QATAR UNIVERSITY

COLLEGE OF ENGINEERING

DIMENSIONS OF CHANGE FROM A FISHING VILLAGE TO HERITAGE MARKETPLACE: A STUDY OF SOUQ AL WAKRAH, QATAR

BY

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ABSTRACT

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Title: Dimensions of Change From A Fishing Village to Heritage Marketplace: A Study of Souq Al Wakrah, Qatar

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Al Wakrah is a distinctive settlement for cultural heritage in the State of Qatar. Globalization and rapid urbanization characterized the development of Al Wakrah over the last half-century, leading to a remarkable transformation in the morphology of the settlement from being originally a fishing and pearling village to a reconstructed traditional heritage district today. The thesis studies the morphological characteristics of the reconstruction of the souq and its effect on the design and planning of the souq today by exploring the symbiotic relationship between urban morphology, land use, function, and form. The purpose is to develop a deeper understanding of how Souq Al Wakrah operates within its urban context at various scales from the immediate surroundings to the continuous urban fabric of Al Wakrah. The study applies several representational techniques common to morphological studies, including analysis of urban spatial networks using space syntax for the purposes of design intervention. The findings show critical importance of developing an understanding about the relationship between form, function, and urban context in such places for future preservation projects. The thesis discusses the potential implications of design enhancements for Souq Al Wakra in the future.

Keywords: heritage markets; morphology; public space; urban studies

DEDICATION

To my loved ones

To my mother for her unconditional love. To my proud father in heaven.

To my husband, Mohammadshah, who has been a constant source of support and encouragement.

To my family

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This thesis could not be completed without the support of several amazing individuals. My appreciation goes to all of them for being a part of this journey and making this thesis possible.

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CHAPTER 1: INTRODUCTION

This introduction chapter contains six sections, as summarized in (Figure 1). The first section reviews diverse concepts related to the subject of the thesis. The second section introduces the case study – Souq Al Wakrah – as a reconstructed heritage marketplace, within the State of Qatar. The third section reviews the research problem, questions, and goals of the thesis. The fourth section highlights the significance of the thesis, while the fifth section briefly explains the research structure and the covered materials in each chapter of the thesis. This chapter concludes with a brief description of limitations, future work and, finally, the disciplinary context.

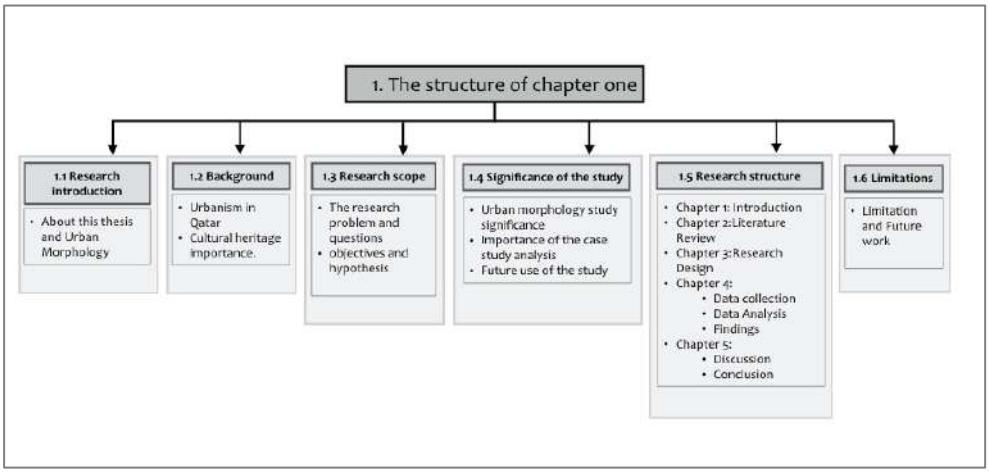

Figure 1: Summary of the introduction structure (Chapter 1) for the thesis.

This thesis studies the morphological characteristics of Souq Al Wakrah as a reconstructed heritage project based on an original traditional urban from to understand better how the souq fits and operates within its urban context of Al Wakrah. Souq Al Wakrah's morphological characteristics today play a fundamental role based on historical development trends on its site, which gives rise to its nature as a distinctive social-economic and cultural place in the city today.

To provide an overview of what exactly this study focuses on, the thesis reviews concepts and terms concerning research into the urban form of other cities including their definitions, types, and elements. The discussion begins with what 'the city' means through the identification of the urban form types with a perspective about the nature of change and the forces which prompt these changes. The thesis identifies the determinants for the transformation of an urban area, which are classified into two types: human-made determinants and natural determinants, which are explained in detail in the literature review chapter. Additionally, the literature includes a translation of a text from Arabic to English from a section of a book by Ibn Abi al-rabi', an Arab-Muslim scientist of the Abbasid era, entitled "Solok Al-malik fe Tadbeer Al-mamalik Ala Altamam Walkamal" about the rules and regulations of initiating an Islamic settlement.

The discussion then moves to the methods and methodologies that have been used in analyzing urban form in other studies. According to Kostof (1991) settlements are a collection of a sequential of planned, unplanned, studied, unstudied, conscious, and unconscious actions over time. However, Rossi (1982) argues that humans establish settlements to fulfil their needs. He defines settlements as "places made up of buildings and people" (Rossi, 1982). The physical nature of settlements tends to be categorized into two main categories: planned and unplanned. Yet, all settlements are a mixture of both; certain cases have clear unplanned patterns as 'organic,' while, the regular grid type represents the planned urban form pattern. The organic types of settlements have irregular open spaces, non-ordered alleys, and irregular building footprints, which evolve and grow without a prior overall plan (Kostof, 1991). These kinds of organic settlements can be clearly noticed in older historical settlements, yet most of these historical settlements were later regulated and reshaped by planned

interventions, according to the needs in different periods of time. As a result, these settlements became a mixture of different patterns.

Other than human interventions, several other factors influenced the transformation of settlements and created a significant impact in their formation and evolution over time. These changes in the urban form were a result of different forces that differ from one region to the other and from one country to the next, which have become a subject of interest for many geographers and urban planners in the research to develop diverse methods and techniques for analyzing such urban changes. One of which is the morphological analysis; in simple terms, it is a method for understanding urban form based on the physical shape and pattern of constituent elements in a settlement.

Urban morphology is a study of city form focusing on its genesis, evolution, and transformation over time. Although the term 'urban morphology' has many perspectives and uses, all are a means for the exploration of physical form (Whitehand, 2001). It focuses on developing a deeper understanding of urban form via its physical elements, including buildings, open spaces, plots, and streets, from the micro scale (such as singular building and plot) to the macro scale or regional scale, which focuses how these elements shape the overall form of the city. Also, urban morphology studies focus on the historical aspects of a settlement as well by examining the evolution of these elements over time. Such studies can help to promote sustainable urban development by highlighting physical characteristics with the potential for design interventions (Chen, 2014). Other scholars identify urban morphology as the study of physical and social components at different scales based on land use, building footprint, block patterns and size, and street networks (Kankol, 2015). Urban morphology studies are a critical tool for understanding the physical formation and changes of settlements

over time (Ahmadi et al., 2012). Because of this, the research in this thesis focuses on the morphological examination of its case study: Al Wakrah settlement, generally, and specifically, Souq Al Wakrah today.

1.1 Background of the Study

Historically, significant economic advances drove dynamic rapid growth over the last few decades as the primary influencer for urban transformations in the Arabian Peninsula, the Gulf Cooperation Council (GCC) countries, and, especially, in Qatar. Qatar confronted a rapid economic development, which led many Qatari families to leave the old city centers and shift to new houses in pursuit of a better lifestyle. This economic development had a dramatic impact on several aspects of Qatari society, including massive population growth, large-scale development of critical infrastructure, transportation, and housing (Alraouf, 2010). Citizens started to desert and neglect old city centers in which many traditional Middle Eastern settlements, which include compact urban form based on narrow streets known as *sikkas*. Many were transformed into wide streets by planning authorities, due to modern transportation planning needs (Major et al., 2019). Residents abandoned the traditional courtyard houses of the past for contemporary residential villa models and high-rise housing (Al-Mohannadi et al., 2019). The formation of new, high- rise business districts was also a result of economic development (Salama & Wiedmann, 2013; Furlan et al., 2018; Suneson, 2019). As the urban form of these settlements began to lose its identity, hence, there emerged a perceived loss of their historical value. Similarly, Qatar demolished many historical buildings for the demand of rapid urbanization. Qatar's father Amir Hamd bn Khalifa Al Thani and his son, the Amir Tamim bn Hamd bn Khalifa Al Thani, sought to implement and prioritize policy making the preservation of the cultural identity

grounded in traditional values a priority in the State of Qatar. This movement aimed to preserve, renovate, and even reconstruct Qatari heritage sites to reinvigorate some resemblance of cultural image and identity tied to the country's past and the people who inhabited it (Boussaa, 2016).

1.2 Problem Statement

Qatar's rapid urbanization created a variety of urban, environmental, social, and economic problems. As a rapidly developing country, Qatar began focusing on preserving its historical resources for cultural heritage and identity value early in the 21st century. These efforts focused on regenerating and revitalizing these historic resources into tourist destinations. Such cases can be seen today in Souq Waqif in the heart of Doha, Souq Al Wakrah Al Qadeem, and other examples that are under a regeneration plan of Qatar National Vision (QNV). However, the case of Souq Al Wakrah slightly differs from Souq Waqif. Souq Al Wakrah's historical aerial photo shows its urban form today is a reconstruction based on the courtyard house typology of the past while Souq Waqif's urban form more accurately reflects a historical evolution of the area over time. These differences generated different morphological characteristics in Souq Waqif compared to Souq Al Wakrah.

The thesis hypothesizes that urban form and function directly relates to several social, functional, environmental, and economic factors, which is detectable in their physical morphology. Because of this, different settlements can pursue different spatial strategies to accommodate and respond to urban growth. The research in this the thesis tests this proposition by examining the formation and evolution of the Al Wakrah city's urban form over time in relation to its original site on the coast, reconstructed into Souq Al Wakrah during the early 21st century to become a 'new heritage center' for the larger

settlement. There is a lack of studies about Al Wakrah, which was the primary motivation to initiate this thesis. The study itself, and the answers to these questions, constitute an original contribution to our knowledge about urban form and function in the State of Qatar and the larger GCC region.

1.3 The Research Questions and Objectives

The research questions are addressed through the investigation of the historical development of the case study, and the current situation of the marketplace from the perspective of a built environment and user.

The questions of the research are:

- What are the morphological characteristics of the reconstructed Souq Al Wakrah compared to its original origins as a fishing village?
- What were the historical and morphological influences for the reconstruction of this old core and how did it impact the design and planning of the souq today?
- What is the relationship between the form and the function in the souq today, and how does it related to its surroundings in the continuous urban fabric of Al Wakrah?

The objectives of the research are:

- To understand Souq Al Wakrah as urban place reconstructed based on the historical fishing village, a key objective of this research is to better understand how the souq fits and operates within its urban context at various scales from the immediate surroundings to the continuous urban fabric of Al Wakrah.
- To understand the characteristics of the urban environment of Souq Al Wakrah as a public place today.

- To understand Souq Al Wakrah's urban form and the integration of new and old patterns into its urban fabric.

1.4 Significance of the Study

The study is about the morphological analysis of Al Wakrah, with special attention paid to right before and after oil discovery and exportation. This period is signified by the introduction of westernization and modernism concepts to the traditional patterns of urban space. Additional consideration and attention are paid to the preparations for the World Cup 2022, which also influenced rapid growth of Al Wakrah settlement. The scenario of modernist planning approaches caused similar problems in different cities, especially in historical areas. These issues can be evaluated through a morphological analysis.

Urban morphology is a useful tool to grasp the nature of different problems in existing settlement by analyzing the urban form and its incremental changes that allow identification of design solutions based on existing real problems and local need (Hillier & Hanson, 1984; Kostof, 1991, Major, 2018). The research outcomes of this thesis will constitute a valuable and effective reference for enhancing an existing built environment. The result from this study will provide a contribution to knowledge as a useful prototype for similar cases. There is not any previous study of Souq Al Wakrah using the set of morphological techniques deployed in this thesis. In doing so, it fills a significant gap in our knowledge.

1.5 Thesis Structure

This thesis contains five chapters, which begins with outlining the Introductory Chapter of the research including the elaboration of the research problem and questions involved in the research about Al Wakrah settlement and Souq Al Wakrah.

Chapter Two is the literature review. It consists of four sections. The first part critically reviews the world-wide perspective of urban morphology and its different approaches, which emerged from the different European schools (English, Italian, and French). The English approach constitutes most of the methods used to analyze the urban morphology and function of Souq Al Wakrah and Al Wakrah settlement. The second part explores the concept of urban forms and their elements and types, which is later described in more detail to highlight the different typologies of the urban form elements. The third part encompasses a historical background about Islamic cities legislation and regulatory tools affecting buildings and city planning. The thesis explores the discussions of different Arab scholars such as Ibn Khaldun, Ibn Abi al-Rabi'a, Al Hathloul, and more. The literature review then focuses on examples of villages and settlements in Qatar and the Arabian Peninsula. In this chapter, the theoretical overview of different subjects generates a solid foundation to build upon and develop criteria to analyze Al Wakrah in general, and Souq Al Wakrah specifically. This theoretical framework encompasses the urban transformation factors, influences, issues, types, and typology as essential aspects of analyzing the morphological nature of a settlement.

Chapter Three provides a detail description of research design and methodology. This chapter reviews the various methods for collecting and analyzing data. The data was collected through site visits, observations, photographing, and historical maps. The data was later analyzed using mapping, graphical representation,

and space syntax tool. The chapter reviews the scope of research, focusing on the different strategies for implementing the in-depth analysis of spatial structure and functional use of the Al Wakrah settlement and Souq Al Wakrah.

Chapter Four will concentrate on Al Wakrah and Souq Al Wakrah as the case study of the research. This data analysis chapter is a transitional step from the theoretical framework developed from Chapter Two to practical analysis and implementation of the theory learned in Chapter Five (see below). Chapter Four studies the urban form of Al Wakrah settlement since 1947. The first part starts with key historical events, factors which might have directly or indirectly influenced the formation and transformation of Al Wakrah, and its accelerated economic growth. The second part studies the current condition of Souq Al Wakrah based on the criteria developed from the literature.

Chapter Five includes the discussions of findings, draws conclusions, and makes recommendations with implications for design proposals for future development and planning. This part of the thesis returns to the original questions of the thesis to provide answers with detailed explanations. The thesis outcome adds contributions to knowledge, especially with regards to the morphological analysis of Al Wakrah settlement and Souq Al Wakrah.

1.6 Study Limitation and Future Work

This thesis was undertaken during the period of the COVID-19 pandemic, affecting the research's progression speed. Study limitations also included climate constraints as it was essential to study the souq in comfortable weather and during the busiest months of the year for more accurate results. The lack of publicly available resources, due to detailed historical maps of Al Wakrah being held confidential by Qatari government

agencies, and the theoretical documentation of the case study has limited the study's resources. Simultaneously, it affected the map accuracy, because most of the maps and photographs were generated from on-site visits by the author.

The study can develop in the future by analyzing the site from different dimensions of users' relation to the built environment. The morphological analysis is not limited to the social and physical analysis of urban forms, it also includes other factors, such as ecological and economic aspects. These different dimensions can be studied to highlight comprehensively the issues and relation between each aspect to the existing urban form of the settlement. Also, there is an opportunity to strengthen the channels of communication between each one of these issues, providing solutions and recommendations for future urban developments. Additional research could be also undertaken by using segment and angular choice analysis techniques of space syntax. This study limits itself to axial analysis. Quantitative analysis could also include surveys of the users in future research. The scope of future research is discussed in more detail in the concluding chapter.

1.7 The Disciplinary Context

This thesis is multidisciplinary in substance as it incorporates a diverse perspective, including urban studies, history, architecture, and other integrated social sciences. However, the research is specific to its disciplinary context about the built environment and urbanism within the Arabian Peninsula, and especially Souq Al Wakrah-Qatar.

This importance is due to the following:

1) Many changes took place in the old core of Al Wakrah in terms of the demolition and reconstruction of the urban fabric and building footprint throughout time, e.g., changes caused by citizens shifting to contemporary villas and a better lifestyle, and the demands of modern transportations measures.

2) The primary change of Al Wakrah old core from a fishing village to a heritage marketplace.

3) Previous research has been done on Arabian and Persian souqs. Regarding Qatar historical sites, a study was, in part, based on Souq Waqif urban morphology (Tannous, 2020). Therefore, this study draws on this previous research to provide a context for the current state of knowledge for this study.

Understanding these coastal cities can help to establish urban design guidance and successfully contribute to these traditional places by thoughtfully managing and operating these heritage urban environments in Middle Eastern settlements. This includes location, socio-economic aspects, spatial and functional activities, architectural characters, and significant components of these cities.

CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Introduction

This chapter is the first step of the research work. It aims to situate the research within the existing literature of urban morphology and urban form. Since this chapter generates the research framework, it will provide an explanation of the representational techniques utilized from the different reviewed concepts to highlight the research methodology and methods used to answer the thesis' research questions. The literature review consists of four sections: (2.1) Urban morphology (2.2) Urban form (2.3) The Islamic settlements (2.4) Literature about Space Syntax as summarized in (Figure 2).

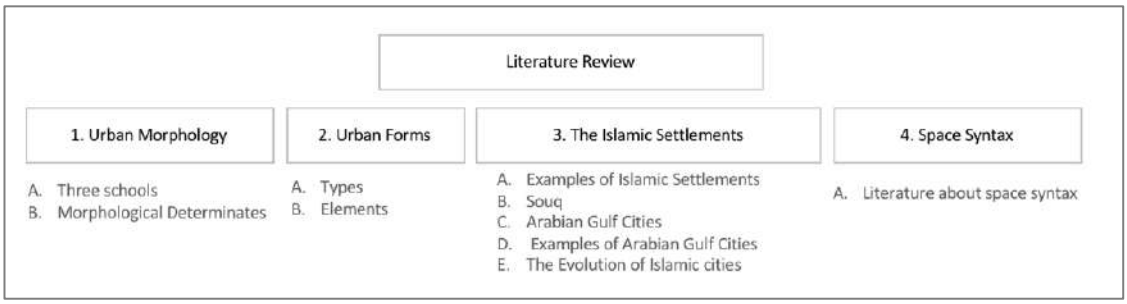

Figure 2: Summary of the structure of the literature review of the study.

2.2 Understanding Urban Morphology

The study of urban morphology dates to the late nineteenth century. The term was used and defined as an investigative tool for studying the physical form of a built environment (Whitehand, 2001). The word morphology was initially introduced by the famous German writer and thinker Wolfgang Von Goethe (1749– 1832), who designates morphology as the 'science that deals with the essence of forms (Sabr, 2016). Various authors defined the nature of morphology in different fields and from different approaches and perspectives. The general definition of urban morphology was

simplified by Cowan (2005), who defines morphology as the study of physical urban forms, while Lozano (1990, p 209) interprets Cowan's concept as a *'The science of form, or of various factors that govern and influence form.'* However, the Urban Morphology Research Group (1990) states that urban morphology is a study of the physical form of the urban fabric and processes shaping it. Mayer (2005) also defines the study of urban morphology as the knowledge of form and the relation of the spatial logic of space for the formation of structuring urban principles.

Larkham (2005) states a slightly different approach, defining urban morphology a study to conceptualize the urban complexity at different scales, claiming these complexities need to be studied as base elements including types of buildings, plots, street blocks, and the street patterns. He highlights these elements are what the cities are made of, and the way these cities have grown and developed through time is critical (Larkham, 2005). Urban morphology has also been defined as a method of analysis for the purpose of finding out principles and rules for urban design (Gebauer and Samuels, 1981; cited in Larkham, 1998). Moudon (1997) says it is the study of a city's evolution through years to find the urban value and components based on their consistency and transformation. Moudon's definition is applied for analyzing Souq Al Wakrah based on the consistency and transformation of the souq's urban components through time. Scholars identify forces that prompted urban transformations via socioeconomic forces and human actions to meet the current needs (Moudon, 1997).

As a conclusion for the concept definition of urban morphology, it is a practice that strongly relies on time, therefore, time becomes a vital dimension in study of settlements. After presenting these various definitions of urban morphology, the literature concludes that urban morphology has a variety of approaches, and these

approaches can be generally classified into three different perspectives of understanding urban form by the three schools (English, Italian, and French).

2.2.1 The Three Schools of Urban Morphology.

Anne Vernez Moudon categorized urban morphology into three schools based on its different perspectives such as geography, architecture, and urban design (Moudon, 1970). The reason for defining three schools of urban morphology was to accomplish the proper pattern of study necessary for the urban morphology research.

There is the English school, also known as the British school or Conzenian school. The English school used the geographic approach advocated by M.R.G Conzen, who is considered the father of urban morphology in the twentieth century (Whitehand, 2001). However, the space syntax group of Bill Hillier, Julienne Hanson, and colleagues at The Bartlett, University College London are part of this English school. Space syntax contributes to the urban morphology field since space syntax studies urban form based on an quantitative approach by developing representations with mathematical measurements. In this regard, space syntax is a scientific implementation of morphological analysis. We will discuss this in more detail in later sections.

Conzen named his studies "Townscape," which mapped cities, function, and urban form. The English school use extensive representations of urban morphology that are used in this thesis including space syntax analysis. Conzen established two concepts known as "Fringe-Belt" and "Burgage Cycle" (Whitehand, 2001) (Figure 3). The Fringe belt concept refers to the areas in a city in a transitional stage; these areas show morphological changes in the city structure (Whitehand, 2001). Conzen also introduced the Burgage cycle, which refers to the transformation cycle of buildings, clearing, and building up again over time (Whitehand, 2001). These representational techniques are

used to highlight the process of change of Al Wakrah settlement, with specific focus on the old core by relaying on the aerial imagery. However, because of the reconstructed state of Souq Al Wakrah, examining the process of change over time can be useful but limited since most of the original fishing village was demolished in 1990s.

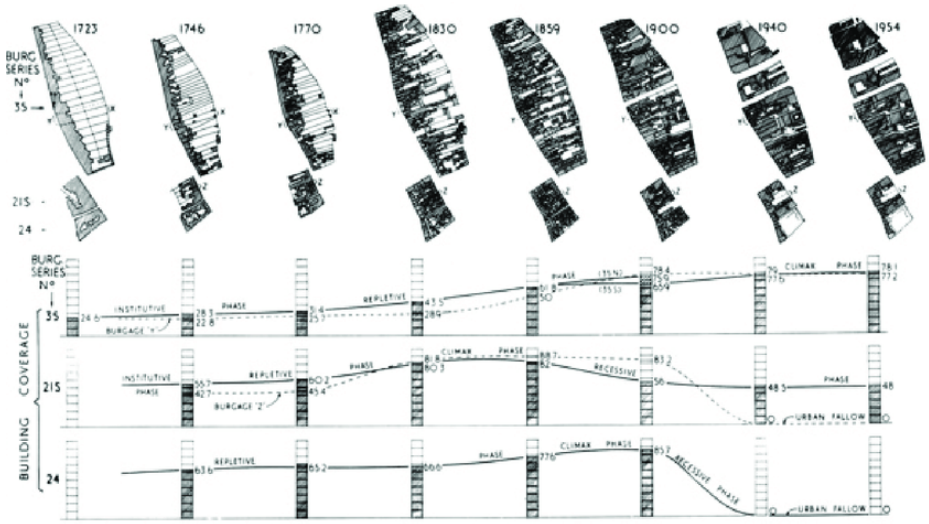

Figure 3: Illustration of Conzen's burgage cycle concept, which conditions the built space over time in a study of Pilgrim Street, Newcastle-Upon-Tyne (Source: Conzen, 1954).

