the local image of Souq Waqif and sets the stage for economic activity. Souq Waqif cultural identity is an important factor determining why people choose to visit, invest in or relocate there. Well-proportioned public spaces and streets contribute to business visibility, accessibility, and viability. The use of design features such as appropriately-scaled lighting, street furniture, street trees, and other amenities can help to define places. Sense of place is a perception held by people about a specific location. It includes those characteristics that make a place special or unique, as well as those attributes that enhance a sense of human belonging [11].

Urban form is the outcome from the urban design process. The urban form influences whether this space is interesting and enjoyable for the users, accordingly to the way the urban space contribute to improve social interactions. The existence of physical features can attract users to spend longer time in an outdoor space. For instance, these elements might include water features, greenery and parks, sitting areas and shaded areas.

New urbanism

The movement of new urbanism was born in 1980 in the USA with the aim to enhance the design of the city and quality of urban life of the users [12]. The theories of the new

urbanism aimed to reform and reshape the built environment, by creating communities where a wide range of activities can be performed within a walking distance. The main concern of this movement is to establish a new way of life, not based on the constant use of the car [13]. The new urbanism was born as a reaction to urban sprawling or conventional suburban development (CSD), in which people rely on the use of their own private cars, and where public transportation is absent or not used. In turn, this leads to lose the compact mixed-use urban fabric [14]. Therefore, the new urbanism movement investigates and defines various themes, whose implementation will lead to a better quality of life. The themes are as follow: walkability, connectivity, mixed use & diversity, quality architecture and urban design, traditional neighborhood structure, smart transportation, quality of life and sustainability (figure 11).

The new urbanism movement's approach to urban design is based on twentyseven principles.

The Congress of New Urbanism (CNU), consisting of a group of planners, architects, scholars, developer and citizens, worked for three years and formulated by 1996 a list of principles.

These twentyseven principles are sub-divided into three categories: each category encloses nine principles. These

categories are known as (A) The region, metropolis, and town; (B) The neighborhood, district, and corridor; (C) The block, street and building. These principles are set as guidelines for architects, urban planners and public policy. In the case of the Souq Waqif the third category of principles is investigated: the block, the street and the building [12].

The following points are addressed: (Figure 12) (A) Physical form and public engagement. (B) Context relationship; (C) Revitalization projects provide safe, secured and accessible site; (D) Use of automobile with respect to the pedestrians; (E) Local climate, topography and history of the site should be respected in urban and architectural design; (F) Public gathering spaces to reinforce identity and the culture of the urban space; (G) All building to provide a clear sense of location, time and weather for their users; (H) Any preservation or urban renewal projects for historic buildings in order to affirm continuity of urban society.

New urbanism is a movement supporting the design and planning of a compact mixed use urban fabric, since the main aim of this movement is to encourage people to walk and to perform all their daily activities within a walking distance. Namely, walkability provides safe, secured and accessible urban spaces.



Figure 9. Illustrates the element of urban design. (Source: authors)

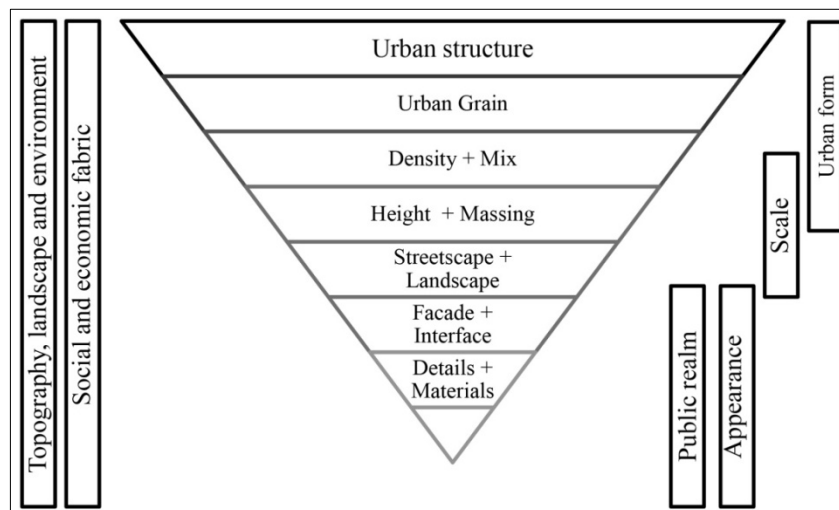


Figure 10. Illustrate the elements of urban design from macro to micro level [9]

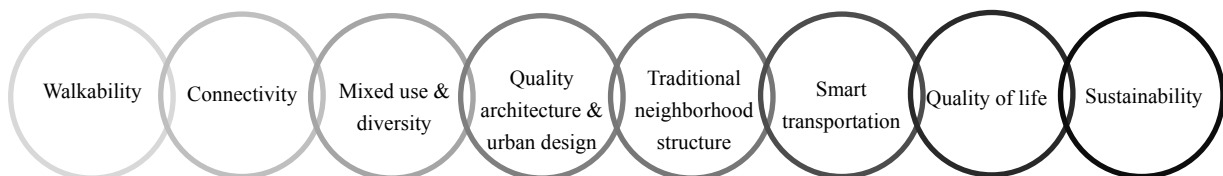


Figure 11. Illustrates the main objectives of new urbanism movement. (Source: authors)

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|---|---|
| <p>19) A primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use.</p> <p>20) Individual architectural projects should be seamlessly linked to their surroundings. This issue transcends style.</p> <p>21) The revitalization of urban places depends on safety and security. The design of streets and buildings should reinforce safe environments, but not at the expense of accessibility and openness.</p> <p>22) In the contemporary metropolis, development must adequately accommodate automobiles. It should do so in ways that respect the pedestrian and the form of public space.</p> <p>23) Streets and squares should be safe, comfortable, and interesting to the pedestrian. Properly configured, they encourage walking and enable neighbors to know each other and protect their communities.</p> | <p>24) Architecture and landscape design should grow from local climate, topography, history, and building practice.</p> <p>25) Civic buildings and public gathering places require important sites to reinforce community identity and the culture of democracy. They deserve distinctive form, because their role is different from that of other buildings and places that constitute the fabric of the city.</p> <p>26) All buildings should provide their inhabitants with a clear sense of location, weather and time. Natural methods of heating and cooling can be more resource-efficient than mechanical systems.</p> <p>27) Preservation and renewal of historic buildings districts, and landscapes affirm the continuity and evolution of urban society.</p> |
|---|---|

Figure 12. Nine principle for designing the block, street and the building [12]

Urban heritage conservation

Urban heritage conservation does not necessarily mean preserving a building but reviving it involves being flexible to adapt the objectives of rehabilitation to the needs of modern living, while respecting the local community cultural values. Conservation of public areas is essential as public realm enhances the quality of life and the way in which people perceive and interact with their locality. Rehabilitation of Souk Waqif is a successful example of sustaining Souks and traditional markets in Qatar and in the Gulf Region. The Souq Waqif is a sustainable built heritage site in the heart of Doha [15]. The restoration project was based on a thorough study of the history of the local traditional market and its buildings. The philosophy behind this project was the stopping of the dilapidation of the historic structures and the removing of the inappropriate alterations and additions that have been added in the past decades [15].