Conzen defines urban morphology based on three levels of urban form that represent the main ingredients of analysis summarized in (Figure 4) (Conzen, 1954; 72–253):

- Ground plan that includes the street pattern, plots, and block plan of buildings.
- Building fabric and thus deals with three-dimensional forms, such as building types and their spreading patterns.
- Land use pattern, which is a phenomenon that links morphology and functional realization (Conzen et al., 1960, 2004).

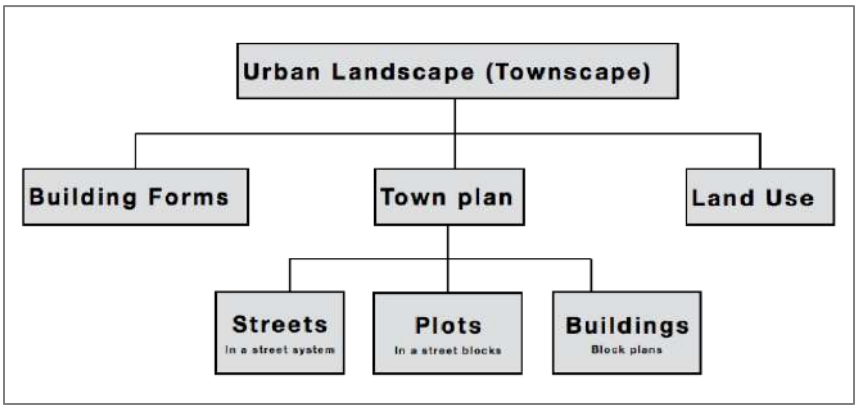

Figure 4: Threefold division of urban landscape by M. R. G. Conzen (Source: Author after Sabr; 2016)

The Italian school focuses on the urban form with relation to architecture. This school became more evident in the mid-twentieth century in Italy when the problem of urbanization appeared and raised the question of how contemporary cities should develop. Thus, they focused on studying the typology of buildings and its relation to urban morphology (Cataldi, Maffei, Marzot, Strappa, Vaccaro, 2005) (Figure 5). Muratori's approach is considered the physical and functional approach, as well as the cultural aspect as he believed that there is always a culture beyond forms. The Italian School studies the building within its context and its approach defines the city as 'one unit' to understand its morphology (Sabr, 2016). The typo-morphology technique studies the urban space from macro scale into micro in the case of Souq Al Wakrah in this research also implements a similar approach to measure the immediate surrounding and the urban context of the souq.

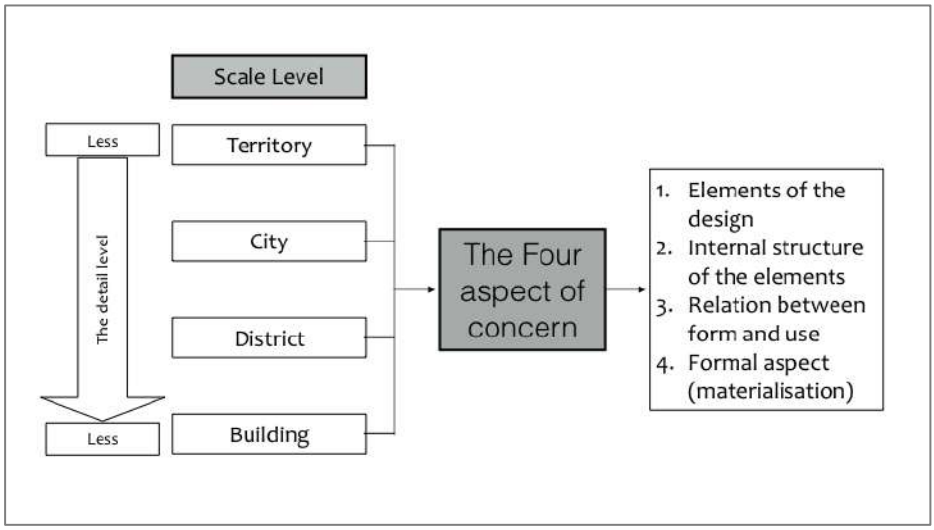

Figure 5: Scale levels of the Italian School of urban morphology (Typo-morphology), (Muratorian typological method) (Source: Author after Sabr; 2016)

Caniggia developed Muratori's concept of the type, typology, structure, tissue, series, and seriality. He established a new concept called 'processual typology', which considers the type, synchronic and diachronic transformative typological patterns (Sabr, 2016). In the beginning of 1980s Aldo Rossi's promoted the importance of traditional types of buildings and he established another concept called 'typo-morphology' (Rossi, 1982) (Figure 6). This historic interest stimulated others for renewing historic buildings by analyzing current urban problems and contemporary architectural issues (Moudon et al., 1997).

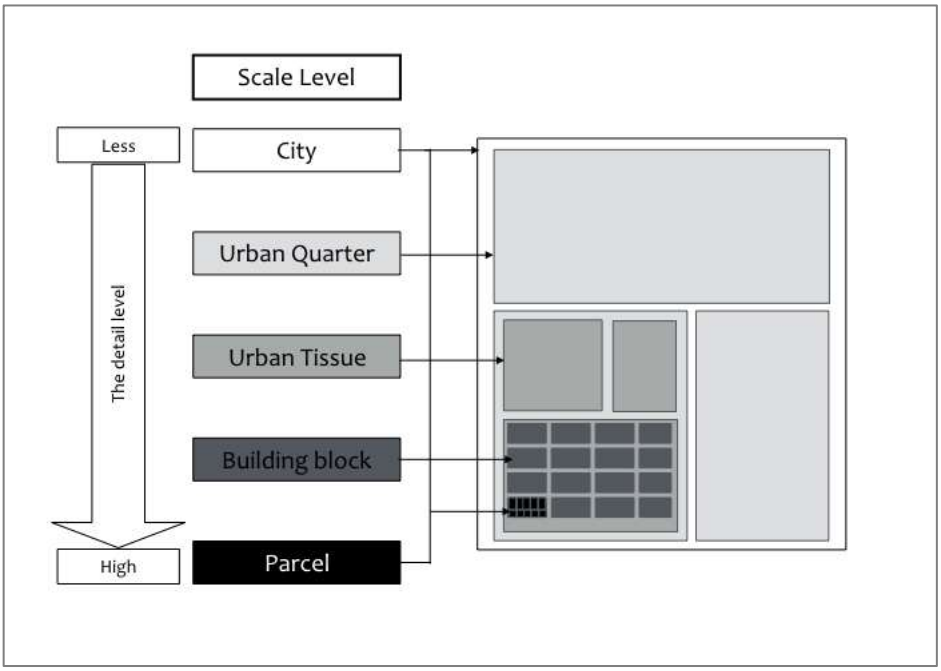

Figure 6: Typo-morphology-Caniggia and Maffei's typological method (Source: Author after Sabr; 2016).

The French school appeared between the 1950s and 1960s. The French school contributed broader than the Muratorian and the Conzenian schools in their methods and subjects (Moudon, 1994). This school's approach focuses on the process of design analysis, considering the social context of a built environment as a complex unit. Their approach also required for the need of typifying the main constituents of a city. Moudon explains the two categories of buildings, the first is the traditional type of buildings and the second is the typical buildings that relate to the urban fabric of the city. The aim of this school was to design for society's need by analyzing the social practice in the urban spaces, which has a basis on Lynch, Cullen, and Unwin's ideas. Lynch is strongly related to the French school, which we will discuss in more detail later in this chapter. Therefore, the French school adopted the morphological analysis to grasp the roots of modernism in urban design and planning.

The study of the three different approaches summarizes that the English school is more oriented to the scientific and mathematical analysis. In contrast, the French school is more oriented to the conceptual analysis, while the Italian school tends to be somewhere in between the other two schools. This thesis principally takes the English school approach by including some methods of space syntax to analyze the physical environment and the social aspect. In the United States, academia tends to be more strongly influenced by the French and the Italian schools than the English one, which is relevant to Qatar's status as it adapts more American planning principles in contemporary urban development and planning.

2.2.2 Morphological Determinates

Cities change through time and these changes are a result of different forces. These forces include natural determinants and human-made determinants (Morris, 1994). The natural forces are defined based on their geographical location, topography, climate, water, and available construction materials (Morris, 1994) (Sabr, 2016). These stand for the factors that shape the cities through the traces of its initial paths to the city subdivision system and the construction material used (Morris, 1994) (Sabr, 2016). The city's urban form is associated with the forces that originate the growth process of geomorphologic formation of the continents (Guerreiro, 2001, 2011). This highlights that each settlement has its configurations and uniqueness.

Climate affects the overall form of the settlements and the buildings forms, that create a comfortable environment that satisfy people's everyday needs (Fathy, 1986; Talib, 1984). Morris highlights the cause of existing courtyard houses in Mesopotamian civilization (Morris, 1994). The types of opening and location were based on climatic reasons, such as wind, daylight, and privacy in most Islamic cities. One example is the

Mashrabiya[1] concept in the Islamic cities. In a hot, dry climate, urban form is always compact with narrow streets and *sikas*[2] that direct the wind coming from the sea to the rest of the settlements.

Topography can strongly affect the establishment and formation of built environments (Smith, 1967). Topography results in alteration during the urban expansions (Morris, 1994; Tannous, 2020). European examples like Athens, Rome, and Edinburgh all are notable examples of cities affected by their topography. A recent study between Souq Waqif in Qatar and Souq Mutrah in Oman highlighted the topographical impact on the shape and expansion configuration of both settlements and impact on the functioning of both souqs within each city (Tannous, 2020). Doha grew on a flat land while Muscat grew linearly due to mountainous and rugged topographic conditions, the differences between both cases can be seen in the space syntax model of both cities (Tannous, 2020) (Figure 7).

[1] Mashrabiya is a type of projecting oriel window enclosed with carved wood latticework located on the second story of a building or higher, often lined with stained glass. The mashrabiya is an element of traditional Arabic architecture used since the Middle Ages up to the mid-20th century. It is mostly used on the street side of the building; however, it may also be used internally on the sahn (courtyard) side.

[2] A *sikka* is a narrow alleyway in residential clusters to connect a main road or the city center to the surrounding areas, commonly used in Arab cities of the past and a prominent feature of historic districts in Arab cities today.

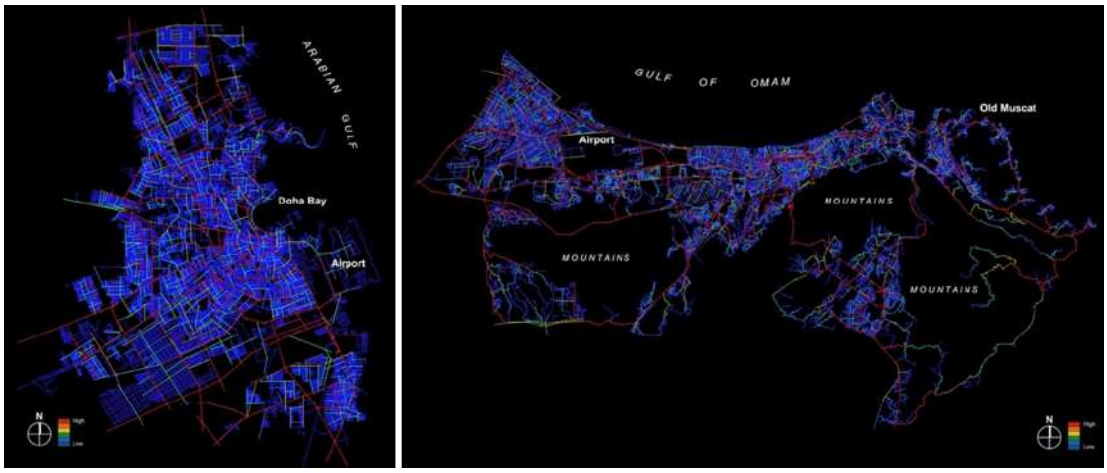

Figure 7: Space syntax model of choice in metropolitan (left) Doha and (right) Muscat (Source: Tannous, 2020).

Different construction materials shape different urban forms. Burnt brick, clay, marble, masonry stonework, and timber can be seen in all historical settlements (Morris, 1994). For example, mud brick used in Mesopotamia civilization, stone used in Makah and the use of marble in Greek civilization. Water was one of the strongest determinants that located the settlement. The availability of water was necessary for the ancient settlement to meet people's daily need. Therefore, all the ancient civilizations started on the banks of rivers, and some appeared as coastal settlements. Examples include the Egyptian civilization existing on the banks of the Nile River, Mesopotamian civilization on the Tigris and Euphrates banks, and most of the Gulf region settlements appeared as coastal settlements.

The second type of urban form determinants is human-made determinates; it is defined by the human interventions on the urban forms that are classified into diverse aspects. (Gallion,1998). The economic factor influences the urban form in ancient times

by establishing linear shops known as *Bazar*[3] and *Souqs*[3] that affected the street patterns and block patterns (Morris, 1994). The citadels and city walls' existence in the ancient settlement as a political force and defense stands for political power highly affected the urban forms. On the other hand, religion is also considered one of the critical urban form determinants; it is apparent in their stand-alone structures for worship, such as mosques in Islamic cities and churches in the ancient settlements. Moreover, the cultural aspect strongly affected the urban form in designing inward-looking building – courtyard- typologies in the Arab world. The social factor was clear in the design of ancient settlement, the social class segregation appeared in the type of houses, their location in relation to the center, or the settlement's heart. All the previous determinants had a significant role in affecting the urban form of a settlement.

2.3 Urban Form

Cities are physical evidence of human existence in a place; their form has diverse shapes and structures that resulted from different forces as discussed earlier. The urban form is a combination of elements that result in a spatial configuration (Anderson et al., 1996). The urban form is strongly related to the metropolitan area's scale as it defines the 'morphological features of an urban area at all scales' (Williams et al., 2000). Urban form is constituted by combined elements, streets, blocks, plots, and buildings (Sabr, 2016). Other says the urban form describes three physical elements of the built environment: plot coverage, setback, street width, building height and type (Talen, 2002). Talen used various representations to demonstrate using the pedestrian shed,

[3] The term bazaar originates from the Persian word bāzār. And the term Souq originates from the Persian word سوق suq, It is a permanently enclosed marketplace or street where goods and services are exchanged or sold.

which is similarly used in this thesis to analyze the souq and its constituent elements in relation to walkability.

2.3.1 The Concept of Urban Form

Generally, urban form encompasses several physical and social features. Some of these features are specific to each city, giving it a unique character that accordingly can affect the human use and behavior int eh urban environment (Sabr, 2016). The layout of an urban area shapes permeability and easiness to find the way, access, and movement for pedestrians (Hillier and Hanson, 1984; Hillier, 1996). The social features refer to users' perception of a space based on the previously discussed physical elements. The overall street and pedestrian network configuration of a city can affect urban functionality, which influences the location and intensity of activities (Porta et al., 2008). The connectedness and permeability of urban layouts are claimed to shape the nature and extent of routes between and through spaces, which, in turn, has an influence on how lively and well-used a space might become in real-world conditions (Cowan, 1997).

2.3.2 Types of Urban Form

Urban form encompasses different physical features that generate diverse types of urban forms, that are classified to linear, centric, radial/ rings (Sabr, 2016). The term urban tissues symbolize the urban pattern such as regular, grid, irregular/ vernacular, centric radial. The same scale of the four different urban forms from different cities are represented to show the various types of urban forms (Figure 8).

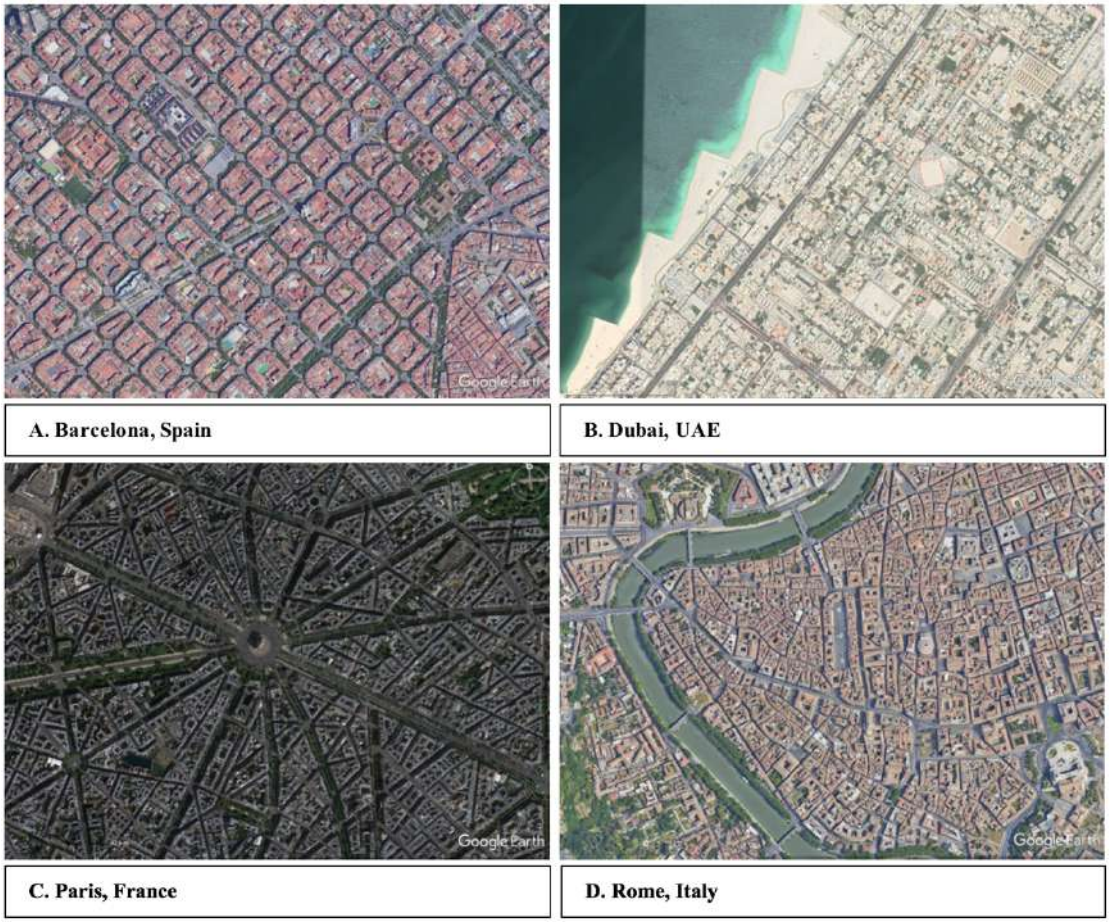

Figure 8: Urban form examples: (A) Regular-Barcelona; (B) Linear-city of Dubai; (C) Centric irregular-Paris; (D)Vernacular irregular-Rome (Source: Google Earth, 2020).

However, within the same city, various urban tissues can be utilized. Four types of urban tissues selected from Qatar are used to show the urban form varieties (Figure 9). The first tissue is from the west part of Doha is Al Sailiya. This area is characterized by a grid type street forming smaller urban blocks of regular shape, resulting in smaller plots and buildings. The second urban tissue is The Pearl, where a fundamental factor of the context is the high quality of its built environment. The urban form of the Pearl shows a centric plan design focused around two bays. The third urban tissue is from Al Wakrah, which clearly shows a linear form along the coast with efficient compactness resulting in narrow streets. More detailed analysis is done in the later chapters since it

is the case study of this research. Finally, the fourth urban tissue is from Freej bin Mahmoud. It clearly shows the irregular urban tissue. However, the initial impression is of a a regular urban form due to the urban superblock divisions, but the buildings have a substantial formal homogeneity.

Figure 9: Examples of Urban forms from Qatar (A) Regular grid: Al Sailiyah . (B) Centric regular: The Pearl. (C) Linear irregular: Souq Al Wakrah (D)Vernacular irregular: Doha Downtown (Source: Google Earth, 2020).

2.3.3 Elements of Urban Forms

Urban form is composed of different interconnected objects such as plots, buildings, streets, and squares (Anderson et al., 1996). These elements create the spatial arrangements and configuration of the overall urban form. The elements of the urban

form influence pedestrian accessibility and the connection of various places (Moudon, 1994). Urban plots are considered as a morphological measurable element with considerable stability over time. Plots can be easily found by the existing buildings in modern urban form, while it seems more complicated in historical and vernacular types of urban forms.

Buildings are an instable and changeable urban element, while plots and streets tend to be more consistent (Sabr, 2016). Buildings are defined based on their form and utilization and divided into two types: the ordinary buildings and landmark buildings (Sabr, 2016). Ordinary buildings are typical in the city (hence their description as 'ordinary') with strong similarities such as the houses and retail units. The landmark buildings refer to those buildings that are unique in shape and use, which are very few in the city and their size plays a role in their designation as 'landmark' objects (Figure 10) as suggested by Kostof (1992).

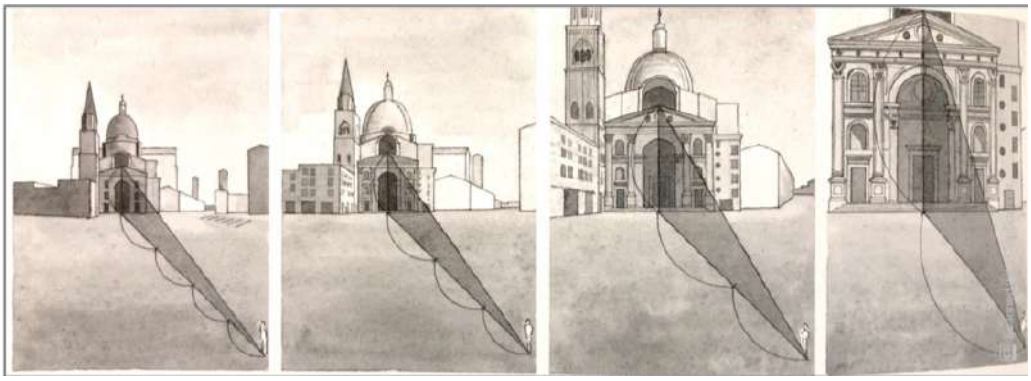

Figure 10: The effect of perception of viewers (Source: Kostof, 1992).

Streets are an element of urban form, which are also the city's public spaces connecting different users' destinations. From the social aspect, streets are equity representatives around the world since social differences have no expression on the street (Hillier, 2009). Street livability is the most useful indicator of a robust civil

society, while the physical measure of streets highlights the connectivity and integration of cities (Hillier, 2009). Integration and connectivity represent one of the indicators of this thesis to measure on the case study using space syntax, which is explained later. Streets that are directly connected to primary services and facilities for citizens ease circulation and are more often used, which can differ in shape, too (Gehl, 1987; Gehl et al., 2004; Marshall, 2005) (Figure11). A representational technique is used to highlight the main and sub routes of the souq and classify its streets based on their function and size in a later chapter.