The conservation of historic urban centers should not be an developed into an individual architectural project. The physical, social and cultural multifaceted aspects should all be combined together to respond to the local cultural needs and identity of the community. There is a growing awareness that most of the historic cities in the Gulf are facing multiple pressures derived from competing demands for land use, introduction of new economic activities, marketing of heritage resources placing substantial decisions from local heritage players. During recent years, new policy mechanisms have emerged to reconcile the conflicting demands of conservation and development. Sustainable development policies have been applied to minimize any further losses in cultural heritage resources. Historic urban

centers represent a great economic, social, and cultural investment that would be unwise for the community to waste. One reason for conserving urban heritage is its potential rehabilitation, and heritage tourism can also be an incentive for urban conservation. Developing historic areas for tourism and commerce requires transition of conservation from a political, cultural, and social level to the economic development level [16].

The approach behind the renovation of historic buildings should be based on the integration of the identity of the traditional site and the cultural values of the local community.

Impact of urban morphology on thermal comfort

A level of sustainable existence needs to be reached at which the community can live in symbiotic harmony between design, microclimate, and its built environment. Both urban and architectural design plays a substantial role in determining how outdoor microclimate can be managed for the creation of a comfortable built environment. This can be achieved by studying the microclimate of a historic site and of a modern urban fabric in the same climatic zone: for instance, taking Damascus in Syria as a case study (hot dry climate), studying different sites (modern site versus historic site). Due to different building regulations, each urban fabric possesses different microclimate: in one hand, in the modern site a large part of the buildings and streets are exposed to solar radiation since it's designed with wide streets, large setbacks and low building height, which is leading to poor microclimatic conditions in the summer time. On the other hand, in the historic site the urban fabric tends to be more compacted with narrow streets, which makes the open area shaded most the time of the day and creates a cooler

environment.

In a similar context, in the case of Damascus and of Colombo and Fez, thermal comfort is lower in summer days in modern parts of the city or in sites with lower aspect ratio (H/W), with higher air temperatures, mainly due to urban geometry. The use of vegetation in the urban design process may help in the case of modern Damascus: the air temperatures below the trees are notably lower than the air temperatures on exposed surfaces. When a row of trees is added to the street, physiologically equivalent temperature (PET) values decreases 17°C. This leads to the fact that the influence of the vegetation on the thermal comfort of the area is crucial. In addition, it has been discovered that the acceptable comfort air temperature in a hot dry climate is 24.9°C in summer and 18.0°C in winter [17, 18].

Another study examining the influence of the urban morphology and sea breeze on the microclimate was developed in Colombo and Sri Lanka. Shading is the most important strategy to create cooler environments. The

difference between shaded and exposed surfaces reaches 20 K; this can be achieved by shaded walkways and shading trees. Furthermore, opening up wind corridors facilitates deeper sea breeze penetration, which leads to cooler environments. On the other hand, medium-high rise buildings act as a barrier for sea breeze (Johansson E., *Urban Design and Outdoor Thermal Comfort in Warm Climates Studies in Fez and Colombo*, 2006). Therefore, as proved by scholars who developed studies based on the comparison of different sites microclimates, the urban morphology has a great influence on the microclimate of any outdoor space, traditional and/or modern.

The following are considered to be the most significant factors that play a cardinal role in this thermal comfort process: a) site orientation studying the sun movement and prevailing wind and how these affect the activities in the site, b) sea breeze, c) shading, d) vegetation, e) height to width ratio. These factors are analyzed in locations selected within the Souq Waqif Heritage site.

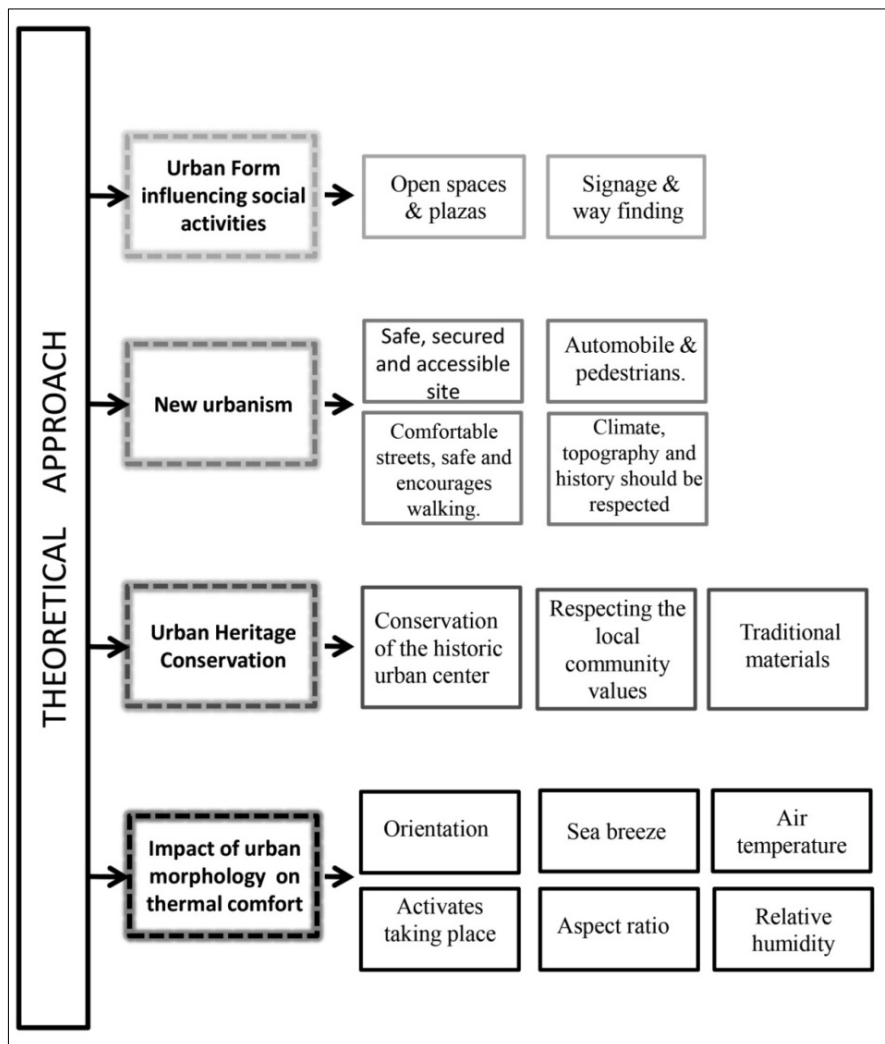


Figure 13. Represents the research theoretical framework (Source: authors)

Theoretical Framework

Urban sociologists argue that the following four categories, which have been identified from the open spaces, affect the level on social interactions/activities carried out by users. Therefore, in order to implement these spaces it is cardinal to understand how to implement the key-factors affecting users ability to interact. Through this research study these four categories are narrowed down into two main categories that influence the social interactions of the users in Souq Waqif. The first category is the impact of urban morphology on the thermal comfort of users, while all other factors are grouped in the second category (safety and security, pedestrian market/ walkability, traditional local architecture, signage system and way finding and open spaces). The diagram below summarizes the theoretical framework adopted for this research study.

3. Methods for Collection of Data

The research methods adopted for the collection of data for this research study are structured into 3 categories:

(1) Theoretical study: Studying different multi-faceted disciplines and topics (urban morphology, urban sociology, new urbanism, urban heritage conservation and the impact of urban morphology on the thermal comfort of users) contributed to develop a conceptual framework for this research study, namely to investigate how the Souq Waqif's urban form encourages people social interactions.

(2) Analytical and applied study: Site observation, photographs and field notes were the methods adopted to collect qualitative data and reach an accurate visual appraisal of the site's "physical attributes". In relation to the investigation of the impact of urban morphology on the thermal comfort of the users, devices measuring the air temperature and relative humidity were installed in three different locations. These devices, operating for one week

(from the 1st-12-2014 to the 7th-12-2014), were fixed at a height of 2.5m, recording data every five minutes. The data was then inserted into specific programs in order to create diagrams showing the relationship between air temperature and relative humidity, the patterns through one day (Thursday the 4th-12-2014).

(3) Structured Interviews: The users were asked about their experience in the area. The interview were divided into two parts: (part A) personal questions where participants were asked about their gender, occupancy, and years living in Qatar; (part B) questions about people experience in the Souq Waqif and about the physical form of the Souq Waqif (morphological aspect). Part B highlighted four main concerns, which are related to their experience in Souq Waqif: what they like/dislike, what lacks, their opinion about the improvement project that already took place, their future recommendations.

This market located in Al Souq district covers an area of 164'000m². The study will be covering three main streets and the following are the reasons beyond the selection of these three areas:

- i) Streets are vibrant and attractive for both locals and tourists.
- ii) Different/various activities taking place in these streets (Pets Street, Restaurants Street and mixed use of shops and cafe Shops Street).
- iii) Each of these spaces has different urban morphology that affects the physical treatment of the space and cause changes in socio-spatial and socio-economic practices.
- iv) The analyzed streets have almost the same orientation. This would allow to find out what other factors affecting the social interaction, other than the street orientation in terms of thermal comfort, are.

Afterwards, a summary of findings is generated and a set of recommendations are defined in order to implement the way the Souq Waqif encourages social interactions.



Figure 14. A, B, C shows three different locations where the study is based (Source: authors)