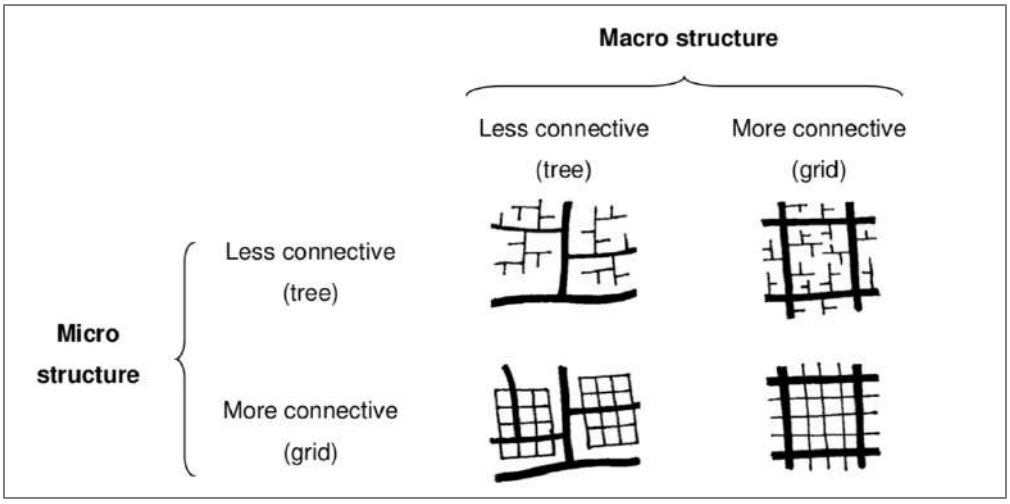

Figure 11: Simple example of two structures (grid, tree) at different scales (macro, micro) (Source: Marshall, 2005).

Streets can be divided based on their size and function. Functionally, classified into residential and souqs, while typologically classified into main spines of the settlement, sub street and smallest path that joins and creates a network (Sabr, 2016). Historically, streets have a wide variety of characteristics; their function is strongly influenced by citizens' culture, religion, and need (Sabr, 2016). This social and economic approach were later neglected, especially after the industrialization and

modernization that evoked private car ownership. Consequently, cities' urban form adapted for the needs for private cars and affected new and old cities' streets. A new generation of modern designers and planners aimed to preserve the initial concept of the streets, including the separation of pedestrian zones from high-speed vehicular routes implemented in many European streets (Gehl, 2010; Jacobs, 1961).

The streets in the Arab region had similar characteristics; most of the important streets in the history functioned as souqs (Sabr, 2016). Most of these souqs in the gulf region are covered, and some were open air (Sabr, 2016). The souq existence along the streets proves the social influence on urban design in the Islamic world. The residential streets in the Arab world are influenced by Islamic rules and regulation; the open balcony from houses was covered by *Mashrabia* to maintain the privacy of the residential building overlooking the public streets in parallel maintained the visibility from the buildings (Sabr, 2016). Residential streets are characterized by the visual connection and direct accessibility to the mosque. The façade of the residential buildings is characterized by simplicity and fewer decorations. The following sketches represent the typical street types in the Islamic world (Figure 12). Similar sketches were developed to classify the types of streets in Souq Al Wakrah.

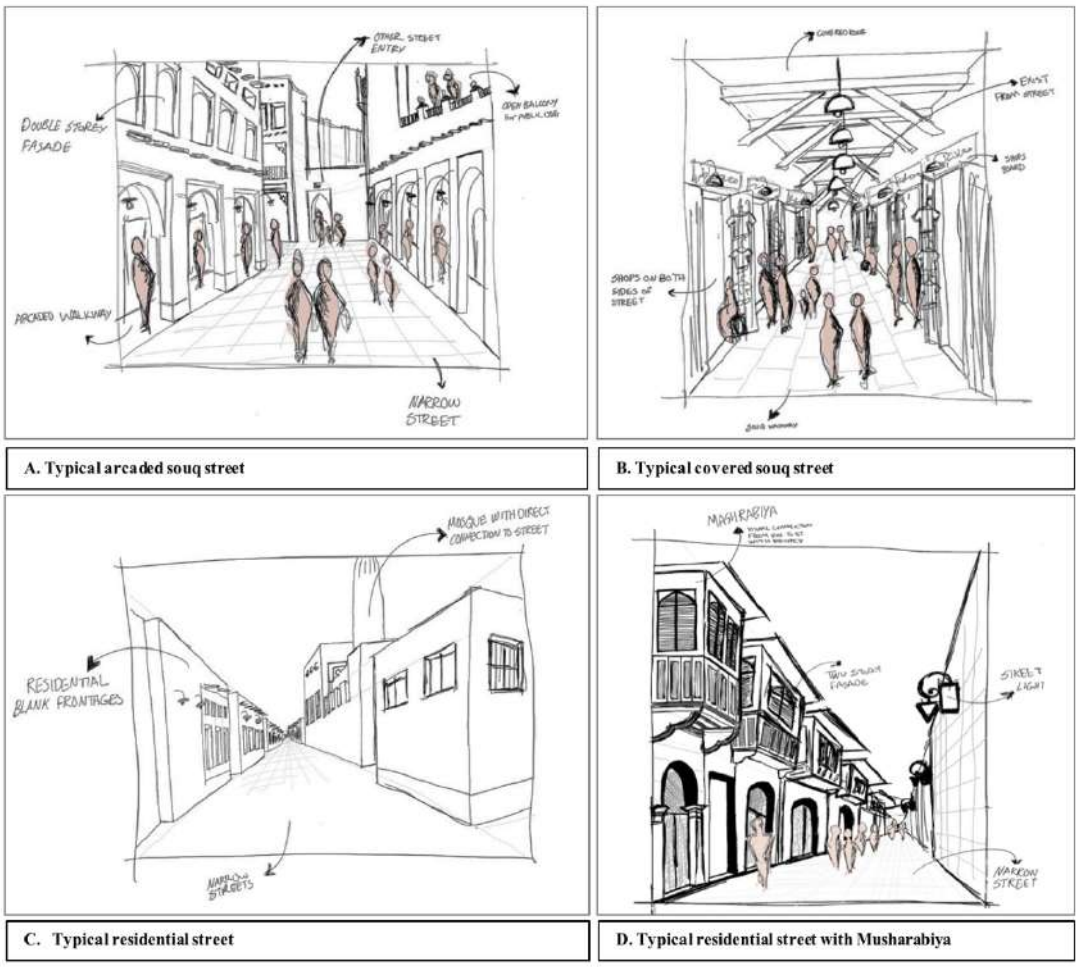

Figure 12: Islamic settlements - physical and functional typologies of streets (Source: Author).

City squares and plazas vary in size and utilization. These variations define the different typologies of squares (Krier, 1979). Squares is a result of an intersection of a single or double or more street (Krier, 1979) (Figure 13). Most of the squares are shaped around landmarks or adjacent to city monuments, especially religious buildings (XingNand Siu KWM, 2017). City squares are representation of urban life through which citizens are directly connected to the heart of the city culture, history, and memory (Levy, 2012). Some representational techniques were utilized to highlight the typologies of urban squares in this thesis for the purpose of classifying the squares

typologies in Souq Al Wakrah with specific focus on the number of intersections like Krier classifications of squares.

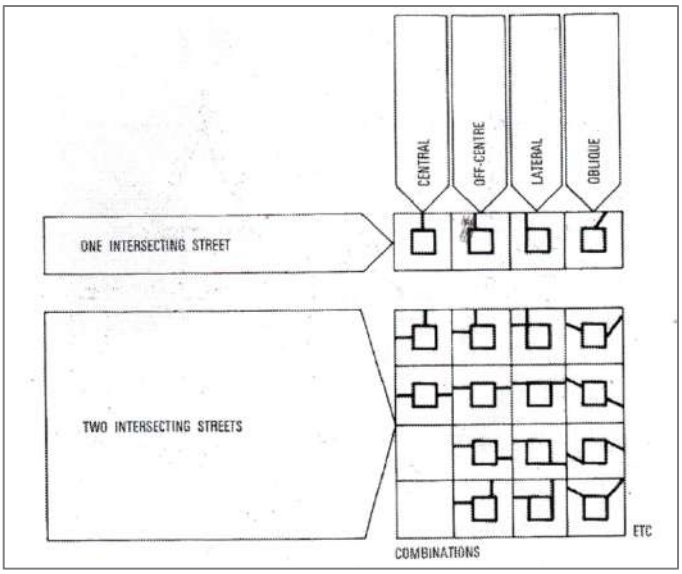

Figure 12: Typological description of urban squares (Source: R. Krier, 1979).

Lynch (1960) classified the city elements using a different approach. His approach is based on the concept of imageability, which attempts to capture the city's common image based on the typological approaches. Lynch (1960) studied the perceived form of the built environment in their mental image of the city. In 1981, he highlighted the lack of human behavior studies in urban planning in advocating an outline for the human behavior's influence on settlement form. The image of a city focuses on these physical elements that influences the user readability of a city form (Lynch, 1960). Through this concept, he argues for the importance of visual quality of cities since it creates a mental image in its users' memory (Lynch, 1960). He classified the mental map by five physical elements: path, which are the walkways that people use to move in a city. Edge is a boundary such as rivers, or sea. District is the area that have features in common with each other. Node is a point of street intersections such

as urban squares. Landmark is a recognizable physical urban element (Figure 14). The imageability elements identified by Kevin Lynch involved interviewing users and deploying train observes to develop his analysis of identifications of city elements. This technique is used for analyzing the imageability of Souq Al Wakrah.

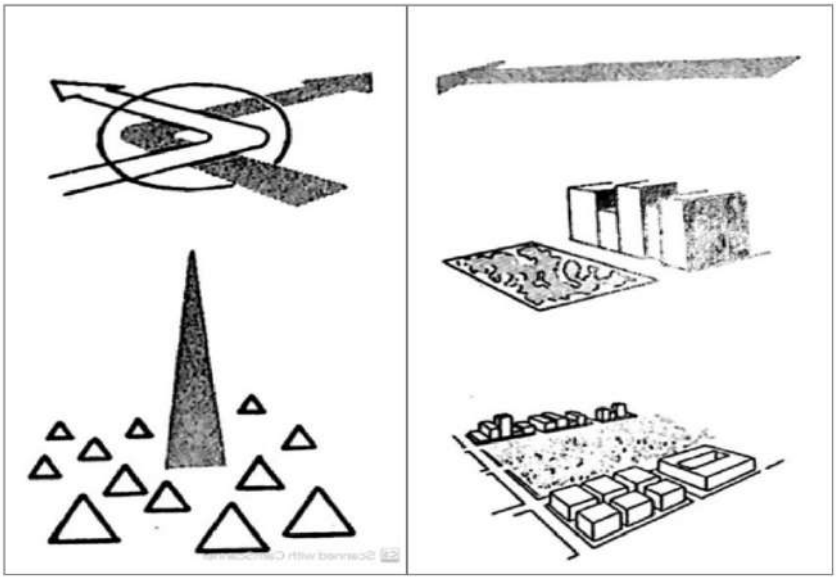

Figure 13: Lynch's elements of city imageability: paths, edges, districts, nodes, landmarks (Source: Lynch 1960, collected by Major, 2018).

2.4 The Islamic Settlement

A review of Islamic rules and regulations in planning is significant to understand its influence on design and planning cities in history and their influence by modernization and globalization trends. The spread and expansion of Islam was accompanied by an expansion in the establishment and prosperity of many Arab-Islamic cities in the countries conquered or joined in the Islamic state. The design of these cities was based on Islam rules and regulations which appeared in their form and content (Gharaybih, 2015). These regulations defined its various political, economic, and social aspects, and its urban planning and composition (Gharaybih, 2015). Al-Hathloul (1994) discussed

and analyzed the establishment methods of Islamic urbanization in the Islamic cities. He began with Medina as the primary, or the founder of the Islamic city model. Then he praised Al-Amsar, Al-Barra, Al-Kufa, and Al-Fustat as each of these cities were influenced by the Medina Al-Munawrah structure. Al-Hathloul (1994) mentioned a third type of Islamic city, which was established by the caliphs as their capitals for their rule, especially Baghdad and Samara.

In his famous manuscript, Ibn Abi al-Rabi'a refers to a set of planning conditions or principles, which he extracted from the commandments of the Prophet, may God's prayers and peace be upon him, during their construction of the first capital of Islam (Medina) and early Arab Islamic cities (Basra, Kufa, Fustat and Kairouan). Ibn Abi al-rabi', an Arab-Muslim scientist of the Abbasid era, wrote his only book "Solok Al-malik fe Tadbeer Al-mamalik Ala Altamam Walkamal" to the Abbasid Caliph Al-Mu'tasim bi-'llah (227-218 AH / 833-842). A pedigree book has political, social, philosophical, mathematical, and urban planning topics presented in an Islamic framework (Gharaybih, 2015), and the following text of the book translated from Arabic to English. Ibn Abi al-Rabi mentioned the conditions in Chapter Four of his famous manuscript. Under the four pillars of the kingdom, these principles, or conditions that the ruler must follow divided into two types, they are:

1. Conditions for selecting city sites (Figure 15): Ibn Abi al-Rabi'a says, "There are six strings in establishing cities," which confirms the depth of awareness of these criteria and conditions that distinguish sites suitable for construction of cities. First: the capacity of wasted water. The second: the potential for derived water. The third: moderation and air quality. The Fourth: proximity to pasture and logging, and Fifth: fortifying its homes from enemies and terror. Finally, sixth: to be surrounded by a wall

that helps its people (Gharaybih, 2015). As also supported by Ibn Khaldun (1406) the purpose of establishing towns is to have places that shelter and protect inhabitants. Ibn Khaldun, in 1406 signifies the importance of water by emphasizing that the site should be selected next to a water source such as a river, sea, and oasis. The presence of water next to the settlement simplifies the water problem for the inhabitants (Ahmad et al., 2016).

Figure 14: Conditions for selecting city sites (Source: Ibn Abi al-Rabi'a, page 61).

2. Conditions for planning city sites (Figure 16): The principles that the ruler must consider when establishing any city include: that freshwater is marketed to her for drinking and easy to consume without effort. To assess its roads and streets so that they are proportionate and not narrow to build a collector for prayer in its midst to bring closer to all its people.

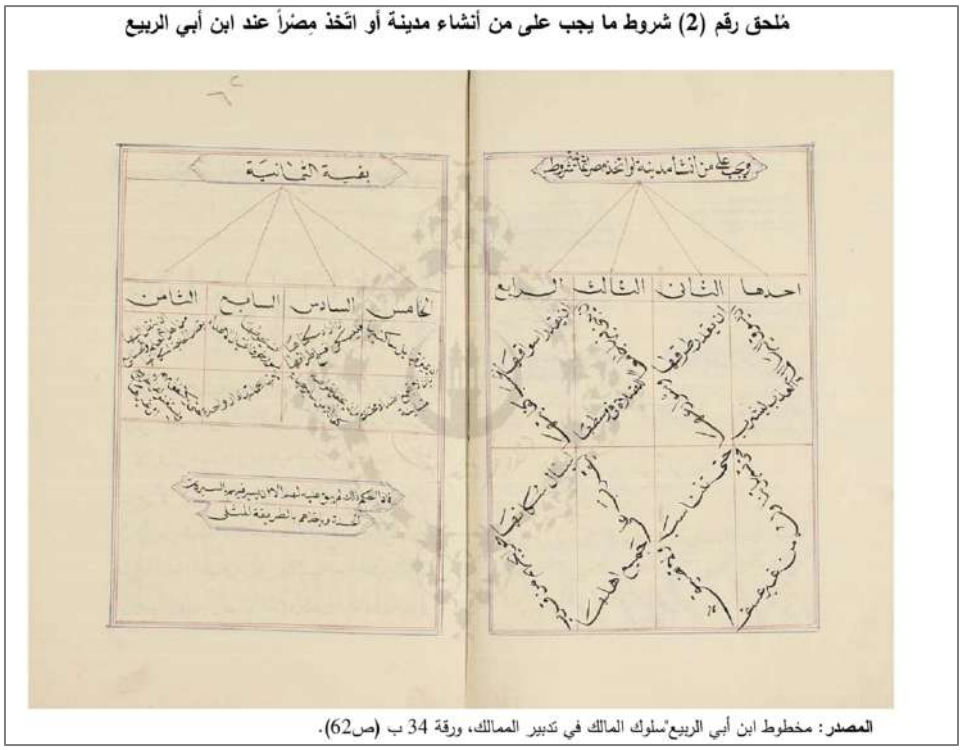

Figure 15: Conditions for planning city sites (Source:Ibn Abi al-Rabi'a, page 62).

These rules and regulations resulted in a unique city form with distinguished elements influenced by the Shari'a. A key element of Islamic urban form in the streets, souqs, mosques and open space. The streets are mainly composed of two types of streets: wide access streets allowing passage of two laden camels with width (3.23–3.50 m), and the cul-de-sac, allowing passage for one laden camel with street width of (1.84–2.00 m) (Gharaybih, 2015). Mosques represent a fundamental building of the Islamic city, usually it has a courtyard with one or more fountains for purification before prayer. Also, squares and open spaces mostly appear near the mosque for social gatherings before and after prayers, which makes it a unique public space element. Mosques also included one or more minarets. Islamic cities had several other building types, including

the *Hamman* [4] or the public bathhouses used separately by men and women, and the *Madrasa*[5], a college for advanced study of Islamic law and sciences (Morris 1972).

Exploring the elements of the Islamic cities, plots of Islamic cities were irregular both in terms of form and size. The building coverage of Islamic cities was too high, and each house would occupy the whole plot. The Islamic city's house followed a courtyard housing typology that is divided into two parts: the public part like the *majlis* [6], and the private part is the courtyard and rooms. The climatic comfort was one of the house's main concerns, including several measures to achieve that purpose (Gharaybih, 2015).

2.5.1 Examples of Islamic Settlements

As mentioned by Al-Hathloul, Islamic cities such as Baghdad and Samara were established by the caliphs it to be capitals for their rule (Al-Hathloul, 1994). Generally, different types of settlements have different types of characteristics such as their size in relation to their cultural and social aspect. However, this research's focus is the physical aspect of the morphology, and the physical elements are common in all cities. Thus, the case studies will help in contextualizing this study within the larger field of Islamic settlements.

The Abbasid Caliph, Al Mansur, built the well-known city of Baghdad as his new capital of the Islamic Empire. The urban form represents a milestone in the history of urban design. The round shape of Baghdad city is influenced by cultural, religious,

[4] *Hammam* or a Turkish bath is a type of steam bath or a place of public bathing associated with the Islamic world

[5] *Madrasa* is the Arabic word for any type of educational institution, secular or religious

[6] *Majlis* is an Arabic and Persian term meaning "council", used to describe various types of special gatherings among common interest groups be it administrative, social or religious in countries with linguistic or cultural connections to Islamic countries.

and economic factors. However, Baghdad city's morphological analysis highlights the numerous urban features that reflect its influence by different historical periods. The Round City transformation to irregular organic pattern highlights the morphological changes through physical and socioeconomic characteristics. The old fabric within Rusafa and Karkh faces severe disintegration, which resulted in segregation, the loss of Baghdad's heritage, and the identity of its old urban fabric. Baghdad represented a turning point in the Islamic city's development in terms of its urban form, society, and protection. The location of the city was identified based on Ibn Abi al-Rabi'a rules and regulation for establishing and planning for an Islamic settlement, the location of the city is near a water source to provide the basis of life such as food and trade (Figure 17). These rules were established in the Abbasid era when Islam expanded, and Islamic settlements were increasingly established in different areas.

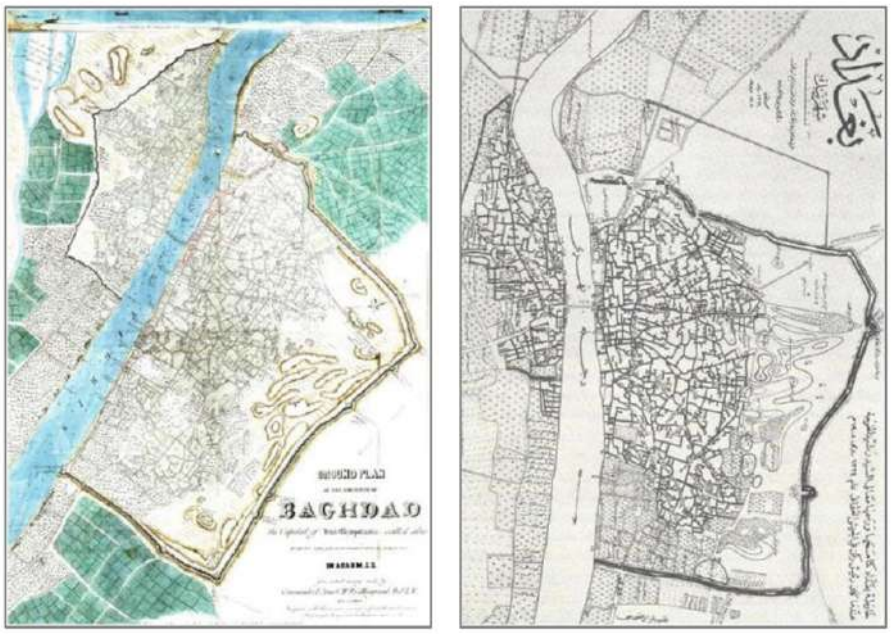

Figure 16: Baghdad 1854 AD (left) and 1908 AD (right) (Source: Al-Hasani, 2012).

Aleppo, also known by Madīnat Ḥalab, is in the historic city center of Aleppo. Before the recent Syrian Civil War, the urban form of the historic city was preserved. The urban form of the settlement is characterized by the citadel's central location and its dominant high elevation. The urban form elements are a typical Islamic city element representation. The settlements consist of historic buildings, such as the citadel in the city's center, mosques, *madrasa*, *souqs*, and *Hammas* (Figure 18). Aleppo's location was based on the trade and commerce connecting Alexandretta to Europe from the west, while on the east Baghdad, Mosul, and Basra, and in the south the main route to Damascus as the link to Palestine, Egypt, and Arabia. The city of Aleppo witnessed differentiation in the settlements pattern from regular to organic. Also, more transformation happened to the city walls. At the same time, a distinct diversity can be noticed from maps, the regular street network of the commercial center and irregular network of the residential areas by the nature of the activity patterns.

Figure 17: The plan of Aleppo the division of building blocks according to the Roman gridiron system can be clearly observed (Source: Sena et al, 2016).

The Islamic cities depended on Islamic law "şeriat" and "örf" as the customary law, which shaped the Islamic settlements. These Islamic settlements' cases were explored to highlight the Islamic influence on the formation of these settlements (Gharaybih, 2015). These are the major Islamic settlements, that are different in scale and history conditions than the GCC towns and villages in the gulf region. However, the morphological approach studies the urban form of cities in different scales. Also, these examples of Islamic settlements contextualize the case study.

Kostof (1991) reviews the transformation of the Roman cities into Islamic one based on urban rules and demand. He clearly illustrates the Roman city's transformation from gridded urban form to vernacular Islamic City (Figure 19). Kostof states that the structure of the Roman gridded form conserved as "super-grid", while the transformation of the Islamic contribution added secondary street network to the existing ones to fulfil the citizens' demand. The Roman urban form was generated based on the single unrelated families, while the Islamic role grouped residences into neighborhoods. Kostof compares the Roman grid and Islamic block as "outer-related", and the other as "involuted." Kostof representations rely extensively on plans and photographs, which the analysis of the souq in this research similarly relies on the same approach by using plans, figure ground, and photographs, etc.

Figure 18: The gradual transformation of a gridded Roman colony into an Islamic city (Kostof, 1991; 49).