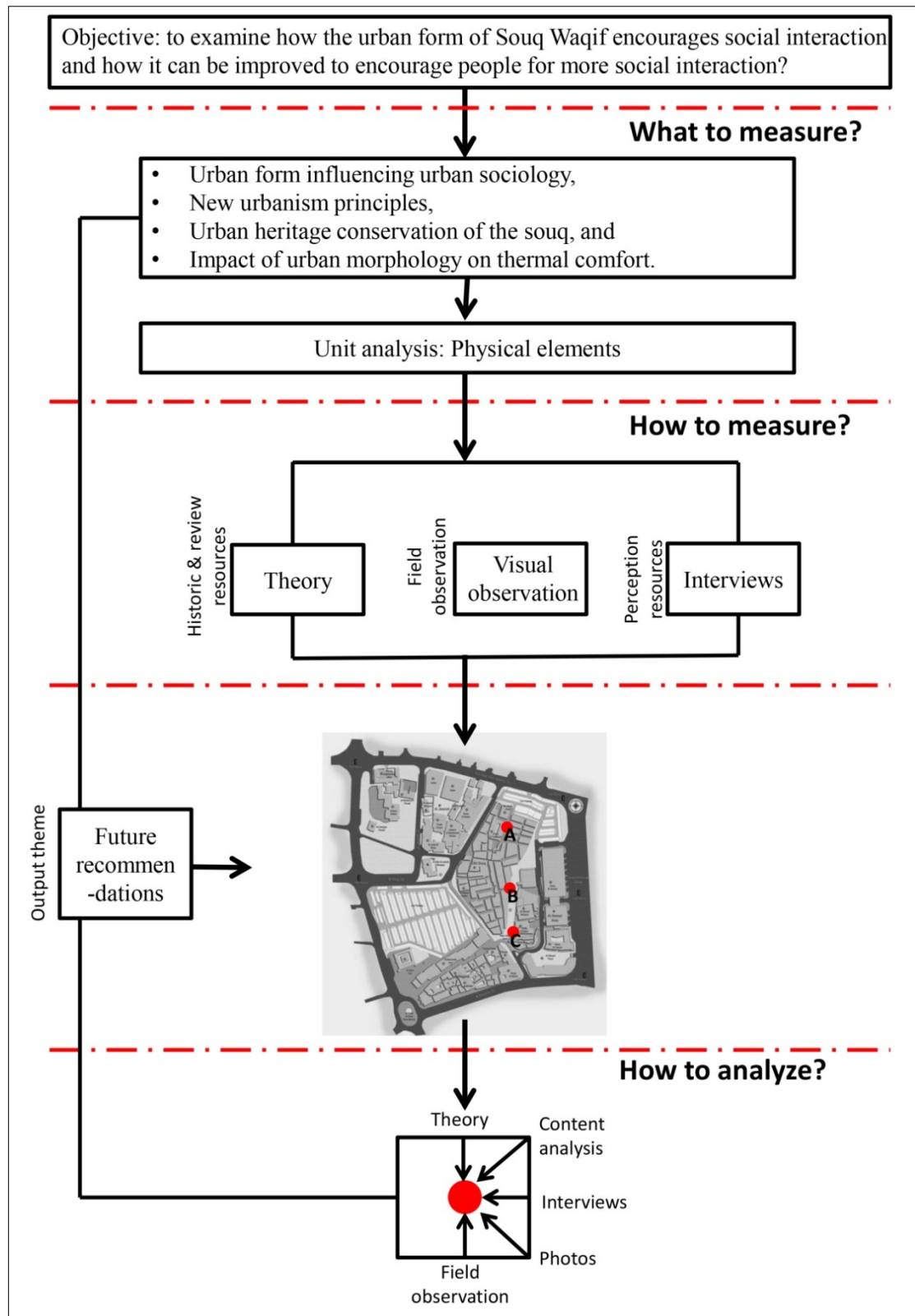


Figure 15. Represents the research methodology (Source: authors)

4. Data Analysis

The aim of this section is to analyzing (1) the key factors, related to the urban form of the Souq Waqif, affecting the thermal comfort of the users. Namely, the impact of the orientation, performed activities, sea breeze, the aspect ratio, air temperature, and relative humidity impacting on the urban comfort microclimate is presented. (2) In addition, specific factors such as safety and security, pedestrian market/ walkability, traditional local architecture, open spaces and signage system and way findings are analyzed. Visual and oral data was collected from site observation, photographs and maps related to three different locations (streets A, B, C) set within the Souq Waqif (as shown in figure 16), and from interviews with forty participants.

Orientation

Orientation is the positioning of a building in relation to the sun's path as well as to wind's patterns. Good orientation can increase the energy efficiency of the space, making it more comfortable to live in and impacting on energy costs and saving. In relation to the Souq Waqif site, the three locations have almost the same orientation which's NNE (North, North east) with a slightly minimal difference in location C (the orientation is almost 20 degrees off from the north toward east). They all take advantage of the prevailing

wind as well as of the sea breeze (Figure 17).

Sun movement and street activities

In this section how the sun movement affects the activities taking place in each location is addressed. Location A is well known as "animals street". It is a bit narrow street with 7 meters width and buildings canyons on both sides are 7 meters. Thus the street is pretty shaded all the day time. That makes it suitable for such activities where the pets can't tolerate to stay alive in a sunny place, people walk with their children, buy pets, and some school trips drop in the morning time.

As to location B, it has some coffee shops and stores. The stores are located in the eastern side of the street which shaded in the morning and that makes it suitable to people in order to buy their needs while walking in shade. However, the coffee shops located on the western side of the street are also shaded in the afternoon as well.

Regarding location C, it has shops on both sides. The shops located on the eastern side of the street are less exposed to sun while the shops in the western side had a problem of a high solar exposure, the shop owners solved this problem by allocating shading devices just 2 meters in front of their shops that allow people to walk in shade and create a perfect atmosphere.



Figure 16. Shows the different locations of study (Source: authors)

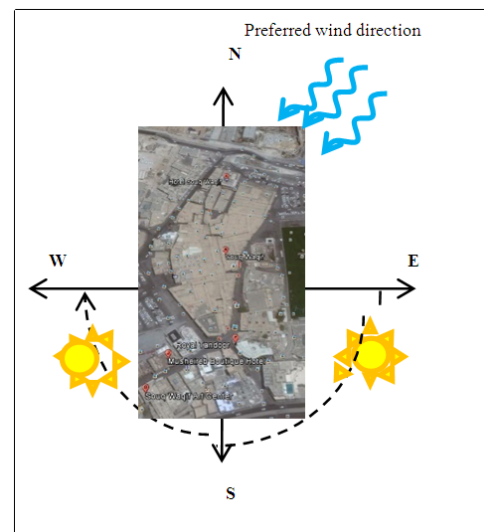


Figure 17. Site orientation, representing the prevailing winds and the sun movement (Source: authors)

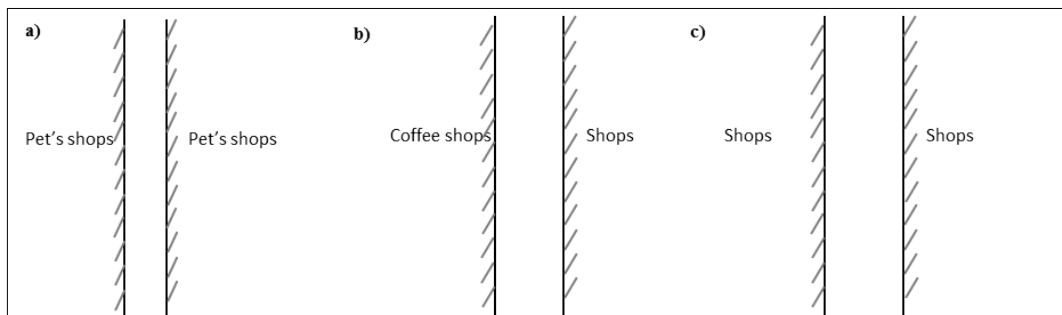


Figure 18. a, b, c Shows the activities taking place in each street side according to the orientation. (Source: authors)

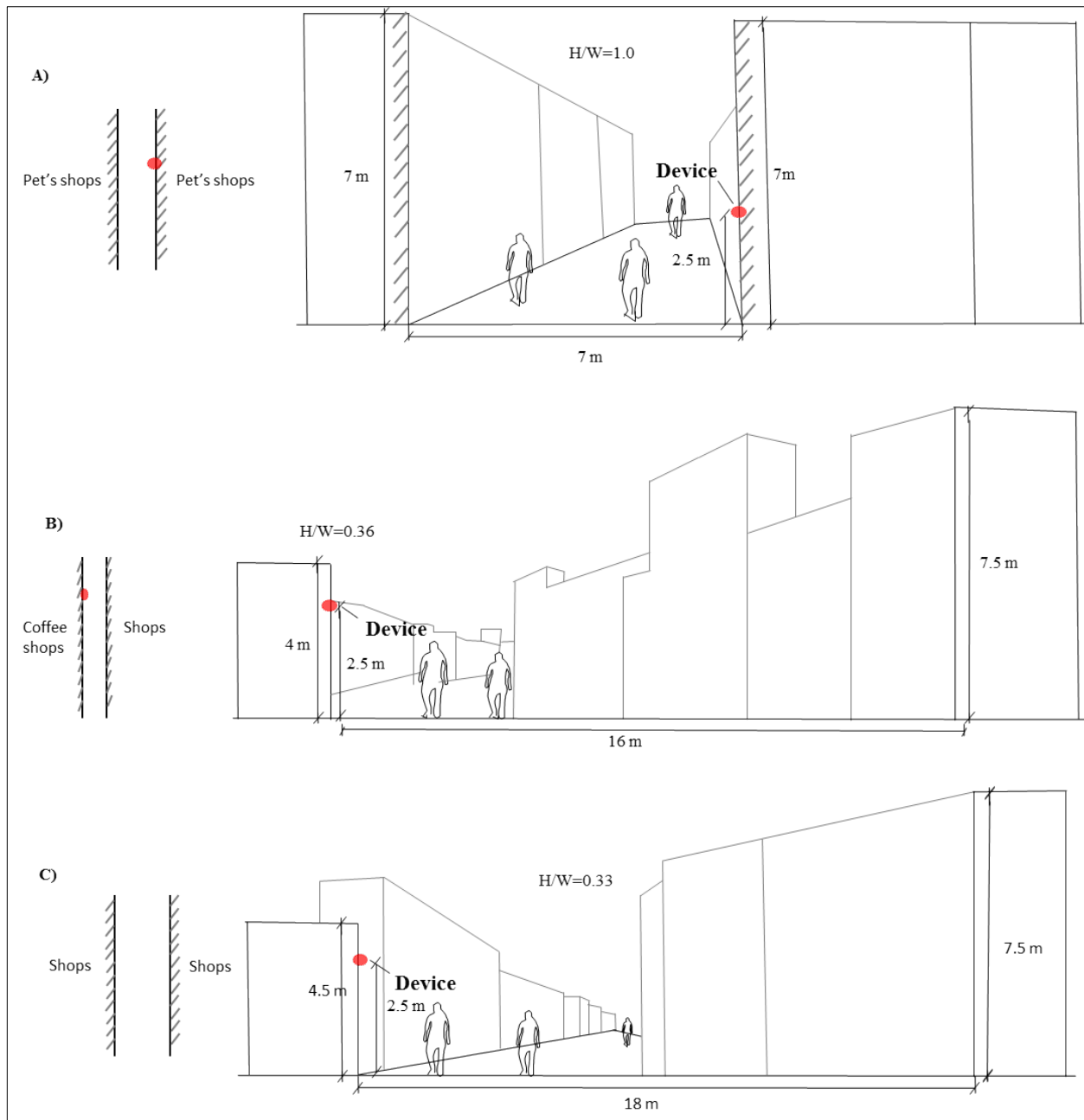


Figure 19. A, B, C streets cross sections and plans showing devices location, streets width and canopy (aspect ratio) for each studied location

Table 1. represents different locations aspect ratio (H/W) and the average temperatures on Thursday 4-12-2014 (Source: authors)

Location	Street use	Street width	B.H.R	B.H.L	H/W	Average Temperature
A	Pets shops	7 m	7 m	7 m	1.0	26.54°C
B	Coffee shops/shops	16 m	7.5 m	4 m	0.36	24.27°C
C	shops	18 m	4.5 m	7.5 m	0.33	26.69°C

Aspect ratio

Aspect ratio is the ratio between the height of streets canyons and the width of the street. Urban canyons have an impact on various local conditions: air temperature, wind, and air quality. Through the investigation of the three locations, there were location with symmetric canyons and other locations with asymmetric canyons. The results of the case of Damascus showed that the H/W ratio has a large impact on outdoor thermal comfort and the temperature tends to decrease with increasing H/W. The main reason of low temperature in old Damascus is due to that the street is in shade during all day time except at noon time. However, in modern Damascus temperature tends to be higher with 10°C more than old Damascus due to the low H/W ratio. Similar findings in Both Fez and Colombo, the simulations showed that PET tends to decrease with increasing H/W ratio. Unlike the cases of Damascus and Fez, the three mentioned locations showed that the relation of H/W ratio and the average air temperature is not that correlated. In location A the H/W ratio is the highest (H/W=1.0) and the average air temperature is 26.54°C which is really close to the average

air temperature of location C (26.69°C). Although the H/W ratio is (0.33) that's much less than the H/W ratio of location A (1.0), while the average air temperature is lower than the one in location A. That's due to the fact, location A has the highest H/W ratio if compared to the other two locations, However, in location A wind penetration is minimized because some buildings prevent the sea breeze to reach this street. On the other hand the street of location B gain the maximum benefit of the sea breeze since there is no buildings block. For this reason, this location has the lowest average air temperature if compared to the other two sites. About location C, the reason beyond this inverse relationship between the H/W ratio and average air temperature is again the wind movement and sea breeze since this street is a continuation to location B street where the sea breeze is not obstructed and from the other side of the street there is some openings allows more wind penetration. In this case, the coolness of different locations mainly depends on how open it is to the sea to benefit from the sea breeze.

Air temperature and relative humidity

Table 2. Represents different locations aspect ratio (H/W) , maximum/ minimum temperatures, the average temperatures, maximum/minimum relative humidity and the average relative humidity on Thursday 4-12-2014 (Source: authors)

Location	H/W	Maximum Temperature	Minimum Temperature	Average Temperature	MAX RH	MIN RH	Average RH
A	1.0	33.92°C	19.17°C	26.54°C	77.6%	46.6%	62.1%
B	0.36	30.04°C	18.5°C	24.27°C	81.4%	49.2%	65.3%
C	0.33	34.8°C	18.59°C	26.69°C	80.7%	43.7%	62%