2.5.2 Souqs

The term souq "سوق" in Arabic-speaking countries referred to traditional marketplaces, which date back to at least the 6th century BCE (Gharipour, 2012). The mosque located in the city center, which was surrounded by linearly connected shops. The markets played an essential role in Islamic cities' neighborhoods, which distinguished them in a distinctive manner from other cities. Another terminology for the Islamic city market is a hotel, the Rab'a square, and the "bazaar" (a Persian term). Al-Hathloul (1994) states that some *souqs* were established by the state, and some others were created by private individuals. The covered markets spread in the Islamic city at an early stage, and this goes back to the beginning of the Umayyad state. Figure 20 shows the map of historical part of Iran, which follows the ancient trade route for its Bazar. It was shaped by linearly connected shops from south to the old city into the river where the key circulation spine is lined with shops gathered and located according to goods. The highlighted route is the main route, which is domed throughout its length and arches give entrance to mosques, storage areas, and bathhouses.

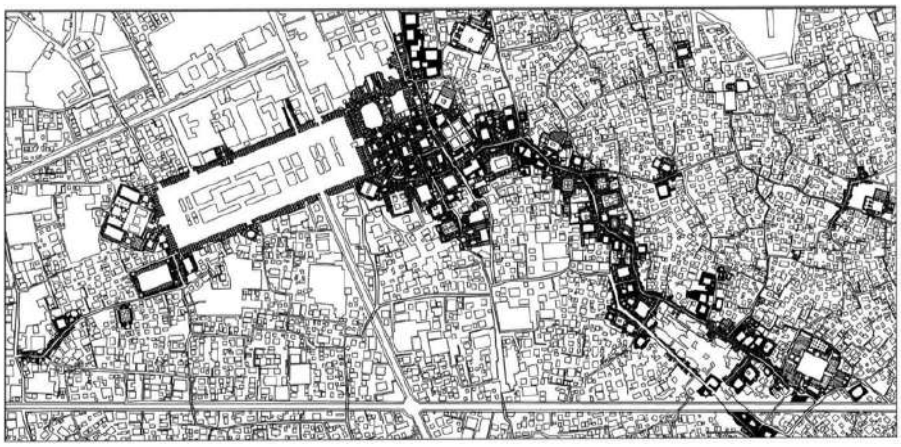

Figure 19: Plan of linear Souq in Isfahan, Iran, Maidan-i-Shah district created in the 17th century (S-travels, 2019).

Many of the markets were distinguished by the covered and tiled markets, that is on either side of them are built with paths for people to walk and extended spaces for the markets to display goods. These markets were also divided according to the type of goods, such as the perfumery market, the carpet and textile market, the gold markets, and secondary markets that meet the residents' daily needs. The Islamic souq is defined as an arcaded pedestrian market with plazas, a variety of shops, a place to socialize, and the sale of goods for citizens' daily needs. The Islamic souqs are referred to those built or modified with its final shape during the Islamic rule when Islam strongly influenced many cities' lives (Awad, 1989). The Islamic souqs, were as described by Lewcock as 'if you have seen one souq, you have seen them all' (Lewcock, 1978). In a social sense, souqs were considered the busiest part of the Islamic city.

2.5.3 Exploring Arabian Gulf Towns and Villages

Desert forms much of the Arabian Gulf's borders, located in between the north-eastern Arabian Peninsula and Iran, known as the Persian Gulf, later named as “the Gulf” (Vaughan, Grace & Al-Mansoori, Noura & Burt, John, 2018) (Figure 21, left). The Gulf region is known by its harsh climate, wherein during summer the temperature exceeds 50-degree with winter temperatures as low as 15°C to create a variable annual SST range throughout the region (Sheppard, 1993) (Figure 21, right).

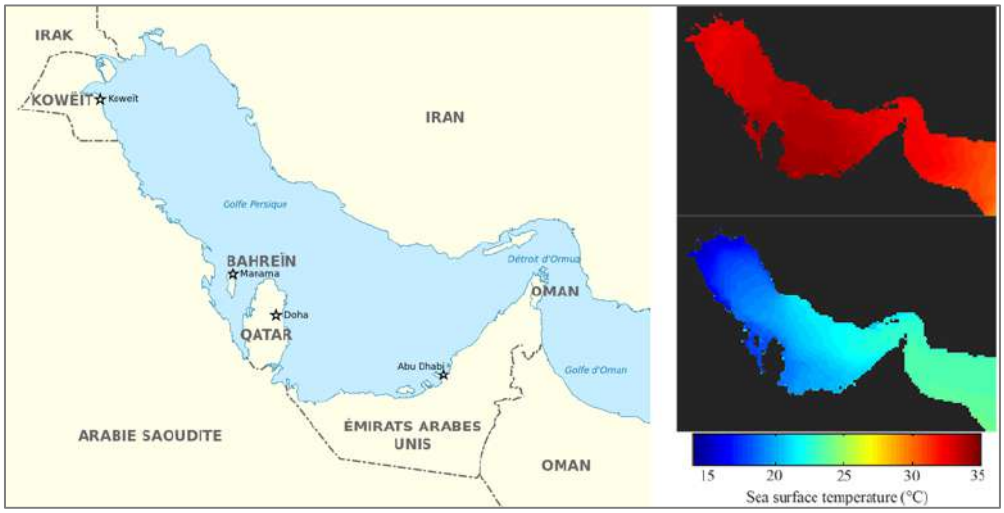

Figure 20: (left) Location map of Arabian Gulf By (Source: Farajirad, 2019) and (right) mean monthly maximum and minimum sea surface temperatures of the Gulf, averaged over a 10-year period (2004–14) (Source: Data from MODIS level 3, 9 km, 11 μm, daytime SST.)

Ibn Khaldun categorizes the Arabian region towns and villages into Bedouin and urban class (Ibn Khaldun, 1406). This is supported by historical overview of these cities through the identification of their locations. The categorizes of the towns and villages is based on their location in relation to water source, agricultural villages near the oases and Bedouins living in tents in the desert. The urban form of the villages is characterized by their irregular organic form.

The urban form of Arabian gulf villages responded to climate constraints to result in a distinctive urban form typology. The traditional buildings placed near one another result in narrow streets in between to maximize shading, enhance air circulation throughout the village, and minimize the ratio of the exposed area to the sun relative to the building's total volume (Figure 22, center). The traditional houses' openings to the public are covered by Mushrabiya, maintaining privacy as previously discussed (Figure

22, left). Furthermore, some traditional buildings have a wind tower to circulate cool air, which results in natural ventilation (Figure 22, right).

Figure 21: (left) Lattice windows, (center) Narrow streets Built close, for comfort, and (right) a wind tower (Source: Felibrilu/Flickr, CC BY-NC).

Several examples of these towns and villages can be seen nowadays as historic districts in the heart of larger cities. Oman is one of the countries enriched by its historic coastal villages, such as Sohar, Shinas, Musandam, Al Suwayq, Mussanah, etc (Tannous, H.O., Major, M.D., 2020). These towns and villages functioned with souqs and contained other valuable historical buildings. Likewise, in Qatar, old Doha represents one of the most important historical sites, which contains Souq Waqif as the most important tourist attraction in Qatar. Similarly, Souq Al Wakrah is one of the valuable heritage sites in Qatar. The coastal villages in the northern part of Qatar include those such as Tinbak, Freiha, Ruwayda, Al Jumail, Al Zubarah, and Murwab. These historical areas had most of its buildings demolished over the last fifty years. The big cities that we can see nowadays in the Arabian Gulf region hides within its centers and old cores the past historical evidence of their origins (Figure 23).

Figure 22: Example of large-scale caostal development in the Arabian Gulf. From top left: Tarut Bay in Saudi Arabia, Durrat Al Bahrain in Bahrain, Doha, Qatar, the Palm Jumeirah, UAE, and Kuwait City, Kuwait (Source: Google Earth, 2021)

2.5.5 The Evolution of Islamic Settlement and Villages

The nineteenth-century cities started to change from their predecessors in terms of scale and size. It was the turning point for most settlements around the Arabian Gulf. Industrialization and rapid population growth have strongly affected urban development, which caused urban sprawl and urban expansion outside the historic city walls. The built environment expanded over the territory with emerging suburbs. The traditional urban form elements obtained new meanings and functions. The street began reserved for cars. The square was no longer a place for gathering and social interaction and houses had no direct relationship with the street—a wall or fence (and not the building façade) separated the public and the private space.

Scholars argue that the new cities' low-density form did not offer a physical structure to meets its residents' needs (Lamas 1993). However, industrialization brought

about many transformations in many older Arabian Peninsula settlements. Most transformations followed the Western style of generating urban forms such as in Europe and the United States.

Globalization and rapid growth caused several problems, one of which the demolition of valuable historical structures resulting in the loss of heritage identity of most of the settlements in the Arabian Gulf. With the rapid growth of urban environments and cultural and heritage identity loss, preservation of the souqs became more essential. Today, the souqs in the MENA region are among the most important destinations for tourists. These souqs reflect the culture and city's identity by its diverse functions and activities of its streets with colorful clothes and fabrics shops on both sides, food and perfumes, furniture, and casual chatting, all arranged within the historical context of the market.

The effect of globalization and rapid growth transformed the physical form of souqs all around the world. It also established new uses such as restaurants, crafts, and souvenirs to survive and meet the space's new demand as an international tourists' destination. However, we will discuss the concept of transformation of the gulf society and their change to westernization of its built environment in more detail in Chapter Four.

2.4 Literature About Space Syntax

Bill Hillier and Julienne Hanson published their book *The Social Logic of Space* in 1984, which outlined a new method of analyzing the built environment in relation to its social aspects. This method builds a conceptual model to study spatial pattern relation with social content and the social pattern with spatial content. It establishes an analytical method of the relation between local morphological relations and global

patterns (Major, 2018). ‘The social logic of space’ describes the fundamental social information conducted for analyzing the spatial pattern of settlements (Hillier and Hanson, 1984).

Space syntax is a quantitative analytical tool. Researchers study the relationship between spatial structure and generic function of movement. Space syntax researchers argue that space configuration in the city highly affects the user movement (Hillier, 1996). Axial map analysis maps the behavior of people in a pattern of urban spaces based on linear movement (Figure 24). The analytical procedure's main concern mostly takes into consideration the voids of an urban area, the street of a settlement that is responsible for user movement like blood vessels, and the spaces around buildings. The study applies this quantitative representational technique to measure the integration of the city of Al Wakrah.

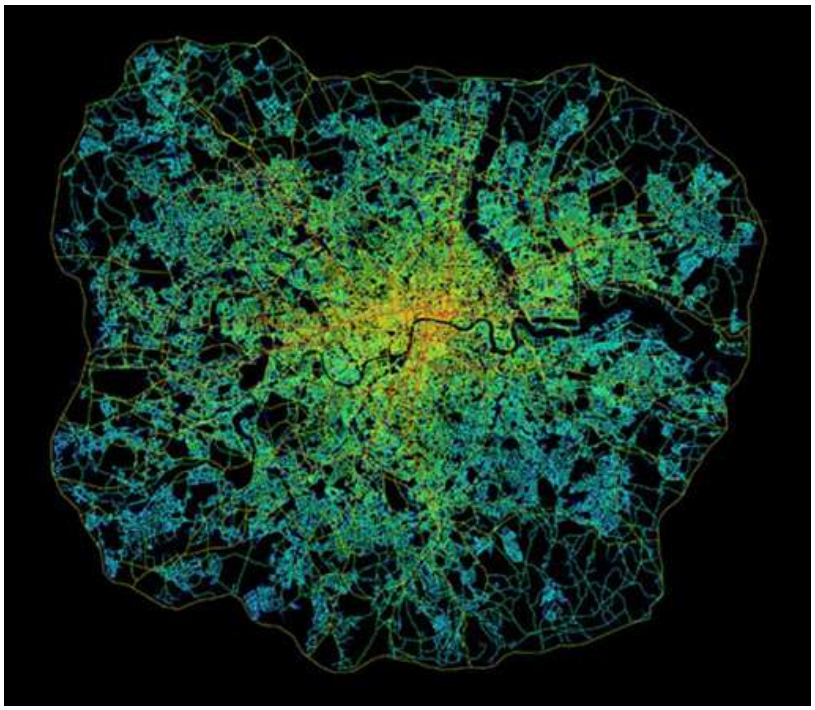

Figure 23: The space syntax model of London within the M25 (Source: Major, 2018).

2.4.2 The Configurational Approach

Hillier defines ‘spatial form’ as the arrangement of spaces, concerning its position in the structure of the entire configuration. Spatial analysis in axial and convex space mapping illustrates urban spaces as solids and voids; the solids are the buildings and existing physical structure, and voids correspond to the streets and open empty lands. Therefore, the axial and convex maps reflect user visibility within space. Space syntax is a relatively new perspective of architectural and urban analysis as it helps to measure the physical form of settlements in relation to user movement and economic attraction points. Based on this method, a series of illustrations are established to analyze existing spatial and proposed spatial configuration of Al Wakrah settlement.

In early days, space syntax modeled pedestrian movement patterns, while nowadays it includes morphological analysis, social connectivity, design solution proposals, and pre-design forensic study. Space syntax studies can result in integrated and effective solutions about social and economic aspects (Hillier and Vaughan, 2007). Space syntax approach discusses the outcome of an existing settlement or building from micro to macro scale. Space syntax defines three concepts as below: Axial lines are straight lines (sightline) that cumulatively result in the space syntax model (axial map) by the least set of axial lines covering the entire system (Major, 2018) (Safari et al., 2018). The axial line resembles the longest, most strategic line of vision and movement. On the other hand, a convex space is a space where all axial lines do not cross its border (Figure 25). The study develops an axial map of Al Wakrah settlement to use the space syntax model to measure the integration and connectivity attributes of the settlement.

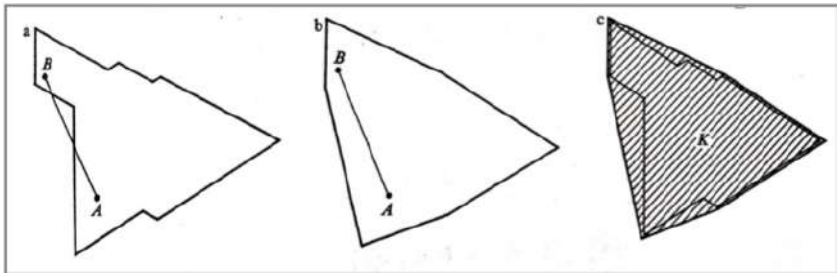

Figure 24: Convex shape (Source: Lionel March and Philip Steadman, 1971).

A visual field or isovist space is a volume of visibility from a given point, line of movement, or space (Major, 2018). These three concepts of visual representation are usually plan-based using the built environment as a constrain of visibility for the most generic of human uses such as movement, occupation, and visibility (Figure 26). The study applies some of these representational techniques to measure the accessibility and visibility of Souq Al Wakrah.

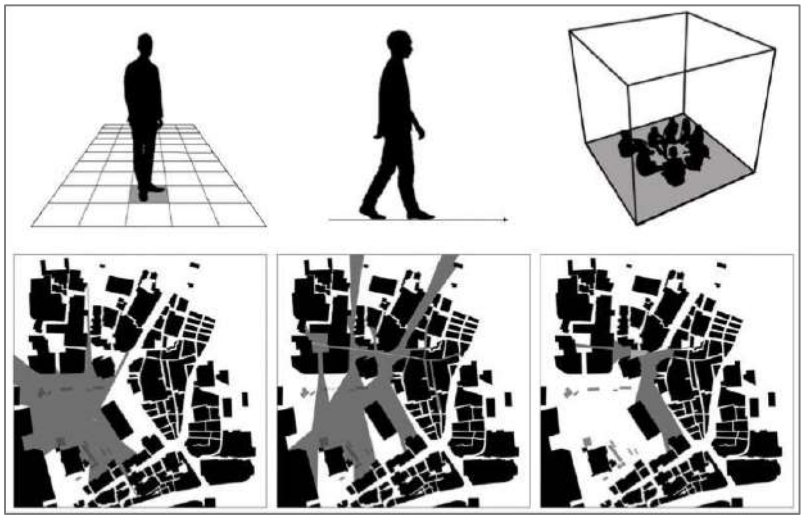

Figure 25: Representing (top) a point, line, and convexity (‘the quality or state of being convex’) in space syntax and (below) a visual field (in dark grey) from a point, line, and convex space (in light grey) in the plan of Souq Waqif in Doha, State of Qatar (Source: Major and Tannous, 2020).

The axial map consists of the least set of longest and fewest lines that cover the entire system of open spaces. In the case of large urban systems such as cities with well-defined streets spaces, the drawing of a convex map before drawing the axial map is usually not necessary. The procedure of generating an axial map can start by drawing the axial map based on the open space structure in a plan for the minimum set of lines essential to cover all the convex spaces as described by building facades (Major, 2018). The procedure for generating a space syntax model is (a) open space structure, (b) convex space map, and (c) the corresponding axial map is shown graphically in (Figure 27). This study applied the representational technique of at the axial map to complete the procedure for modeling space syntax model of Al Wakrah, starting with the figure ground and then developing the axial lines.

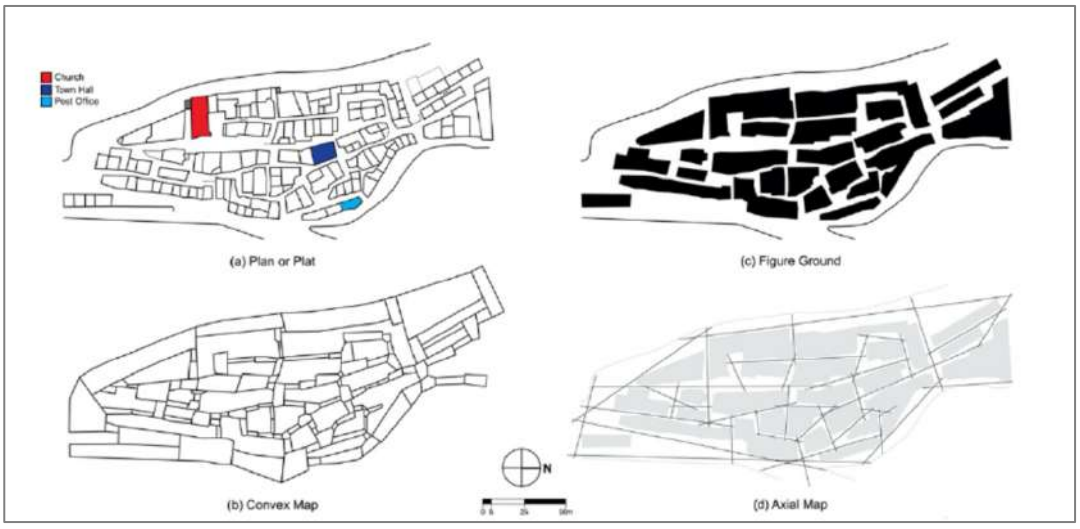

Figure 26: The procedure for modeling an axial map (Source: M. Major after Hillier & Hanson, 1984).

2.4.3 Topological Measures Used in Axial Analysis

Space syntax is an investigative tool to measure concepts such as Integration, Connectivity, Depth, and Choice. Integration is accessibility based on the number of

changes of direction as a measure of mean depth within the entire spatial network; a higher integration means higher accessibility and accordingly higher pedestrian flow. Spaces with higher integration levels tend to carry higher movement levels, which means the ease of accessibility, hence, a more significant potential to access different varieties of land use (Hillier, 1996; Hillier et al, 1993). Integration scale varies from local to global; global integration (R=n), while local integration measures up to three changes of direction (R=3) (Tannous, 2020).

Connectivity measures the connections of each axial line with other axial lines as immediate connections. The street that accumulatively carries a higher value of line intersections tends to also have a higher choice value (Major, 2018).

Depth is a fundamental concept in the quantitative analysis of space syntax. It measures the steps from a node to all other nodes in space syntax map (Tannous, 2020). The mean depth is measured based on connectivity; the number of areas connected directly to a specific space; “If you can move or see from one location, space, or street to another without accessing an intermediary one, they are connected” (Major, 2018). Syntactic maps are graphically and numerically represented by DepthMap software developed by Turner and others (Turner, 2001). The map represents the measurements in a range of colors from red to dark blue, with quantitative data tables of integration, choice and other measures based on configuration measures with depth being the most basic (Figure 28).

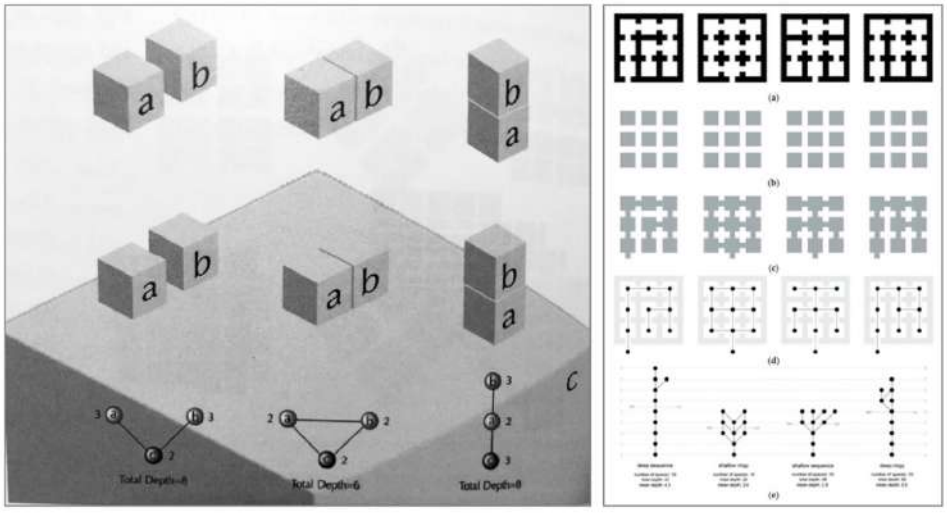

Figure 27: (left) The basics of configuration in space syntax (Source: M. Major 2018). (right) (a) floor plans, (b) formal composition, (c) spatial layout, (d) topological, and (e) justified topological graphs with mean depth (Source: Mark David Major after Julienne Hanson).

Global choice is defined as a dynamic flow for 'through movement' at a global scale in space. Some urban spaces have a high choice-value, while the other has low choice value. This is based on the number of available opportunities to reach a destination. Usually, the choice is represented by the short paths that are connected to the longer path, to ease the movement from origin to destination (Klarqvist, 1993).

2.6 Conclusion

This chapter represents the first stage of the research work. It contained a review of the literature of urban morphology, urban form, Islamic settlements, and literature about space syntax with definition and description of different school of thoughts, various approaches elements and forces related to the earlier subjects. This research focus on Souq Al Wakrah using many of these reviewed techniques in different contexts with

the geographic, social, cultural, and institutional background. We make a detailed explanation of the research design and adopted methodology in the next chapter.

CHAPTER 3: RESEARCH DESIGN

3.1 Chapter Introduction

This chapter focuses on the research design and the methodological approach for the analysis of Souq Al Wakrah Al Qadeem. The thesis embarks on the morphological study of Souq Al Wakrah achieved through the collection of primary and secondary data. The analysis in this thesis primarily follows a theoretical framework, based on different attributes which were highlighted by the literature review, to help in answering the research questions. The research methodology is summarized below. (Figure 29).