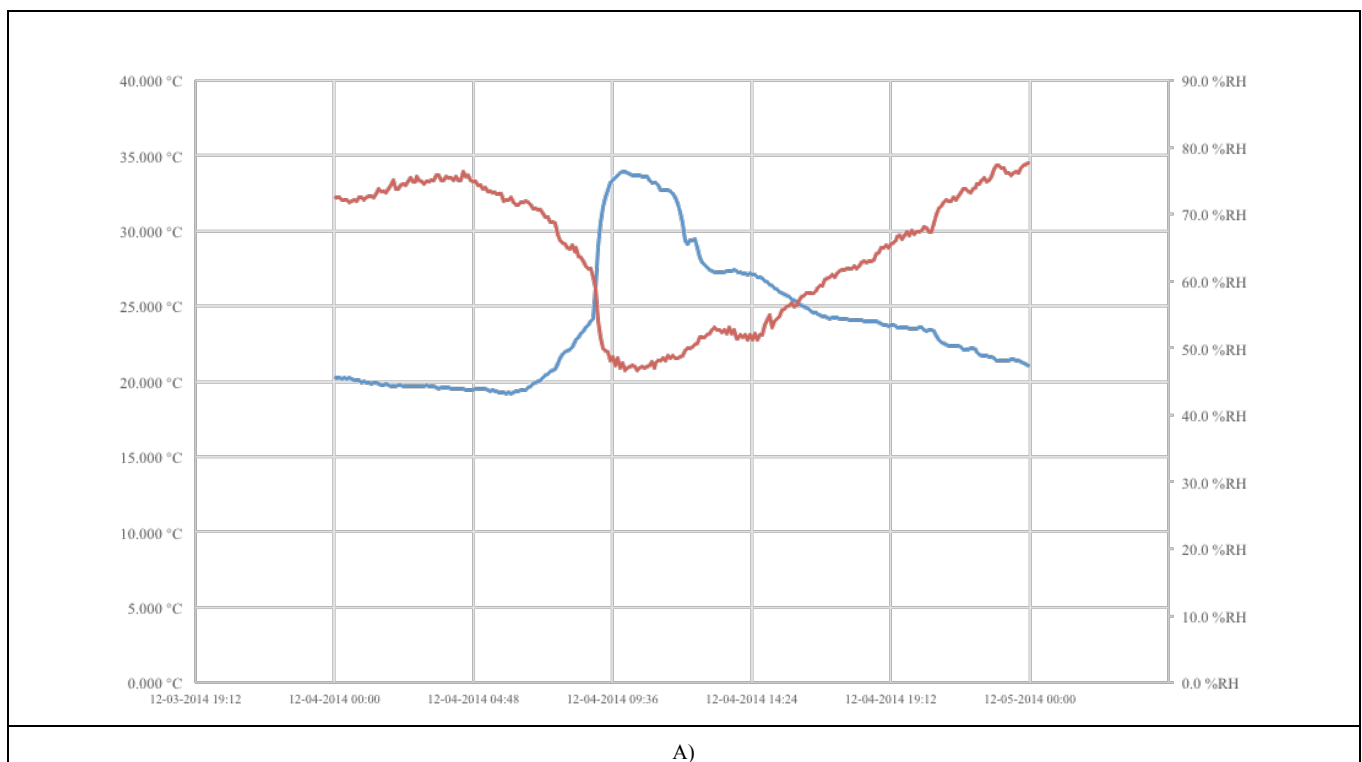




Figure 20. A, B, C Represents different locations temperatures variation and relative humidity (RH) on Thursday 4-12-2014 (Source: authors)

Air temperature and relative humidity

Based on the data from figure 20 and the table 2 its noticed that, the minimum/maximum air temperature(T_a) in the three different locations is nearly within the same range, it varies from 18.5°C to 34.8°C. Going back to the meteorological data for the same day, the readings for Doha of T_a is between 21.0°C to 38.0°C, meaning that, the compact urban form, the impact of sea breeze, and the use of shading devices in some locations helped to enhance the microclimate of Souq waiqf

and made it more comfortable. Similar to the case of Damascus, the old Damascus was much cooler than the modern side and that was due to, the compact urban form of old Damascus. Moreover, in the study of Damascus the comfort zone was ranging between (25.6 – 30.3°C) that means the three studied locations fall within the comfort zone and that's why most of the participants love to visit Souq Waqif during winter time for the amazing weather.

In terms of relative humidity, relative humidity showed a

large diurnal variation on all three sites with almost close readings varying from 43.7% to 81.4%. However, in location C where the lowest H/W ratio (0.33) the diurnal variation is the largest due to having a shallow canyons.

Safety and Security

The project is highly secured and safe, all Souq Waqif area is provided with CC cameras during 24 hours. There is a police station in Souq Waqif ready for a quick reaction against any urgent situations. Adding to this, Souq Waqif alleys are provided with evacuation exits as well as fire sprinklers. All participants find Souq Waqif safe and secured. All of the above makes Souq Waqif one of the safest and secured public spaces.

Pedestrian Market/ walkability

Most of the participants stated that they usually visit Souq Waqif because they love to walk in Souq Waqif alley where they feel surrounded by a living heritage. Souq Waqif is very significant for being the only site in Doha, which is dedicated for pedestrians. This encourages people to walk freely in non-polluted environment. Automobiles are not allowed to move through the Souq Waqif alleys.

Traditional Local Architecture

The Souq Waqif is a unique architectural revival project for the heritage site in Doha. The Souq Waqif explores remaining dilapidated structures of an overused souk. It represents the memory of Qatari cultural. The building

system of the Souq Waqif consists of walls formed with series of bearing incorporated columns with a span of 90cm. Metal sheets on roofs were replaced with traditional roof of mangrove poles and covered with wooden bamboo with a binding layer of clay and straw (Figure 23). The facades are comely to the eye though their simply architectural. What characterizes the building exterior is the bamboo wood material and the flying beams (Figure 24). Glass doors have been replaced by the traditional wooden doors and windows (Figure 25). In most cases, traditional strategies have been applied to insulate the buildings against the extreme heat. The architectural aspect of the Souq Waqif attracts tourists to visit it and to interact and socialize.

Open spaces and plazas

The diversity of public areas is important and essential as it ensures the sustainability of a living heritage and the way in which people interact and identify with their locality. The Souq Waqif contains important open spaces in the city, which hold occasional and weekly events such as performing art venues, games and circus in Al Rayan Theatre. The Souq Waqif is considered as one of the most popular destination for residents and tourists (Figure 26 & 27). Participants highlighted some major discomforts in the open space area such as: inadequate shaded areas, the absence of landscape feature, and lack of appropriate outdoor furniture. In order to enhance social engagement, people's needs should be fulfilled for better improvement.