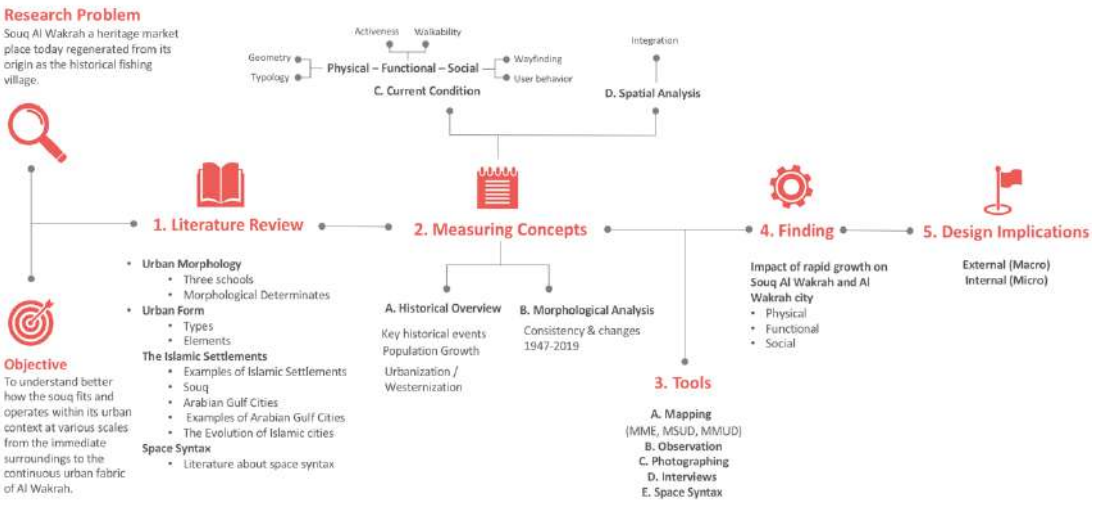

Figure 28: Summary of the research methodology of the thesis (Source: Author).

3.2 Research Methodology

The research design aims to build a solid foundation to understand and apply the scope, purpose, and exploration of different concepts from the literature review. The literature review helped in generating the theoretical framework for the research methodology outlined in this chapter. The review covered the world-wide literature on the aspects

of urban morphology and its different approaches, which emerged from the different schools of thought. The literature review offered an opportunity for an exploration of the urban form, its elements, and the types. Additionally, there was an exploration of diverse concepts and theories related to the Islamic city form and formation, and finally, the space syntax as a tool of a quantitative analysis.

After studying different concepts related to the subject of the thesis, the literature generated a theoretical framework as a basis for the study reviewed in this chapter. The measuring criteria emerged from the literature in relation to the research questions. The main subjects of the theoretical framework included the study of urban morphology, through understanding the evolution through time with respect to consistency and changes of the urban form and formation as a first part of the analysis. The analysis then moves to the current condition analysis of the souq based on different scales and three aspects - physical, functional, and social - in which each aspect contains indicators. The physical aspect studies the built environment through analyzing its geometry and typology, the functional aspect studies the activeness and walkability of the souq as a public space, and the social aspect examines users' behavior and wayfinding. The last aspect of the souq analysis is the spatial study by using space syntax as a design tool focusing on connectivity and integration of the souq in relation to Al Wakrah at the city level.

3.3 The Location and Timescale of the Research

This section identifies the place context and time of the study and how to collect the research data. This section of the research is principally concerned with Souq Al Wakrah Al Qadeem in Al Wakrah, but the leading role of this section is to start the analysis at a macro scale, and then zoom finally into the souq boundaries (Figure 30).

The study collected data in four parts: 1) historical overview, 2) morphological analysis, 3) current condition of the souq, and 4) spatial analysis.

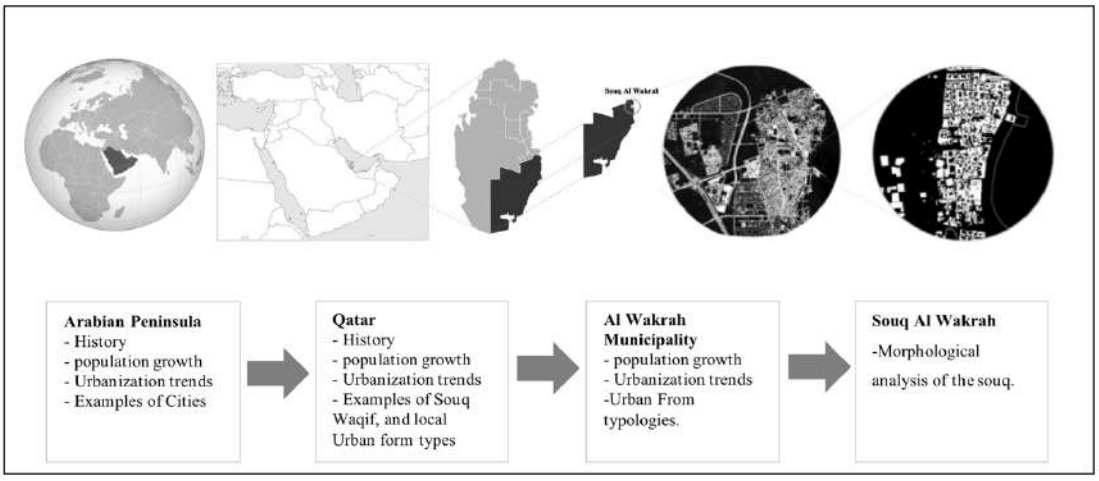

Figure 29: The process of the analysis from bigger scale to the souq (Source: Author after Khan, A., Major, M.D., 2021).

The study distinguishes the period for the analysis. The study covers the period from 1947-2019 due to two main reasons. First, this is the earliest map availability to visually compare and highlight the physical changes over time. The second reason is the huge influence of oil discovery period on the urbanization of Qatar as an exporting country. This section of the analysis starts with a historical overview of the region and discussing the key historical events, such as oil discovery and its economic impact, and the spread of western urbanization trends. The focus is on the transformations that have directly and indirectly influenced the formation and the transformation of GCC countries, in general, and Al Wakrah settlement, specifically.

3.4 The Variables and Sources

This part of the analysis highlights the key variables that the study will measure and undertake. The urban changes through time will be examined through different

elements of the urban form based on a set of comparable sequential maps starts from 1947-2019. The study focuses on the urban growth and the coastline changes, also studying the mosques consistency through time to highlight the importance of religious and cultural aspect to Al Wakrah citizens. Various aspects and elements highlighted in this section make up a qualitative approach based on historical maps. This section used only the historical sequential mapping technique as a primary tool in representing the data and its analysis, these maps concluded the theoretical description of various data in Souq Al Wakrah. These aerial photos were provided from the Ministries and Municipalities of Doha (MME, MSUD, MMUD). However, the area represented a confidentiality challenge, making it difficult to provide more detailed mapping of the area. Therefore, it was challenging to collect information about the historical urban fabric of the souqs. However, it was possible to collect general information about the original context through sequential historical aerial photos, which are utilized to help understand the evolution and story of the souqs based on discernible photographic evidence.

The study later aims to focus on the current souq situation relying on different concept and theories. The analysis of the souq is divided into three aspects: physical, functional, social. The physical aspect measures the built environment, through investigating the block pattern and size, the geometric logic of the souq, the typologies of the urban form elements. The functional aspect of the analysis covered the land use data of the souq in relation to the existing and current vacancies of the shops. The social aspect investigates the relation between the built environment and the user through diverse theories from the literature.

Finally, the research analyzes the city from spatial aspect, this part of the research identifies the connectivity and integration of the city. Space syntax can help

us to understand better the morphological characteristics of the souq to address a gap in our knowledge about Arabian cities. The space syntax model in this thesis was generated with two scales. One is the study areas of the souq within the city boundaries and network, and the other within its more immediate urban context, the souq itself.

3.5 Research Methods and Tools

The graphical representation of the data is classified into mapping, photographing, observation, interviews, and space syntax. The official maps of Souq Al Wakrah were confidential and the Ministries and Municipalities of Doha (MME, MSUD, MMUD) helped in providing the general layout of the souq. Therefore, it was challenging to collect some data. However, the mapping of the souq was done by the author. These maps were double-checked through site visits. Since there is a shortage of historically detailed maps and plans for the souq, it was necessary to undertake this fieldwork. The methodology contained a survey of existing physical conditions (footprint, number of shops, and figure-ground).

The research began with morphological analysis and transformation of old Al Wakrah, based on the historical maps. Data collection involved systematically checking Google Earth/Maps and aerial photographs (including images from 1947 to the present day) that were provided by MME. To analyze the current condition of the souq, multiple site visits to Souq Al Wakrah occurred in different periods from the end of 2019 till 2020, to produce block-based figure-ground representations, at the scale of one square kilometer and using satellite image to produce figure-ground representations at a scale of two square kilometers.

The second part of the analysis focuses more on the analysis of the urban from at one square kilometer scale in the present day. The study applies the figure-ground

map as a source of research inquiry for analyzing the souqs. The drive of the figure-ground is to exemplify urban form and space using *poche* method, scale comparisons, edge definition, texture analysis, and pattern recognition.

Multiple visits to Souq Al Wakrah occurred during different months, weeks, days, and hours, to produce qualified data on which the research can rely. Observations was used to understand the functions, user behavior, and life in the souq specifically for social aspect of the site. The main spine "promenade" of Souq Al Wakrah was observed for behavioral mapping during the busiest day of the week and busiest time of day. A pilot study was done during three various times to select the busiest time for behavioral observation. Continuous observation of the souq aimed to identify problems and potentials for the public life on a given route. Behavioral mapping about user movement assists in understanding and analyzing public life (Gehl & Svarre, 2013).

Photography is also important in providing a visual aid for communication and an analytical tool for capturing certain moments for later documentation, especially in public spaces. Finally, the use of space syntax theory is useful to clearly illustrate, quantify, and understand the morphological conditions arising out of the historical evolution of the souq. Space syntax tools measured integration, and choice, respectively. Several models were constructed; however, only the most relevant models at a particular scale are shown in this thesis. The author utilized the software program DepthMapX- 0.5 for processing the space syntax model.

3.6 Analyzing the Data

The latter stages of this thesis discuss the key finding to highlight what are the potential problems and their solutions might be for the area. This discussion answers the

research questions through the explanation of the findings from morphological analysis of the souq, the relation between the form and the function of the souq to its surroundings, the impact of re-creating the fishing village into heritage marketplace, and finally highlighting the potentials to improve the built environment in the future.

The issues and recommendations proposals are highlighted and graphically represented for a better reflection of the results. The last part of the thesis targets a futuristic vision of the area as a landing stage for a whole journey. A holistic proposal of the urban form of the area is recommended at the end of the thesis to provide an enhanced built environment and urban experience, which is validated through using space syntax model as a design tool for the proposed urban form.

3.7 Conclusion of Chapter Three

This chapter defined the research design and the methodological approach of the analysis of Souq Al Wakrah Al Qadeem. The methodology defined the location and the timescale of the research in this chapter, followed by the explanation of the variables and sourcing data. This chapter also highlighted the tools used in the research to measure the variables and draw conclusions. These conclusions will further highlight key findings to identify issues to provide design recommendations. The chapter summarized the method, which used to help find the answers to the research questions of the thesis.

CHAPTER 4: DATA ANALYSIS AND FINDINGS

4.1 Chapter Introduction

This chapter is divided into four parts: 1) study of the context through historical overview, 2) morphological analysis, 3) current condition of the souq, and 4) the spatial analysis (Figure 31). This chapter starts with an examination of the holistic issues of going from the general to the specific.

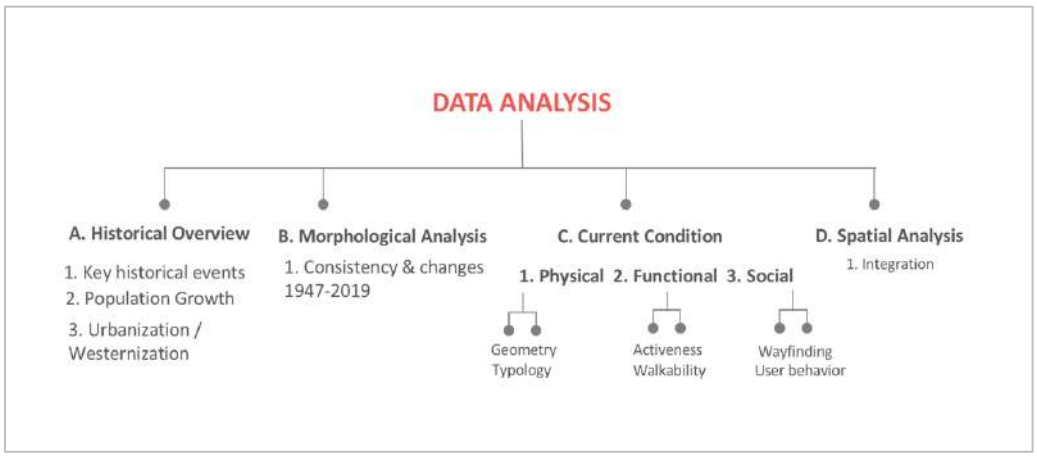

Figure 30: Diagram summarizing the structure of this chapter.

4.2 Part A: Historical Overview

Based on Morris' statement, the characteristic of an urban form at any given period is an outcome of different locally influential factors, which we explained in detail in Chapter Two.

The case study of the research "Souq Al Wakrah Al Qadeem" is in the state of Qatar. The state of Qatar is located geographically in the Arabian Peninsula and is one of a set of several other countries including Kuwait, Oman, Saudi Arabia, the United Arab Emirates (UAE) of the Gulf Cooperation Countries (GCC) region (Geopolitics of the World System, 2003). Historically, the harsh climate strongly influenced the

establishment of settlements in the pre-Islamic Arabian Peninsula, thus, substantial historical settlements exist in the Arabian Peninsula, such as Mecca and Medina, located in the Hejaz in the west of the peninsula.

Historically, the Arabian Peninsula is noted for a high population growth rate due to both strong inflows of migrant labour and sustained high birth rates (see Table 1). Presented below is the Arabian Peninsula's estimated population change, informed by selecting the sum of four smallest GCC states, UAE, Bahrain, Qatar, Kuwait, starting from 1950 to 2018.

Table 1: Population of 4 smallest (in area) GCC states with entire coastline in Persian Gulf: UAE, Bahrain, Qatar, Kuwait (Sources: 1950- 2000 census.gov, 2015/2000–2014 and Asia: Population Statistics).

Historical population (Gulf 4)		
Year	Pop.	±%
1950	356,235	—
1970	1,329,168	+273.1%
1990	4,896,491	+268.4%
2010	11,457,000	+134.0%
2014	17,086,000	+49.1%
2018	18,675,440	+9.3%

The first demographic records were conducted in 1892; the total population stated in 1892 was 9,830 (Kursun, Zekeriya, 2004). In contrast, in 1970, at the time of the first census, the population was 111,133 (Qatar Statistics Authority) (see Table 2). Later, the dynamic population growth caused Qatari nationals to be less than 15% of the total population, of whom 85% are resident non-citizens (Qatar Statistics

Authority). Qatar represents one of the most fast-growing countries; the dynamic population growth relies heavily on migrant labour (Figure 32). Qatar Statistical Authority released the projection of Qatar's total population that could reach up to 2.8 million by 2020.

Table 2: Population of Qatar from 1950-2019 (Sources: Qatar Statistics Authority, World Population prospects).

Historical population (Qatar)		
Year	Pop.	±%
1950	25,000	—
1960	47,000	+88.0%
1970	110,000	+134.0%
1980	224,000	+103.6%
1990	476,000	+112.5%
2000	592,000	+24.4%
2010	1,856,000	+213.5%
2019	2,832,000	+52.6%

The growing numbers of Qatar's population not only affected the capital Doha (Figure 34), but it also strongly affected the surrounding settlements in its time of growth and expansion. As mentioned before, most of the villages were abandoned because of the migration of citizens for a better lifestyle, such as the fishing and pearling village in the far north side of Al Shamal area. In contrast, some villages e grew unhealthily with shifting city centers and extensive urban sprawl. One example of which is the old core of Al Wakrah, known today as Souq Al Wakrah Al Qadeem.

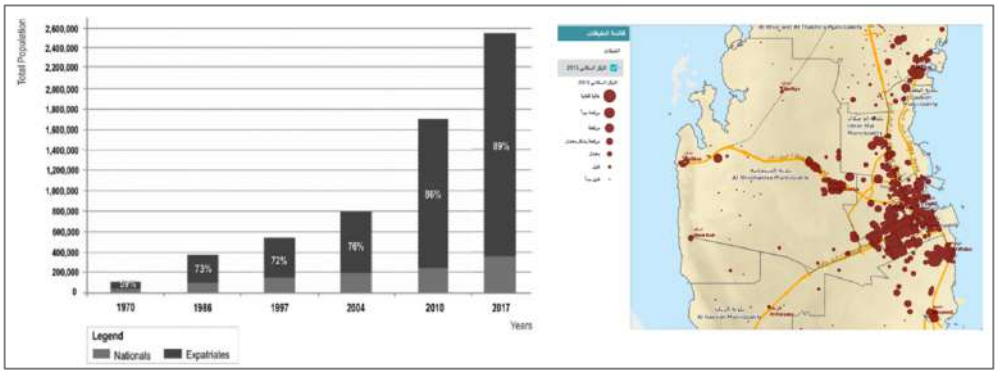

Figure 31: Population growth in Qatar based on: (left) years (Source: Bel-Air, 2017; Snoj, 2017), (right) urban development (Source: Qatar Ministry of Development Planning and Statistics).

Al Wakrah (or Al Wakra, الوكرة in Arabic) is originally from the word *wakar* which means "bird's nest" in Arabic. The old core of Al Wakrah was the original small fishing and pearling village. The municipality of Al Wakrah covers an area of 120/km^2 (300 mi^2) of southeast Qatar today. Historically, evidence of human habitation in the area dates back in time to be the first urban center of Qatar (Jaidah & Bourennane, 2010). By 1920, there were ~300 ships situated in the town based on information from the United States Hydrographic Office. Presently, it is second-largest city in the country because its high urbanization and population growth, which was estimated in 2015 to be 88,000 people (Source: Qatar Ministry of Development Planning and Statistics) (Table 3).

Table 3: Population of AL Wakrah from 1986-2015: (Sources: 1986-2010 Qatar Statistics Authority/2015 World Population Prospects).

Historical population (Al Wakrah)		
Year	Pop.	±%
1986	17,245	—
1997	24,283	+40.8%
2004	31,441	+29.5%
2010	79,457	+152.7%
2015	87,970	+10.7%

In the 20th-century, industrialization brought many transformations to older Arabian Peninsula settlements. Most of these transformations followed the Western style of generating urban forms such as in Europe and the United States. The most distinctive characteristic of such changes was traffic management due to the urbanization of the physical transformation of Arab cities, such as the case of Dubai, Mecca in Saudi Arabia and Doha in Qatar (Figure 33). In general, these changes resulted from economic growth, industrial modernization, and rapid urbanization trends in the Arabian Peninsula.

Figure 32: (left) Aerial view of before and after, Dubai (Source: Inga Korolkovaite, 2017) (center) before and after at West Bay of Qatar (Source: Qatar Museums), and (right) before and after in Mecca, Saudi Arabia (Source: Ahmad Husain. 2018).

Qatar faced remarkable urban growth in the last few decades. Beginning at the end of 1940s, the country transformed from a small pearling and fishing community into the country with highest GDP per capita in the world by 2013, and this growth was clearly visible in urban and industrial development (Gritchting, 2013). After World War 2, the revenues made from the oil exportation were invested in the country's infrastructure, and modernizing its services and facilities (Wiedmann, Salama, & Thiestein, 2012). Qatar's most noticeable transformation of its urban form occurred in three stages across different times associated with the pre-oil era, oil discovery, and post-oil eras. The urban form of the pre-oil period was strongly influenced by the needs of citizens since the sea was the source of food and (via aquifer wells) water. Also, with Qatar being an Islamic country, its urban form incorporated religious regulations. Considerations were made to build for minimum heights, linearly linked shops, courtyard houses, and a Friday Mosque, which worked as a central landmark and a public space for social gathering. After the first discovery of oil in the

1940s, Qatar started its oil exportation in 1960s to 1970s. The revenues from oil exportation drove economic growth, which resulted in many job opportunities and population growth. The capital city Doha witnessed a stark transformation after the discovery of oil (Alraouf & Alnuaimi, 2018). This period represented the turning point of the Qatari urban transformation from traditional coastal settings to wealthy oil-exporting cities. Later, Qatar started the procedure of economic diversification in the post-oil period, focusing on education, financial service trading, sporting activities, recreation, and tourism (Al-Marri, 2017). This was the second turning point in Qatar's history, which had implications for urban transformations from a wealthy high-rise skyline to preservation projects for cultural and historical sites (Figure 34).

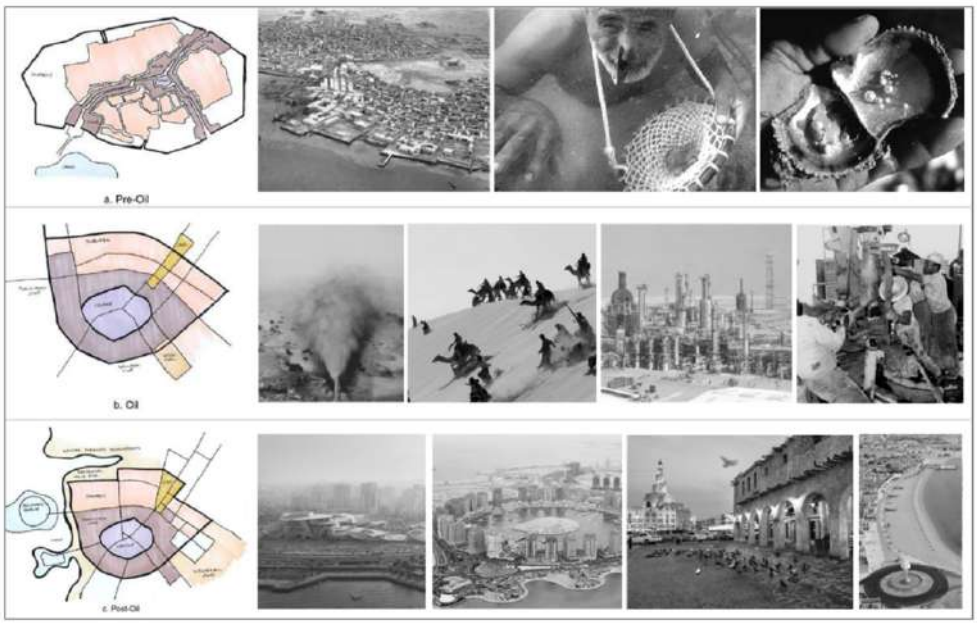

Figure 33: Representative sketches of the urban form in relation to images that represents the era (Images Source: MME, Qatar Marine.net, Ahmed Fakhroo/ Drawing Source: Drawing by Tannous, 2020 after Salama and Wiedmann, 2013).

Souq Waqif is the best example of a preserved heritage site in Qatar and became a model for future preservation and renovation projects (Radoine, 2010; Alraouf, 2012). It dates to the 19th century with a form that is a combination of connected shops and private homes, originally characterized by single-story traditional courtyard houses (Jaidah & Bourennane, 2010; Al-Mohannadi et al., 2019) (Figure 35). In the late 20th century, Souq Waqif began to fade as citizens moved to contemporary villas located in new suburban residential areas and souqs were replaced by large modern shopping malls. In the early 21st century, the Qatari royal family acknowledged the cultural significance of the traditional marketplace and funded the 2004-2008 restoration project after a fire destroyed several buildings in Souq Waqif (Salama & Wiedmann, 2013). The preservation project involved maintaining the oldest buildings, elimination of all buildings built after 1950, and removing most surface parking areas, shifting them to underground parking. It also included the preservation of local Qatari architectural style, which is characterized by using traditional methods of construction during the early 20th century that is reflective of the cultural heritage origins of Doha. A series of pedestrian paths, including narrow alleyways, separate these buildings and acts as the social souq area where all the shops' frontages are allocated, thus, replicating the traditional *sikka* morphology (Tannous, 2020).