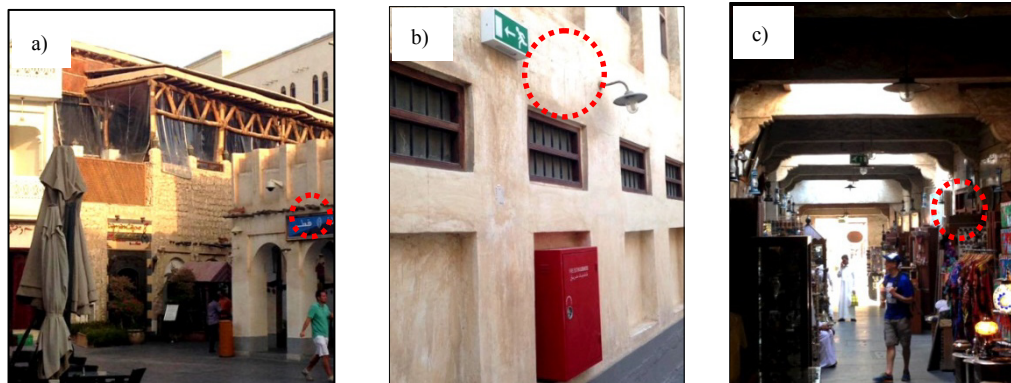


Figure 21. a) Shows one of the CC cameras, b and c) shows the fire exist signs and water pump for fire case (Source: authors)



Figure 22. Shows souqs walkways dedicated for pedestrians (Source: authors)



Figure 23. Traditional roof of mangrove poles (Source: authors)



Figure 24. Traditional façade materials and the flying beams (Source: authors)



Figure 25. Traditional wooden doors and windows (Source: authors)



Figure 26. Outdoor activities (Source: [42]).



Figure 27. Al Rayan Theatre (Source: authors)

Signage and way finding

It is difficult for visitors of the Souq Waqif to reach their desired destination because of limited directional signs that mislead the visitors. Participants highlighted that the Souq Waqif entrances need to be well defined by adding more signs to map the way. Therefore, the way finding and signage system are important issues that should be taken into consideration for the purpose of social involvement.

5. Findings

The findings revealed from the data analyzed (visual and oral data) for this research study can be classified into two main categories: a) the urban form of the Souq Waqif and its impact on the thermal comfort of the users; b) specific factors such as safety and security, pedestrian market/walkability, open spaces and signage system and way finding.

a) Urban form of the Souq Waqif and its impact on the thermal comfort of the users:

- 1) The measurements of the souq were taken in December 2014 which was in winter season. All the readings for air temperature fall between (24.27°C -26.69°C) and these fall within the comfort zone. Therefore, most of the participants love to visit the Souq during winter time for the amazing weather and the Souq have more activities and festivals during winter.
- 2) Large diurnal range in air temperatures between day and night leads to the fact that most of participants prefer to visit the Souq Waqif during night time especially in summer season. Because the weather tends to be cooler and more activities take place at night. In the other hand, a good number of the participants prefer to visit the Souq Waqif at day time as well, either for having their breakfast or for shopping.
- 3) Both vegetation and green areas have positive impact on the thermal comfort. Walking under shade of tree decreases the air temperature about 17°C. The vegetation is to minimal in the Souq Waqif. Accordingly, most of the participants highlighted a real need for more vegetation and green areas in the Souq Waqif, even with the new implementation of the park that was established over the underground of the new car parking.
- 4) Most of the participants noted that the shaded paths are cooler and more thermally comfortable than the unshaded one. It's recommended to create more shaded areas in the Souq Waqif in order to enhance its microclimate.
- 5) From the measurements of three different locations in the Souq Waqif it has been found that location B tends to be the most climatically comfortable. The reason beyond this fact is the positive affect of the sea breeze since no buildings block the sea breeze for this street; even the participants found it the most thermally

comfortable street in the whole Souq Waqif site. Although, location A supposed to be the most thermally comfortable since it has the highest H/W ratio, but it's not the case. Because of the sea breeze in location A is prevented from other buildings. This shows the importance of the sea breeze and it should be considered in the urban design.

- 6) There is a need for new and modern ventilation treatments in the Souq Waqif during the summer days especially the time period between 12:00 am and 2:00 pm; since most of the participants noted this timing is very hard to stay in the Souq Waqif outdoor area.

b) Safety and security:

Safety and security are fundamental factor for the public engagement, which is highly considered in the Souq Waqif area (provided with 24 hours CC cameras, police station, and fire precautions).

c) Pedestrian market/ walkability:

Since the Souq Waqif designed only for pedestrians enhance the social engagement where people walk, meet, shop and socialize.

d) Traditional Local Architecture:

The outcome of the site observation revealed that the architectural style of Souq Waqif attract locals and tourists to visit, interact and socialize.

e) Open spaces:

From the site observation and the feedback of the participants, there is a need to enhance the open spaces by creating more plazas, shaded areas, and by providing more greenery.

f) Signage system and way finding:

Most of the participants stated that they got lost in the Souq Waqif and there is no guiding signage. Accordingly, it's important to develop a well-designed signage system to help the visitors to reach their desired destination. Adding to this, the entrances of the Souq Waqif need to be named and well defined as well.

Importantly, most of the participants stated that the Souq Waqif is very special for them and it has its own exclusive experience for combining both traditional and modern soul. From all of the above, some points showed how the Souq Waqif successes in social engagement and in some others showed that there is a need for some future modifications especially for the thermal comfort. The final urban design project should be built upon the multidisciplinary consultant's cooperation and this process should engage architects, urban planner, and urban designers to deliver a comprehensive design that evoke the social aspect of the users of an open public space in a hot dry climate.

6. Conclusions and Discussion

The Souq Waqif is one of the most important heritage sites

in Qatar. It is considered an open museum, representing the local Qatari architectural style of 1930's era, when Doha was a small village based on peeling and fishing economy. Nowadays, the Souq Waqif has become one of the top five touristic attraction sites in Qatar. Furthermore, it plays a social, cultural, and economical role in the society. Therefore, it is important to study the social/ public engagement in the Souq Waqif. The thermal comfort of the users is a key factor that affects the social/ public engagement in hot arid climate. Beside the thermal comfort, other crucial factors plays a role in this process.

The findings revealed from this research study support the reviewed theory. In relation to the orientation factor, in support to scholars, the Souq Waqif is positively affected by the sea breeze. Location B gains the maximum benefit of the sea breeze since there is no buildings preventing sea breeze access. For this reason, this location has the lowest average air temprature when compared to the other two locations. In addition to this, it is proven that the outdoor spaces with a high H/W ratio possess lower air tempratures. However, this is not the case of the Souq Waqif. Location A, with the highest H/W=1, is not the coolest site. Location B, as mentioned with H/W= 0.36, is cooler with 2°C lower than location A. As stressed in the literature, the compact urban form, the impact of sea breeze, and the use of shading devices contribute to enhance the microclimate of the Souq Waqif and made it more comfortable. This can be proved when both air tempratures readings in Doha (21.0°C to 38.0°C) and in the Souq Waqif (18.5°C to 34.8°C) is compared within the same day.