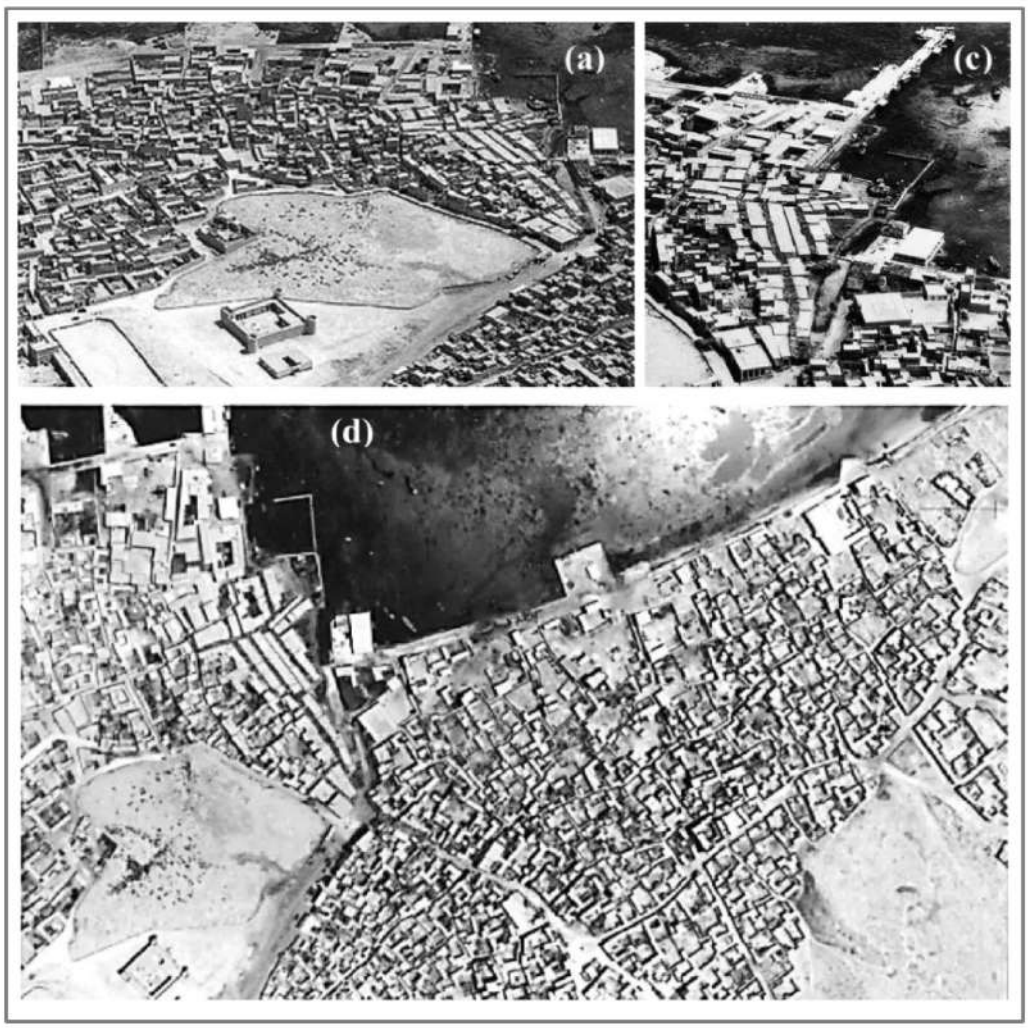

Figure 34: (a) An aerial photograph of the center of Doha (b) The jetty on the coast; and (c) aerial view of Doha in 1952 (Source: Qatar Museums).

Subsequently, other valuable historic sites in the country were identified by Qatar's government for the goal of preservation and renovation, one of which was the location of the old core in Al Wakrah. Al Wakrah was initially a small pearling and fishing village dating back to the early 20th century. Like the case of Doha, the establishment of old core of Al Wakrah formed adjacent to the coast for trade and commerce. The small village was characterized by its unique formation of linear vernacular urban fabric (Figure 36). However, after the oil discovery, most of Al Wakrah citizens shifted to contemporary villas, resulting in a different urban form of

the new established Al Wakrah on the opposite side of the original settlement. However, some citizens migrated north to the capital city of Doha in search for job opportunities and a better lifestyle. Thus, in the late 1990s, the historic fishing village became abandoned with several historic buildings the subject of demolition. Accordingly, the reconstruction project of the area established by MME and the development plan for Al Wakrah was announced in 2008. The plan was a turning point that aimed to preserve the cultural identity of Al Wakrah. The plan was to reconstruct the old traces and routes and re-plan those which had faded out with time based on the old maps available of Al Wakrah. The most important aim of the plan was to re-establish the connection between the sea and land and design an active beach reflecting the village's original urban fabric. The main goal of the project was to reconstruct a new district based on the old core of Al Wakra into a traditional marketplace known today as Souq Al Wakrah Al Qadeem.

Figure 35: Al Wakrah Village, Qatar in the (left) 1950s Al Wakrah Fort visible in the background and (right) 1960s with two mosques (Source: MME).

4.3 Part B: Morphological Analysis Period (1947-2019)

This part of the analysis focuses on the morphological transformations based on a set of comparable sequential maps, to understand the consistency and the transformation of Al Wakrah through time. Figure 37 shows the sequential transformation of Al Wakrah settlement over time. At the beginning of 1950s, the settlement reached a peak in growth by the occupation of the citizens of most of the buildings. The turning point of Al Wakrah started with the mass exportation of oil between the 1960s and 1970s, which can be noticed clearly in 1966 map (Figure 37). The migration of citizens provoked building demolition, specifically in the center part of the old core. However, the traces of buildings covered the majority area of the middle part, which can be noticed in the map of 1980 like all the middle and southern area of the old core in 1980 (Figure 37). After urbanization and economic growth, heritage identity became a priority in preserving historical traces of the traditional urban fabric. Therefore, in 2008 the old core of Al Wakrah was reconstructed based on the residential courtyard house typology and its conversion to retail units. This technique was implemented to evoke the *genus loci* (or 'spirit of place') characterizing the original streets and buildings of the settlement.

The reconstruction of the new souq became embedded within courtyard house typology, transforming from domestic rooms to 800 retail units selling traditional crafts and wholesale goods, and several restaurants, all clustered together based on retail type. These clusters are connected to ease cross-circulation and user movement, with the architectural style of buildings reflecting the local Qatari tradition of a fishing village with low-rise buildings. The development plan incorporated traditional building construction techniques. Souq Al Wakrah today expands along the coast in north-south fashion covering an area of ~0.31 square kilometers (76 acres or 'ac'). One

of the most significant historical attributes of Al Wakrah was the connection between the sea and the land, which physically reflects the connection between built environment generated by human and the sea. Socially, the coast reflects the story of the past, showing who lived there and the way they lived. Al Wakrah coastal promenade became a prominent feature of the reconstructed plan.

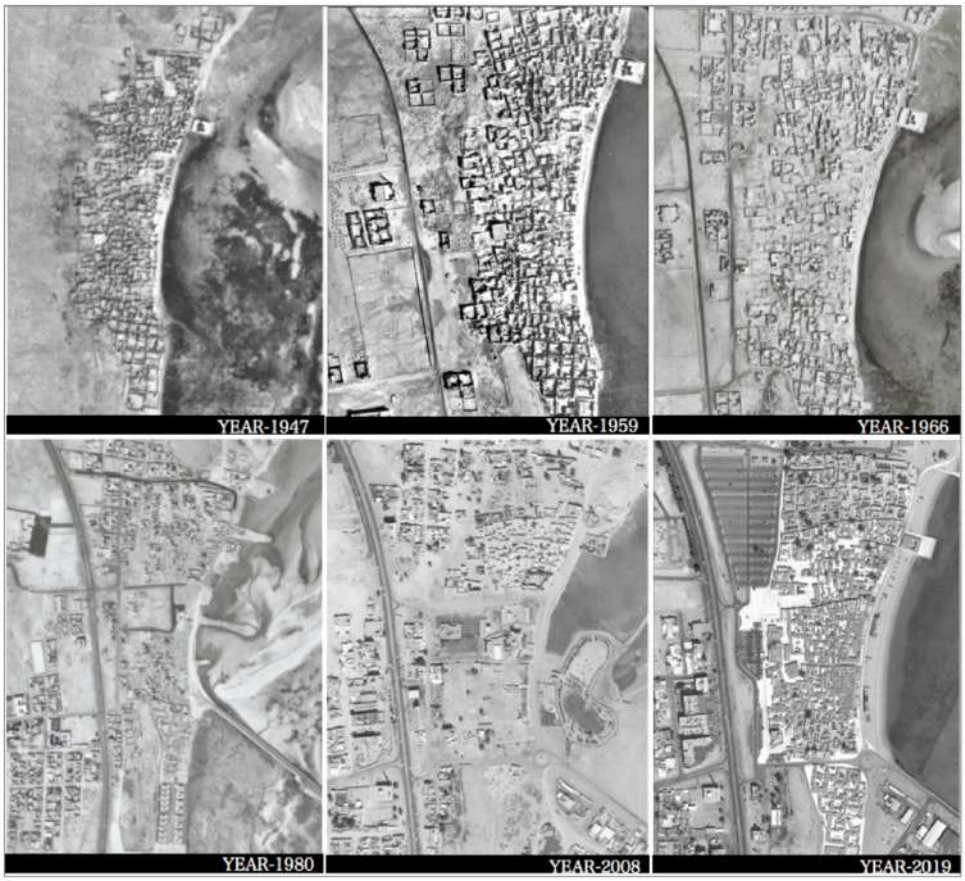

Figure 36: Aerial views of Al Wakrah in (top, left to right) 1947, 1959, 1966, and (bottom, left to right) 1980, 2008, 2019 (Source: MME).

The morphological study of Souq Al Wakrah shows main two comparable aspects in the site, 1) the coastal morphology and 2) urbanization of the old core of Al Wakrah. The historical aerial imagery highlights variations in the geographic location of the shoreline from 1947 to 2019 (Figure 38). The shoreline shows consistency in its

curvy linear shape till the late 1960s, considering the variation in the scale of presented maps. However, a dramatic change occurs during the 1970s in shortening the sea and increase inland. In this period, the coastline changed its geographical configuration. These changes continued till the establishment of the new masterplan in 2008. Furthermore, with the new master plan the office of Private Engineering Office (PEO) aimed to bring back the connection between the sea and land. As a result, the shoreline was redesigned to approximate its original shape as showed in the earlier aerial maps. However, the southern part of the coast was maintained due to the existing extension of the old port. Today, the promenade follows gentle linear curve, this spine length reaches up to 1 km in length and connects the souq spaces through smaller perpendicular routes.

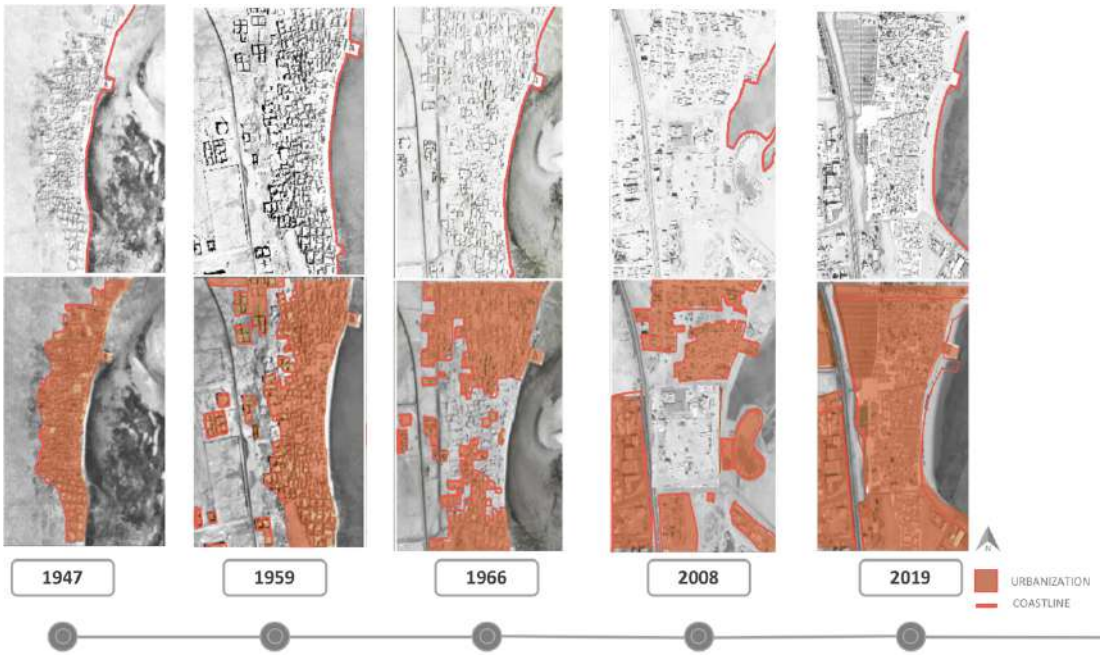

Figure 37: Aerial views of Al Wakrah showing coastline and built environment border transformation (Source: MME, edited by Author).

Aerial images of Al Wakrah tell the story of the dynamics of the settlement. The urban form started linearly, densely and continued with fragmentation and pixilation by detachment from its expanded urban fabric. Later, the plan reconstructed a new urban fabric based on the traditional urban fabric of the original fishing village. However, there are still voids which exist due to the demand of the modern transportation planning. The fragmentation of the urban fabric of Al Wakrah resulted from rural-urban migration of the citizens and modernization, which caused an abandonment of the village and shifted the center of Al Wakrah to the opposite side of the city. Between the aerial photo 1946 and 1959, the introduction of the vehicular roads limited urban growth to the west of the original fishing village. The approximate distance of the urban area in 1947 reached 0.35 km. sq., and the city continued to grow, reaching 0.48 km. sq. However, the urban city core started to slightly decline, back to 0.41 km. sq. and later in 2008 the urban limitation declined due to the demolishing of most buildings for the purpose of rebuilding the area. Later after the project completion, the old core's urban edge reached 0.8 km. sq. The calculation of the old core was based on the area framed in the series of the aerial photos colored with brown. This area calculation did not consider the urban footprints outside the aerial map frame.

During the changes to the old core, mosques stayed consistent over time. At the same time, most of these mosques were demolished for the purpose of the souq reconstruction. The masterplan of Souq Al Wakrah highlighted the importance of the social-cultural and religious aspect, through their preservation of the exact location and form of the previous mosques (Figure 39).

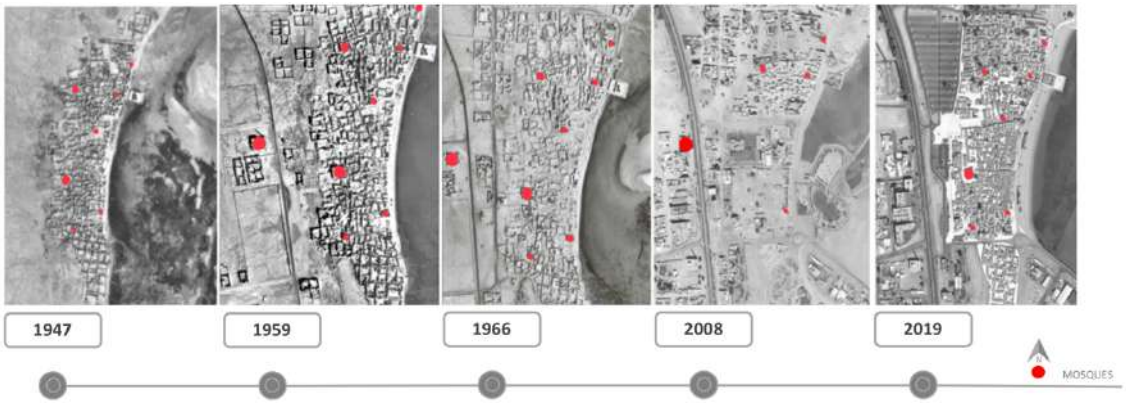

Figure 38: Aerial views of Al Wakrah showing Mosques location over time (Source: MME, edited by Author).

Historically, streets are essential elements to define the traditional urban fabric of settlements, such as Qatari ones like Doha and Al Wakrah (Khan et al., 2020). The importance of streets and street hierarchy are illustrated in the sequential map of Al Wakrah settlement over time. It is apparent in the tendency for some streets to become more expansive and, geometrically, several streets became straighter. The changing urban form of Al Wakrah through time highlights street formation as most used spines and connection by citizens back in the past. A simple parallel and perpendicular forms of streets show the strong relation to coastline of Al Wakrah. It highlights two principal routes running adjacent to the coastline in yellow, while the 5-6 principal routes running perpendicular to the coast in red (Figure 40).

Another significant feature is the ground-level highway running parallel and immediately adjacent to the souq consistent over time (today's Al Wakrah Road). The street formation and its orientation towards the souq highlights the significance of the heritage area from its establishment until the present day. Figure 40 shows, during the 1980s, the modern transportation planning and human modification influenced both parallel spines by becoming much straighter. Morphologically, the sea and the land

connection persist as an important historical attribute of Al Wakrah. The creation of the Al Wakrah coastal promenade as a prominent feature of the development plan in the early 21st century was strongly influenced by this attribute.

Figure 39: Aerial views of Al Wakrah showing main & secondary streets in (Source: MME–Edited by Author).

4.4 Part C: Current Condition

To understand Al Wakrah internal relations and the external relation to the surroundings, it is useful to examine the figure-ground representational technique. The figure-ground representations of Al Wakrah and its surrounding context for an area of 2 km^2 with the souq's formal boundaries today are highlighted in red (Figure 41, left). The figure-ground clearly shows the different urban form typologies based on different

urban patterns. The urban blocks' configuration highlights many free-standing buildings such as the historical forts, the reconstructed souq, several mosques, and schools. Also, today's formation is mostly based on the contemporary residential villa's typology. These contemporary residential villas are designed in the middle of a huge yard surrounded by a compound fence around all the sides (Al-Mohannadi et al., 2019). Similarly, the single villa units follow a comparable design, yet with smaller private yard. This new style of contemporary villas imposed on the traditional urban form of Al Wakrah. As a result, a physical and visual gap seems generated between the modern contemporary urban form and the reconstructed souq area.

Figure 40: The Urban block vs. Building foot prints representation of Souq Al Wakrah for area of 2 km^2 with the souq boundaries highlighted in red (Source: Author).

The urban form of Souq Al Wakrah expands along the coast in north-south fashion with an area of ~0.31 km^2 (76 acres or 'ac'). Figure 42 represents 2 km^2 area of the souq area, showing the study area of the souq highlighted in red. At the same

time, the northern and southern parts are not open yet or remain mostly vacant (in the south). The northern extension areas of Souq Al Wakrah contain a park, large children playground and vacant retail units, and in the south, large wholesale goods and services, mostly related with boating, and most importantly, the horse stable. The souq's block pattern in the northern area is also composed of peripheral older buildings pending demolition or reconstruction. The east edge of Souq Al Wakrah offsets relative to the coast resulting a smooth curve form generating a homogenous connection between the sea and land (Figure 42, right).

Figure 41: The figure ground representation of Souq Al Wakrah (left) 2 km^2 with the analysis boundaries of the souq highlighted in red (right) 1 km^2 with the central portion of the souq highlight in red (Source: Author).

The souq is divided into several zones, while the selected area of the souq is divided into six zones (Figure 43, left). These areas are divided based on thematic land use zones concept; each zone contains different types of retailers selling similar types of goods. Since the souq was initially a fishing village, the morphology of the souq is

based on the courtyard house typology. A satellite image provides a clearer picture of the courtyard house typology in the souq (Figure 43, right).

The routes in Souq Al Wakrah are reconstructed based on the historical precedent of the street pattern of the original fishing village, as evidenced by available aerial imagery. The central spines parallel to the coast are connected by perpendicular routes acting as east-west connecter. These are five relativity clear straight streets are slightly wider than the narrow *sikkas*. There is many pedestrian *sikka* joining the secondary perpendicular routes, ending up with a traditional type of labyrinthine urban fabric. Yet, the formation of the souq streets results in easiness in wayfinding, especially for visitors targeting the coast because all principal streets run toward the beach.

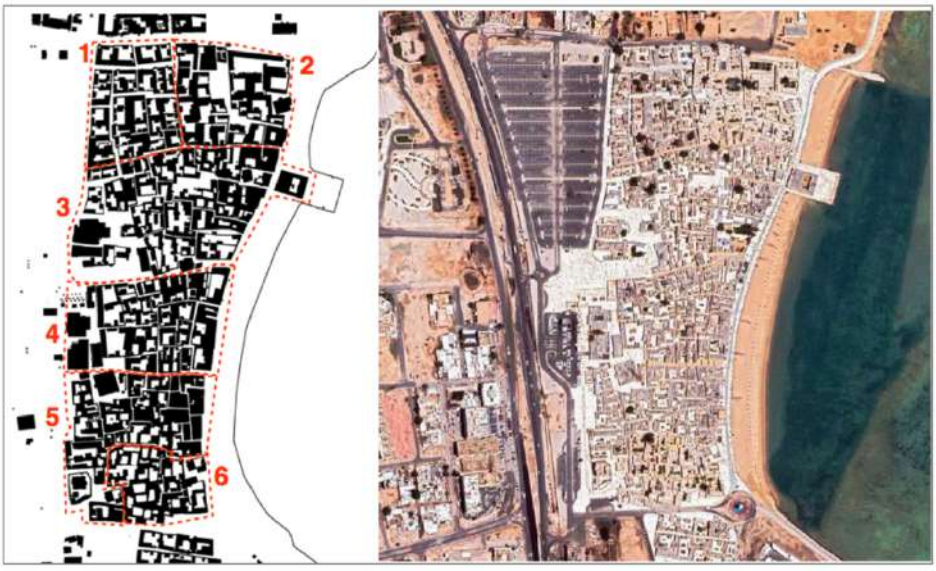

Figure 42: (left) Building foot prints of the souq with zones highlighted in red (Source: Author) and (right) Satellite view of Souq Al Wakrah from 1 km^2 in 2020 (Source: Google Earth/Maxar Technologies).

However, image clarity, especially working outward from the courtyards, may have slight missed or added to the exact situation's accuracy for the building footprints. The attached houses, including the internal courtyard spaces, become part of the larger block pattern and, thus, the first look at the figure-ground gives a deceptive impression of the block size of the souq area. Figure 44 demonstrate the light and dense urban from of Souq Al Wakrah through identifying the main three layers of the figure ground representation: the urban blocks with comparison by extraction of the courtyard to show building footprints and courtyards as separate. (Figure 44).

Figure 43: The urban form layers of Souq Al Wakrah (left) urban blocks, (center) Houses extracted courtyards, (right) Courtyards only (Source: Author).

The physical formations of Islamic settlements are influenced by different natural and human-made factors that results in different forms. Hillier (1999b) argues that a strongly consistent geometric logic characterizes the axial structure of organic settlements. These settlements tend to appear naturally or organically based on the

local influence of residents following simple rules of aggregation (Hiller & Hanson, 1984; Major, 2018; Major et al., 2019). This geometric logic of such settlements is based on open-angle connections in their axial structure within 15˚ of a direct 180˚ continuation, while near right-angle connections within about 15˚ of 90˚ offering access to separate dwellings in a residential area (Hillier, 1999b). Primary paths tend to cater to non-residential land uses like retail and civic purposes and secondary ones provide access to (usually residential) lots. This logic is followed by the central spine of Souq Al Wakrah in relation to the coastline (Figure 45).