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REFERENCES

- [1] F WIEDMANN, A M SALAMA, and A THIERSTEIN, "URBAN EVOLUTION OF THE CITY OF DOHA: AN INVESTIGATION INTO THE IMPACT OF ECONOMIC TRANSFORMATIONS ON URBAN STRUCTURES," METU, vol. 29 (2), pp. 35-61, 2012.
- [2] A M Salama and F Wiedman, *Demystifying Doha.*: Ashgate Publishing Limited, UK., 2013.

- [3] J Lockerbie, "The central area of Doha," 2015.
- [4] H Radoine, "Souk Waqif," 2010.
- [5] (2013, February) 3rdeye. [Online]. http://3rdeye-view.blogspot.qa/2013_02_01_archive.html.
- [6] (2015) PROJECT FOR PUBLIC SPACES. [Online]. <http://www.pps.org/places/public-markets/souq-waqif/>
- [7] "Urban design handbook," *City of baton rouge*, 2009.
- [8] Mayor Vincent C. Gray, "Public Realm Design Manual A Summary of District of Columbia Regulations and Specifications for the Design of Public Space Elements".
- [9] "Creating places for people an urban design protocol for australian cities," 2015.
- [10] Naceur Farida, "Effects of outdoor shared spaces on social interaction in a housing estate in Algeria," 2013.
- [11] "Orange general plan, Urban design," vol. UD-27.
- [12] M T Carmona, *Public Places- Urban Spaces: The dimensions of Urban Design*. New York: Architecture Press, 2010.
- [13] D Kelbaugh, "Three Urbanisms and the Public Realm," in *3rd International Space Syntax Symposium*, Atlanta, 2001.
- [14] A. E. -Z. Duany, *Suburban Nation: The Rise of Sprawl and the Decline of the American Dream*. San Francisco: North Point, 2000.
- [15] Djamel Boussaa, "Rehabilitation as a Catalyst of Sustaining aLiving Heritage: The Case of Souk Waqif in Doha, Qatar," 2014.
- [16] Djamel Boussaa, "Cultural Heritage in the Gulf: Blight or Blessing? A Discussion of Evidence from Dubai, Jeddah and Doha," 2014.
- [17] E Johansson and M W Yahia, "Microclimate and Thermal Comfort of Urban Spaces in Hot Dry Damascus," *Housing Development & Management, Lund University*, Sweden, 2012.
- [18] E Johansson, "Urban Design and Outdoor Thermal Comfort in Warm Climates Studies in Fez and Colombo," *Housing Development & Management, Lund University*, 2006.
- [19] Ashraf M SALAMA, Florian WIEDMANN, and Alain THIERSTEIN, "URBAN EVOLUTION OF THE CITY OF DOHA:AN INVESTIGATION INTO THE IMPACT OF ECONOMIC," *METU JFA*, pp. 35-61, 2012.
- [20] Matthew Carmona, "London's local high streets: The problems, potential and," *ELSEVIER*, 2014.
- [21] Oxford University Press. (2015) Oxford Dictionaries. [Online]. <http://www.oxforddictionaries.com/definition/english/morphology>
- [22] Stephen Marshall, *Streets and Patterns*. LONDON AND NEWYORK: Spon Press Taylor & Francis group, 2005.
- [23] Stephen Marshall, *STREETS & PATTERNS*. LONDON AND NEWYORK: SPON Press Taylor & francis Group, 2005.
- [24] Shri A Bhattacharharjee, "Street Design Guidelines," New Delhi, 2009.
- [25] Boston Trasportation Department, "BOSTON COMPLETE STREET GUIDLINES," Boston, 2013.
- [26] Reeman M Rehan, "Sustainable streetscape as an effective tool in sustainable urban design," *HBRC*, pp. 173-186, 2013.
- [27] Paul Salmon and Nicholas Stevensa, "Safe places for pedestrians: Using cognitive work analysis to consider the relationships between the engineering and urban design offootpaths," *ELSEVIER*, pp. 257-266, 2014.
- [28] Mohadeseh Mahmoudi, Faizah Ahmad, and Bushra Abbasi, "Livable streets: The effects of physical problems on the quality and," *ELSEVIER*, pp. 104-114, 2014.
- [29] Wai-Yin Ng, Chi-Kwan Chau, Greg Powell Powell, and Tze-Ming Leung, "Preferences for street configuration and street tree planting in urban," *ELSEVIER*, 2014.
- [30] Erik Johansson, "Urban Design and Outdoor Thermal Comfort in Warm Climates.," *Housing Development & Management*, 2006.
- [31] Moohammed W Yahia, "Microclimate and Thermal Comfort of Urban Spaces in Hot Dry Damascus," *Housing Development & Management*, 2012.
- [32] John Lockerbie. (2015) catnaps. [Online]. <http://catnaps.org/islamic/protect.html>
- [33] H Shaftoe, "Convivial urban spaces: creating effective public places," *Earthscan/James & James*, 2008.
- [34] M Charkhchian and S A Daneshpour, "Interactions among different dimensions of a responsive public space:case study in Iran," *Review of Urban & Regional Development Studies*, pp. 21, 14-36, 2009.
- [35] John Lockerbie. (2015) [Online]. Lockerbie, J. (2010) Planning in Qatar. Accessible at
- [36] Abdelbaset Sobhy, "Impacts of Highly-Glazed Tall Buildings on the Microclimate of West Bay of Doha: Urban Heat Island Effect Causes and Mitigation policies," *International Post graduate Research Conference 2013 (IPGRC2013)*, 2013.
- [37] Ahmad Okeil, "A holistic approach to energy efficient building forms," *Energy and Buildings*, 2010.
- [38] Sotiris Papantoniou, Dionysia-Denia Kolokotsa, Efpraxia-Aithra Maria Tsilini*, "Urban gardens as a solution to energy poverty and urban heat island," *Sustainable Cities and Society*, 2014.
- [39] Fayze Fikryb, Stephen Sharplesc Radhia, "Impacts of urbanisation on the thermal behaviour of new built up environments: A scoping study of the urban heat island in Bahrain," *Landscape and Urban Planning*, 2013.
- [40] Ministry for Environment, "A Desgn Guid for Urban New Zealand," New Zealand, 2002.
- [41] Ministry for Environment, "A Desgn Guid for Urban New Zealand," New Zealand, Ministry for the environment.
- [42] THE PENINSULA, "Souq Waqif Eid Festival a huge draw," the peninsula qatar, 2014.