The souq's main spine is composed of long lines of movement linked via open angles with lines of variable length connecting to the spine at a right or near right angle. These perpendicular lines emphasize the strong historical connection to the coast. Generally, the effect of these diverse typologies of angles creates a pseudo parallel-perpendicular geometric logic in the older areas of the Al Wakrah settlement. Whereas the settlement lacks only the regular grid adherence to complete the right angles that exist in other settlements of the other parts of the world, especially the USA and continental Europe (Major, 2018). However, the southern part of the souq is the only place that does not maintain this grid logic where there is a 45˚ linkage formed due to modern planning transportation demands. Additionally, more highly connected routes associated with longer and wider streets offer stronger visual filed between the coast and the parking area, and the areas surrounding the souq from north, south, and west.

Figure 44: Main spine of Souq Al Wakrah along the coast (Source: Author).

Next, the analysis concentrates on the typological study of the plazas of the souq. Plazas are mainly defined in the urban from of Souq Al Wakrah as the public wide-open spaces generated by the intersection of streets. As shown in Figure 46, the analysis shows different typologies of plazas. As mentioned by Krier, and discussed in the literature, the plazas are defined by the number of streets intersecting these squares in relation to their location. Plazas in souq Al Wakrah are categorized into six types (A, B, C, D, E, and F), each represents a unique case by the number of streets intersecting the squares and their location of intersecting. Although, G square is the only case in the souq. It is a result of a sequential of plazas joined together and connected in some portions by truly short streets.

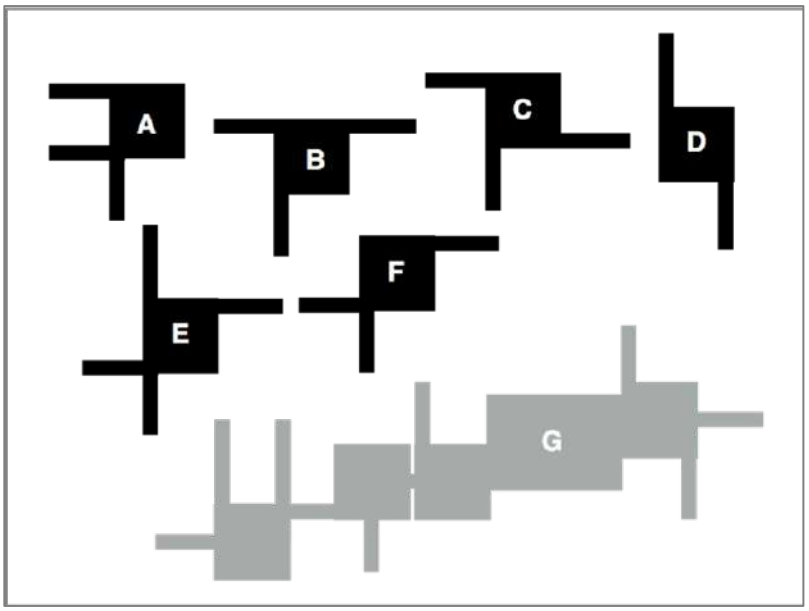

Figure 45: Plaza's type and typology of Souq Al Wakrah (Source: Author).

Streets are important urban public areas that mirror the livability of the urban space. The streets of Souq Al Wakrah are traces of the old urban form of the village. The mapping of the souq appears to show the potential for a dynamic urban place. Figure 47 shows streets typology to be classified into three types, the main and secondary spine interconnected by a series of narrow streets allowing for readability and ease of use of the space by people. The street form and livability variation within the souq, giving a sense of their location within the whole. The main spine is a collection of different activities with wide walkways and the openness of the space to let people to walk, play, and have different types of seating. The secondary perpendicular streets of the souq have limited boundaries by the building elevation on both sides, these streets direct and ease the flow of people to the promenade. However, the narrow streets stitch the rest of the souq together to ease cross-circulation and generate the old spirit of the original fishing village.

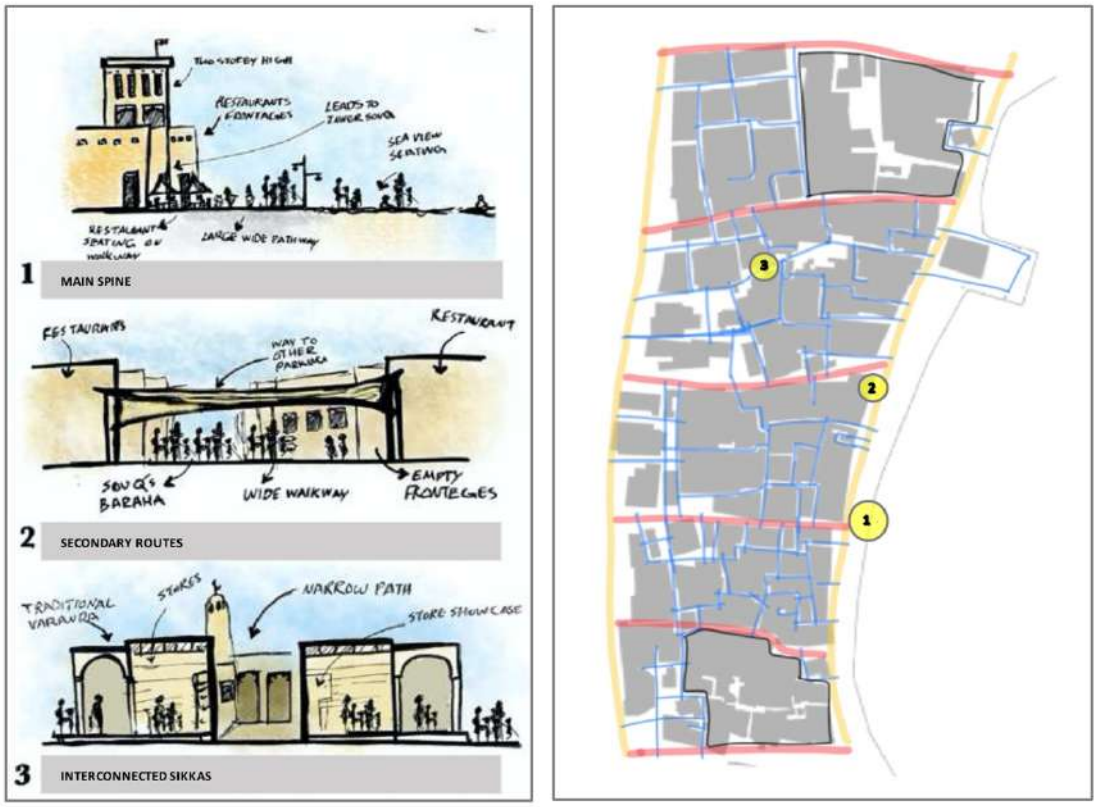

Figure 46: Street's type and typology of Souq Al Wakrah (Source: Author).

Buildings as an element of urban form are divided into two types; a unique type or a landmark, while the other type is classified as a regular repetitive or ordinary, building (Saber, 2016). Buildings within the souq determined the courtyard houses as regular buildings and mosques as landmarks. The regular buildings of the urban form of the souq were classified by the presence of courtyards (Figure 48).

Courtyards are a result of a climatic and ecological need in central hot and dry areas in Qatar and reflective of the traditions in Islamic societies. The bigger courtyards usually have a central greenery area where the presence of these trees is obligatory for shading purposes. The courtyards classified based on the position of courtyards regarding the room's arrangement. The main difference between these three typologies is the courtyard closure and openness. The fully closed courtyards typology is characterized by regular rectangular or square shape. The partial open sides typology

is characterized by scattered distribution of spaces around the courtyard, that resulted irregular courtyard shape. The fully open one side typology is characterized by the courtyard shape being irregularly formed and a continuous opened on one or more sides of courtyard (Figure 48).

The reconstruction of the Al Wakrah fishing village into contemporary souq changed the courtyard into joint space for retail units. Historically, these courtyards acted as family gathering space but today are a shared collective space for the retail units.

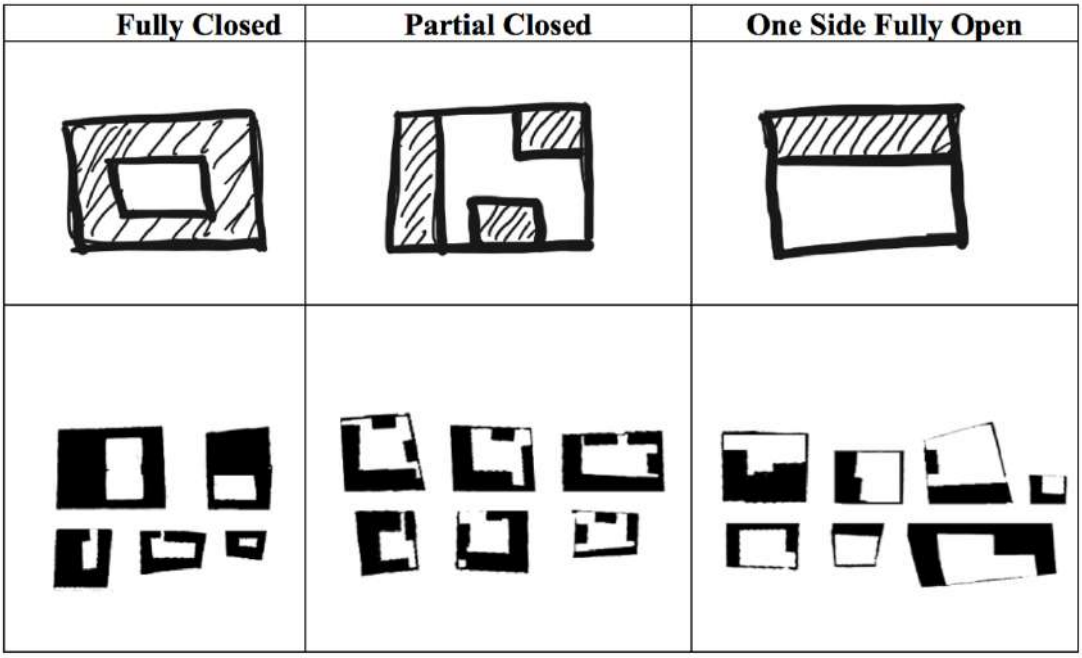

Figure 47: Typology of houses with courtyard based on courtyard position (Source: Author).

The land use of Al Wakrah settlement shows the overall current land use plan (Figure 49). The residential areas and empty lands cover most of the area within Al Wakrah city. The scattered mixed-use area, highlighted with pink, can be found mostly in Al Wakrah main road, since both sides of the road are mixed-use buildings. While

the old core of Al Wakrah highlighted in brown drags the main road of Al Wakrah to force it to run parallel to the souq area and generates centrality in relation to the whole settlement.

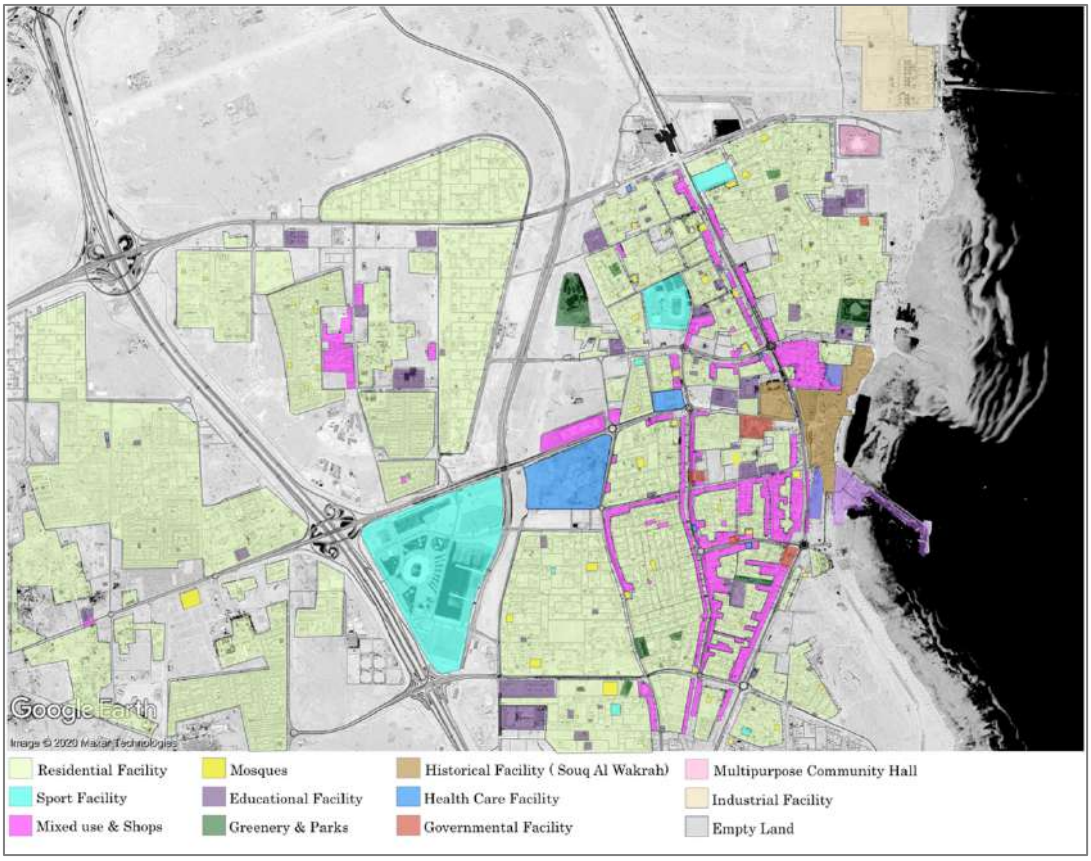

Figure 48: Satellite view of showing landuse of Al Wakrah (Source: Google Earth, edited by author).

Morphological consistency and transformation through time in the land-use result from a range of factors affecting the settlement function with time. In the case of Souq Al Wakrah, the comparison of a land-use pattern from 1947 till today is one of the key significant discussion topics in this thesis. Souq Al Wakrah was initially a fishing village reconstructed to become a heritage marketplace. The area faced a dramatic transformation in its land use, as shown in the new masterplan in 2008 by the

PEO to redevelop the old core of Al Wakrah from abandoned village to tourism destination.

The phenomena of clustering for similar types of land use functions by grouping the commercial retail units can then result in a repetitive effect above and beyond the natural movement levels as highlighted by the formation of routes in the urban grid (Hillier, 2002). The development plan of Souq Al Wakrah follows clustering of similar types of land uses placed in the units made from the reconstructed courtyard houses. The master plan concept of the land use pattern is predetermined by Qatar's urban planning and development agencies.

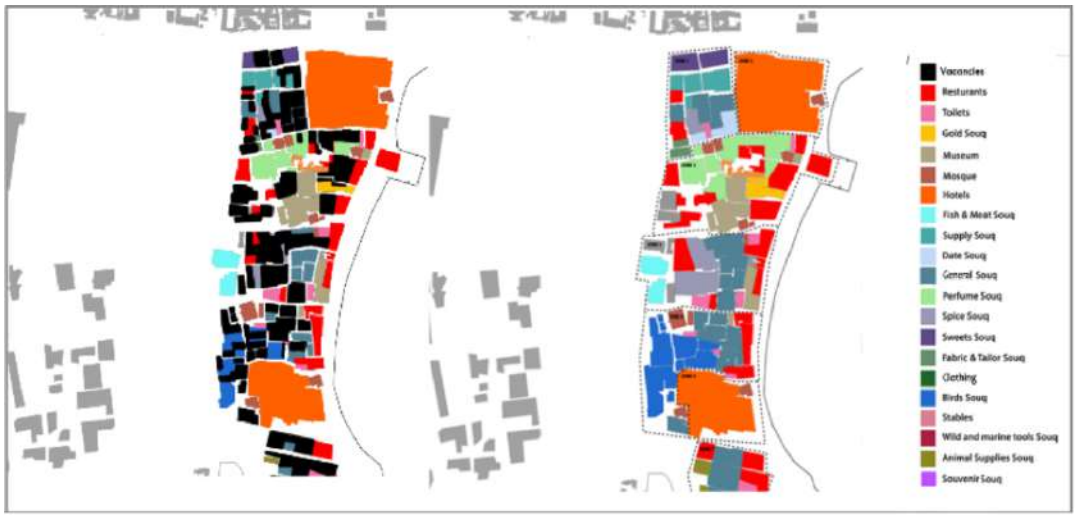

Figure 49: Land use plan of Souq Al Wakrah indicating broadly the division of retail zones with the one on the left indicating the current vacancies (Source: Author).

The land use map shows the large footprints at the northern and southern perimeters of the main souq dedicated to hotel land use (Figure 50, right). Simultaneously, the rest of the souq is clustered with six areas classified by specific retail functions such as general retail, gold, fabrics, and perfumes. The strategic location of the bird market on the spine overlooking the parking area provides added

attractiveness and liveness compared to the rest of the land use pattern located on the same spine. Notably, there is a widespread clustering of restaurants along the coastal promenade but also inland, adjacent to the western parking area due to their strategic locations. These restaurants are adjacent to the sea (for the view) and parking (for convenience). At the same time, some restaurants are inserted internally to different units in different zones. The distribution of functions in Souq Al Wakrah is planned everywhere but the current situation of the ground land use in Souq Al Wakrah have more vacant shops, approximately 35 % of the middle part of the souq (Figure 50, left). This also results some sense of emptiness and quietness on the inner routes of the souq.

Due to the reconstruction of Souq Al Wakrah based on the courtyard house typology, the land-use map is useful for classifying the retail zones in the market. In parallel, mapping active frontages and blank walls based on the current situation is more informative about Souq Al Wakrah (Figure 51). The red color indicates active frontage, or in other words, the open retail units right, which indicates an opportunity for social interaction with retail items for-sale (e.g., browsing) and other shoppers. If there is nothing, then it is a blank wall with limited opportunities for interaction. The enclosed area of the mosques, hotels and walls are indicated in yellow due to privacy reasons associated with religious activities and sleeping accommodations. Figure 51 highlights many active frontages concentrated along the coastal promenade and along the western edge of the souq near the surface parking lot. Also, with the plaza as an important social space, a fragmented active frontage highlights a kiosk placed in front of shops in the *Al Baraha*[7] area. However, the overwhelming common pattern of facades in Souq Al Wakrah contain blank walls, a result of the inward focus of the

[7] Al Baraha (Arabic: البراحة) is the old central public and community space, surrounded by the houses and reached by narrow pathways called Sikka.

courtyard typology within urban blocks, where there are more retail units. This urban form typology generates a degree of 'hidden activeness', where people can hear retail activities taking place but cannot see them unless they enter one of the courtyards where there are retail units. There is a much more vibrant atmosphere on the souq's outer edges than within its heart. The streets in zone five contains newly added retail units with frontages, which imposes the traditional souq concept on the existing urban form.

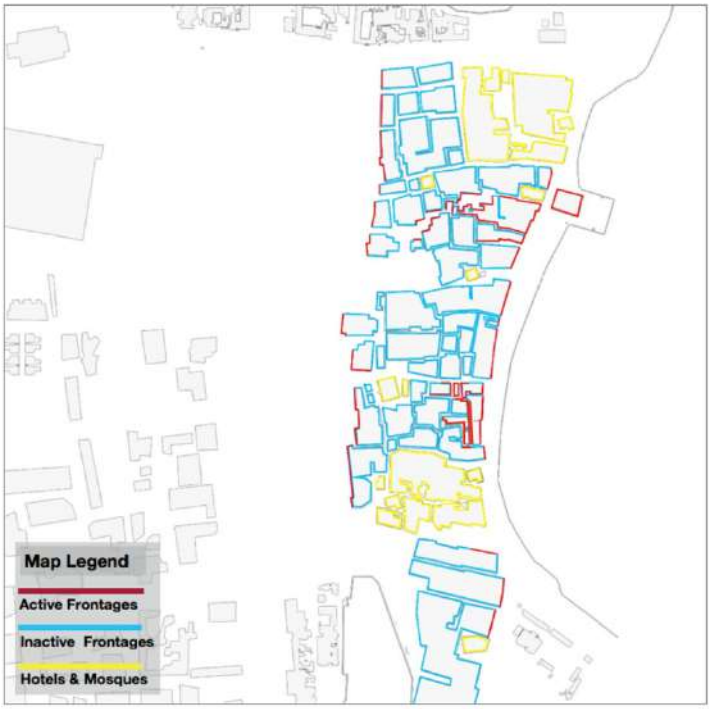

Figure 50: Illustration of active and blank wall frontages where red indicates active, blue means blank and yellow indicates hotels and mosques (Source: Author).

Souqs in the Arab region are characterized by a high number of mosques for the ease of accessibility for religious purposes. The mosques' locations signify the civic and religious heart of Islamic settlements, usually classified into Friday Mosque as well as smaller everyday mosques allocated all around settlements to ease accessibility for users (Tannous, 2020). Historically, mosques in the Islamic settlements represent

the public social spaces for various community meetings. Accordingly, most of the mosques are designed with open area to accommodate an adequate number of users.

In the Souq Al Wakrah, mosques and prayer areas in the main part of the souq are nine in total (Figure 52, left). Seven of the mosques/prayer areas are placed within the interior areas of the urban blocks with only four located at the edge. However, within a 400 m distance from the geometric center of the souq there are only two mosques (both to the west) in the surrounding areas. The combination between the figure-ground representation and the location of mosques and prayer areas in Souq Al Wakrah highlights the strong influence of three main attributes in the formation of these mosques: its location, orientation, and its open public context. In this perspective, a worship location in Souq Al Wakrah is available for almost every 17,778 m^2 of the area in the souq. The extended form of the souq in north-south fashion shapes a scattered network linking together all the mosques and prayer areas, with a 2-minute walk distance or less, based on the average walking speed of 1.4 meters per second. The typical distance between the mosques is only 150 meters or less (Figure 52, right). However, the old core of Al Wakrah as a fishing village in the past indicates the importance of many mosques, even in the small urban settlements. In morphological terms, consistency of mosques from 1984 is noticeable.

Figure 51: Location of mosques and prayer rooms with the pedestrian shed distance distance relationship between the nearest mosque to the next in Souq Al Wakrah (Source: Author).

The figure-ground facilitates a clearer visual appearance of the urban form of a settlement. The layout and specifically the voids become apparent and the movement networks through the urban fabric becomes clearer. Studying walkability of an area is often measured through the pedestrian shed from a selected area. A pedestrian shed map provides a simple walkability measure ‘as the crow flies’ with specific radii as measured based on metric distance. For the Souq Al Wakrah layout based on the pedestrian shed from the geometric center of Souq Al Wakrah (Figure 53).

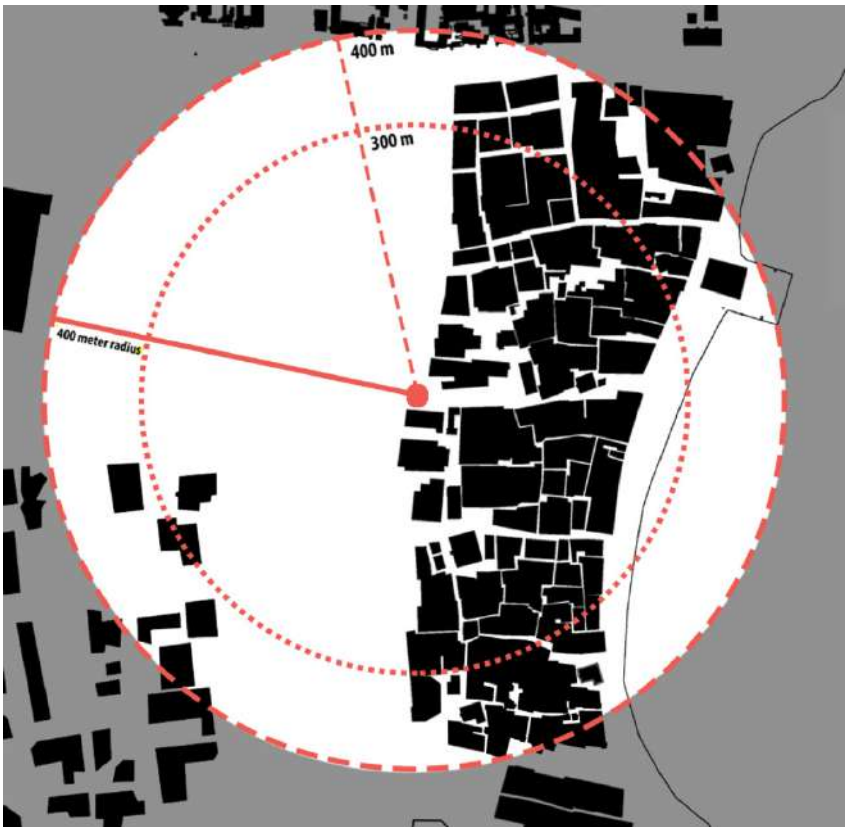

Figure 52: Pedestrian shed of a 3-to-5-minute walk (300-400 meters) from the geometric center of Souq Al Wakrah (Source: Author).

The geometric center of Souq Al Wakrah is selected at the entry plaza next to the western parking area based on its overall shape including the surface parking. This thesis implements the general hypothesis that 400m radius from the center of the souq represents a reasonable distance for a typical pedestrian to walk comfortably (Cervero, 2000). It resembles the Puget Sound Regional Council (State of Washington, USA) definition of "Transit Community." It also takes under consideration the hot and humid climate during most of the year in these souqs, considering the minimized distance of 300m from the center of the souq as the comfortable distance for walking. Accordingly, a pedestrian shed's standard dimension is reduced from a standard 800 to 400 m (in most parts of the world) to reflect this region's challenging climate. There is strong connections the sea and land within the souq layout. Most of the souq area

lies inside a walkable 400 meters (m) distance from the geometric center. This results from the strong relation of the built environment to existing natural element (the sea), which influenced the urban form linear shape in the north and south expansions. As a result, the middle part of the souq itself is characterized by a walkable short distance within a 3-to-5-minute walk, while the corners of the souq to the extreme north and south lies outside the walkable area. The parking surface and the high-speed vehicular road (Al Wakrah Road) isolate the souq from the old fort and a mosque on the western side of Al Wakrah Road. However, the relative closeness of the old fort and a mosque on the other side of Al Wakrah Road indicates a certain potential for generating a clearer physical connection between the souq district and the western areas of Al Wakrah settlement.

The middle part of the souq appears to achieve an acceptable level of walkability. However, due to the linear shape of Souq Al Wakrah, the extreme northern and southern extensions of the souq to lay outside of this walkable distance. It only reaches some residential buildings' facades in the northern area. However, these buildings are mostly vacant due to a future urban renewal project. At the same time, half of the coastal promenade and almost all the west side surface parking are encompassed within 300m walking distance of the souq' geometric center. The pedestrian shed area of 300 m covers more than half of the selected middle portion of the souq. The areas within this pedestrian shed of 300 m cover the zones one, three, and five, and fully covers zone four. Exactly half of the west area of the pedestrian shed area of 300 m is covered by the surface parking lot, which is considered as a void in the figure-ground representation map, resulting in a lesser number of building blocks. The symmetry in the pedestrian shed area of 300 m between the built environment and empty land is a result of urbanization and modern transportation

demands to meet the excessive needs for parking, creating a well-defined but relatively ineffective (in terms of function) for the boundary of the souq. The old mosque on the western side of Al Wakrah road is fully covered by the pedestrian shed area of 300 m but relatively inaccessible due to vehicular traffic.

The rank order of the urban blocks within 300 m of the geometric center provides a better understanding of block size variation and overall block profile within a walkable distance. It provides additional evidence for the walkable nature of the souq. The urban blocks laying within 300 m are arranged in descending order to demonstrate the block profile of the overall souq. The rank order within 300 m of the geometric center of Souq Al Wakrah covers 61 urban blocks and free-standing buildings with the block having the maximum extended length in one dimension being 130 m in length (Figure 54). The 61 urban blocks translate into an average block size 2,623 m^2 or 51 m x 51 m if based on a square form of the central portion of Souq Al Wakrah. However, courtyards, alleyways, and principal routes are not accounted for in this area calculation. If we consider these spaces with 25% area of spaces, then it results in an average block size around 2,000 m^2; in other words, the typical square block size of an average area about 45 m x 45 m. There is a range of large to small blocks available in the pedestrian shed of 300 m of Souq Al Wakrah. Even though the souq is a redeveloped project, the size of urban blocks seems much bigger than the surrounding urban blocks. However, the inclusion of the courtyards expands the average size of the urban block.

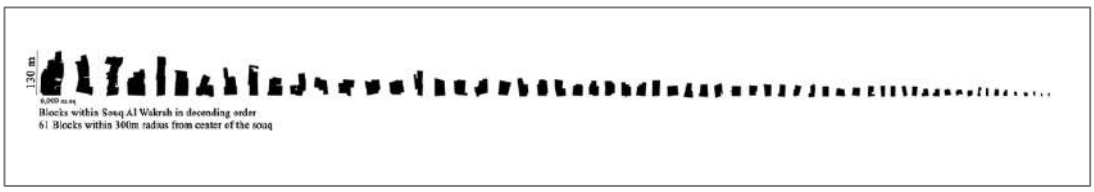

Figure 53: Blocks within the radius of 300 m (or an area of 0.28 km2) in descending order in terms of metric area for Souq Al Wakrah (Source: Author).

Next, the study examines user perception and behavior in relation to the souq's built environment. This analysis is briefly accomplished based on selected criteria generated from the literature review. Several urban measurable dimensions addressed by Lynch (1960) and Jacob (1961) are considered to study the user behavior and the wayfinding in relation to the built environment including the souq imageability based on *The Image of the City* by Kevin Lynch (1960). However, he generated these elements through observation and user interpretation in sketching based on a very limited sample size (45 people for 3 cities) (Lynch, 1960). In this study, we examine the elements through a combination of the observation in relation to evaluation of the space syntax model to compare and identify the city elements. The space syntax model helps to translate the observed element of the souq into the imageability elements from quantitative data into qualitative description.

Lynch (1960) described the common elements – reviewed in the Literature Review chapter - in a built environment of a city are important to the user perception. The urban form of the souq represents a maze specially for the visitors who are not familiar with the space. However, the cultural identity of the souq helps the visitor to visualize the urban area via traditional architecture. The perpendicular streets running toward the coast helps the visitors to orient themselves to the coast and their perception that these routes are running toward the main spine. This is clearly identified by their

behavior once they reach the souq parking as their mental map appears to indicate their movement orientation and their focus to reach their destination, i.e., the promenade. Some streets are connected directly to the main both spines but there is the interconnected changes of direction to reach the promenade and many more dead ends.

The promenade is the busiest area of the souq, it represents the main channel in which all visitors walk. It operates like an **edge** as an element for the image of the souq. The promenade functions as the most significant element of the souq as it is usually the main destination for most visitors coming to the souq. The space syntax model of global integration highlights the highly integrated edge with red color. However, this edge is empowered by a series of feeders, starting from the parking ending up at the promenade as it also divides the zones of the souq. These reconstructed routes are a trace of the original fishing village. These are translated as **paths** for the image of the souq. However, these paths vary in their shape and size and integration level, so each provides somewhat of a unique experience. These paths are dividing the areas into thematic zones that operate as **districts**. The height of the minarets represents the **landmark(s)** of the souq. Similarly, the linear nature of the promenade leads the users to identify the sea as another **landmark** of the souq. This area acts as the luxurious and enjoyable spot in the entire souq and its busiest area. Meanwhile, the areas of the edges and paths intersection reflects the **node** element of the image of the souq (Figure 55).

Figure 54: Space Syntax model of global Integration (R=n) in relation to the Kevin Lynch theory of the city elements (Source: Author).

Previous sections highlighted the generic form of Souq Al Wakrah with the interconnected *sikkas* formulating a 'maze sense' of the place. Visual ability empowers people's orientation by increasing their sense of their location and their destination. The concept of visual fields can help to understand the users' visual ability for wayfinding based on three ways point, line, and convex space.

This visual field analysis is based on selected points, lines, and convex spaces within the souq, which seem somewhat characteristic of the souq in general. Eight points are analyzed for the existing visual fields in the souq. These points were selected based on their relation to the surroundings and based on the importance of the area such as plazas and squares. The selected point was analyzed twice to highlight the effect of slight changes for visual opportunities in the souq (the second is discussed in the last chapter).

The comparison between two graphs here shows the slight alteration in point within same location shows different degrees of visibility (Figure 56). The analysis tends to display various obstructing objects. Obstruction includes things such as narrow streets with dead-ends and right-angle connections. This reminds us of the original function of the space as a fishing village, planned based on the Islamic rules and regulations that prioritizes privacy. On the other hand, fields that include long lines of sight connecting high value locations, such as the case of a plaza to the right and the main plaza itself (Figure 56, right).

Figure 55: Representation of a visual field (in yellow) from a point in the plan of Souq Al Wakrah, State of Qatar (Source: Author).

In contrast, areas that represent low value regarding openness and connectivity show surprisingly show high visual connection to another two or three high value areas. Similar cases appear in other parts of Souq Al Wakrah. Such a case is presented in the upper northern part of both cases, a direct visual connection appears between

souq and northern part of the old preserved area (Figure 57). Similar point with slight alteration presents similar visual connection in addition a high visual connectivity to parking lots.

Figure 56: Representation of a visual field (in yellow) from a point in the plan of Souq Al Wakrah, State of Qatar (Source: Author).

Humans move to reach destinations. This movement tends to be linear, thus, the linearity is represented as the longest line of sight in the selected areas based on the point analysis. The line of movements shows the results of visual filed opportunities based urban fabric of the souq. The narrow streets in the souq resulted in similar narrow visual fields, causing limitation in the visual connectivity to inner spaces and providing a sense of being lot. However, the very northern and *baraha* lines of movement are clearly connected to the main spine, the promenade, and the parking lots, which highly supports the visual connectivity between the inner spaces of the souq to the outer (Figure 58).

Figure 57: Representation of a visual field (in yellow) from a line, and convex space in the plan of Souq Al Wakrah, State of Qatar (Source: Author).

The direct visual connection between the promenade and the inner part of the souq is evidence of the strong historical connectivity between the sea and land (Figure 59). Most of the lines did not differ in their visual field opportunity compared to the point analysis. The convex space tends to supply similar visual field compare to points, while the visual field of line shows higher visual field opportunities. Again, the replication and consistency in the visual field analysis of point, line, and convex space highlights the function transformation of the old core into a traditional marketplace as the obvious trigger in resulting from visual fields limited to narrow streets and dead ends in several cases.

Figure 58: Closeup of representation of a visual field (in yellow) from a line, and convex space in the plan of Souq Al Wakrah, State of Qatar (Source: Author).

A pilot observation of the souq was conducted right before and after the weekend - and in the middle of the week and the weekend - before the global pandemic. The pilot analysis demonstrates that liveliness of souq promenade is relatively high during weekends. It is noted that the intensity of use increases in afternoons and decreases in mornings. The behavioral analysis was studied at two different times; the first one was during the call of Maghrib prayer (5:21 pm) and the second was after the prayer times (6:30 pm) (Figure 60). This study was conducted by taking a sequential panoramic photo with an average of 10-meter distance. The choice of these two dissimilar timings during and after Maghrib prayer timing is for effective observation of users' behavior in the promenade in relation to the prayer time.

Figure 59: Behaviorual mapping study of the promonade of Souq Al Wakrah (left) after and (right) before Mghrib prayer time (Source: Author).

Similar types of use within the main spine promenade of Souq Al Wakrah operate and are available throughout the week. There are similar degrees of pedestrian flow, type, and density. The analysis unveils that the space is equally vibrant along the promenade. The space where a structure projects into the sea reflects higher vibrancy. This spot is a unique case in the whole promenade, where there are buildings on both sides enabling users to sense enclosure in defining the walkway. There is minor variation in the total number of groups and couples who use this space during the observation times. The flow of people in prayer time observation seems to have a slightly different pattern than the after-prayer user pattern. The walking and standing activities increase toward the perpendicular routes, in which users tend to look for the nearest visible mosque to perform prayer (Figure 61). There are also diverse types of

activities undertaken by different age groups and gender at different times. Sitting and standing near the shoreline seemed to be inviting for users before the sun sets. This is reflective the poor lighting and visibility, which affects the feeling of comfort.

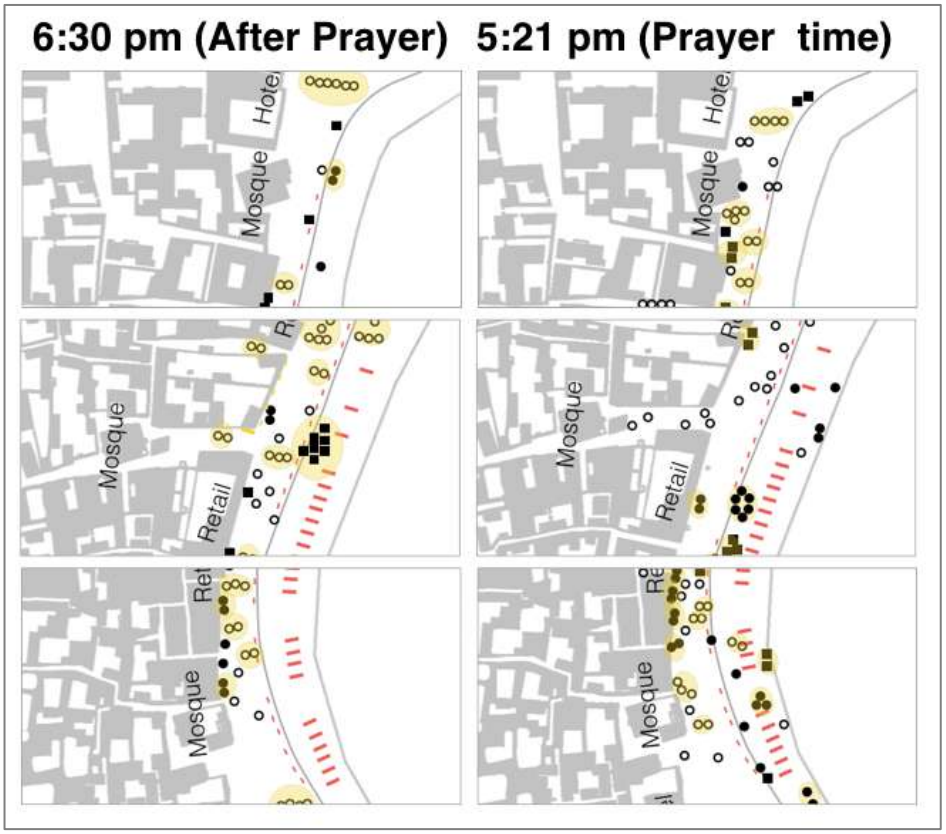

Figure 60: Closeup to location of mosques showing user behavior at the promenade of Souq Al Wakrah during Mghrib prayer and after Mghrib prayer. (Source: Author).

Based on activeness, Souq Al Wakrah is divided into three parallel zones in relation to the shoreline. These areas are classified based in their spatial configuration and activeness. Zone one is represented as the promenade and zone two is the inner interconnected streets of the souq, while zone three is the spine next to the parking area (Figure 62). It could be important to have a closer look in the future at these key identified settings within the three zones by measuring impressions and user perception. Contemplating setting contains explanations of key behavioral concepts

that a user subconsciously represents in using these settings, such as isolation or privacy, territoriality, personalization, and personal distance. These conceptual terms of user behavior are turned into concrete terms by explanation and investigative interpretations based on what is observed.

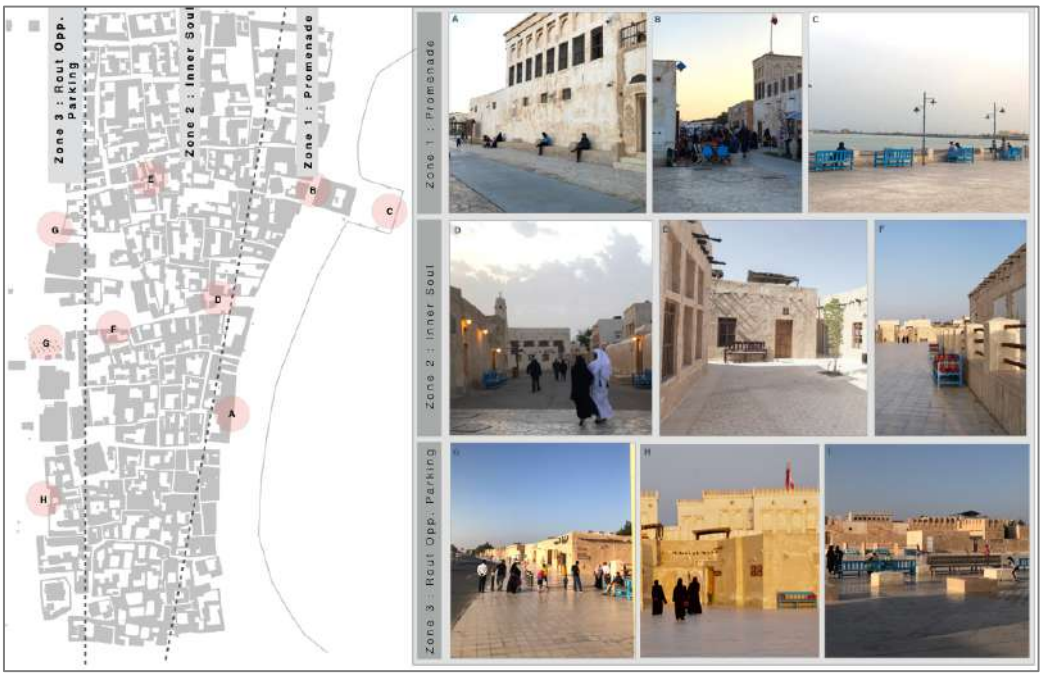

Figure 61: Contemplating settings of Souq Al Wakrah (Source: Author).

However, while many settings were identified as part of examining the socio-spatial qualities of Souq Al Wakrah, three settings were selected for each zone to represent different actions and activities within the space. The analysis of the contemplating settings analyzed the selected areas based on these questions: Who is doing what, where, how, and for how long?

Setting A demonstrates a single male and female with baby sitting on *Dattcha*[8], while undertaking several activities (watching, waiting, and resting) (Figure 63, left).

[8] The terms *Datcha in Arabic* دجه means a traditional outdoor sitting area, usually planned on the outer wall next to the house main gate.

The street furniture consists of long linear traditional benches attached with to a wall. These settings positions are related to each other by separated by fixed dividers. The users' position is at the end side of the bench, which suggests there is no intention in showing ownership over the bench. However, the female is positioned by skipping one full bench and seated away from the male position, demonstrating privacy behavior via distancing within the space.

Figure 62: Close-up of contemplating settings of Zone 1 (Source: Author).

In Setting B, the nature of the activity is quite different where females and males are seated in front of restaurants at the tables outside (Figure 63, center). As a result, narrow paths are created by the restaurant with extended seating on both sides of this area. This represents the only case in the whole promenade. Users are mostly talking and interacting with each other with a seeming lack of interest in the surrounding space.

Setting C demonstrates the nature of the activity is different where females and couples are seated along the benches facing the sea and their back is turned against the promenade where the surrounding context is not of much interest (Figure 63, right). The visual connection with the pedestrians behind is partially broken but can be regained easily. Their position facing the sea provides a sense of protection and partial

isolation. It seems that their preference for this location is that it prevents their personal space from being infringed by those passing in proximity.

Settings D, E, and F are collectively explained due to their similarity (Figure 64). These settings of the souq demonstrate that users prefer to use them for walking, since there are benches are in passageways but none of them are being used. This highlights an effect of reconstructing the fishing village into a public heritage marketplace. The interconnected *sikkas* originally functioned as semi-private area used by citizens to move within the village. However, these streets are now public spaces. The emptiness of these settings show that the user tends to prefer to reach their destination as soon as they can (promenade) by crossing the middle part of the souq rather than linger in such spaces. Also, people tend to only sit and rest momentarily while watching and observing the surroundings before proceeding with their journey.

Figure 63: Close-up of contemplating settings of Zone 2 (Source: Author).

Setting G demonstrates a common activity occurring in the space (Figure 65, left). A single male seated on the bench looking at the parking area, which reveals the user is waiting for someone or a taxi. It also illustrates a setting that involves a group of people passing by this lone sitter. The group of people are positioned in proximity,

which suggests this (now wide) *sikka* is commonly used by users to reach the promenade.

Settings H and I illustrate spaces involving a plaza, thus, the visual connection with the pedestrians is high (Figure 65, center and right). The positioning of the benches facilitates the ability to watch people, who are passing by and playing in the square. The openness of the space allows children to play freely, and benches are distributed in a way that allow parents to rest and watch while their children are playing.

Figure 64: Close-up of contemplating settings of Zone 3 (Source: Author).

The analysis of the preceding three settings for each zone serves as example of the broad range of settings that offer many functional and behavioral opportunities in the souq. It highlights the interaction between built environment and human behavior. The diversity of physical objects and street furniture results in a diverse range of possibilities for possible engagement. The analytical reflection of various behavior and the overall comfort level of users highlights the role of physical environment in shaping user behavior and diversification of overall built form of the souq.

Due to its inward-looking urban form and its pedestrian streets, Souq Al Wakrah is expected to achieve the demands of many daily users and sufficiently address the demand of passing pedestrians. This expectation can occur by implementing a more efficient urban landscape and refinement of street furniture design to help enhance the environment by meeting diverse requirements and facilitate ease of wayfinding. Items and products of street furniture were examined as part of the observation study (Scola et al, 2016).

Street benches have variety of shapes based on their location. Most of the benches are made of wood and not fixed, while the traditional type of benches "*Datcha*" are attached to a building, fixed, made of concrete, and have curved edges. Some wooden benches are positioned in parallel rows along the movement flow of the promenade. Based on the observations of this study, these benches are more likely to be used due to the view and intensity of use along the promenade than those positioned in the inner spaces of the souq. The restaurant benches are used most of time for seating and resting with a greater intensity of use during normal dinnertimes. The positioning of the benches and restaurant seating emphasizes the pedestrian movement pattern of the promenade. The benches are placed overlooking the sea, allowing visitors to sit in relative privacy observing the sea while, at the same time, not to be directly observed by pedestrians (Figure 66).

Figure 65: Multiple photos showing street benches varieties in Souq Al Wakrah (Source: Author).

Bollards are placed in front of entrance and exit of surface parking lot. However, they are do not appear to serve any function in the souq, except to limit vehicular traffic (Figure 67). These bollards are shaped in a square and round shape. Litter Bins are distributed throughout the promenade in different shapes, sizes, material, and colors, resulting in a widespread number of street items and a somewhat unattractive scene. However, cleaners are distributed all over the souq and continuously clean the spaces.

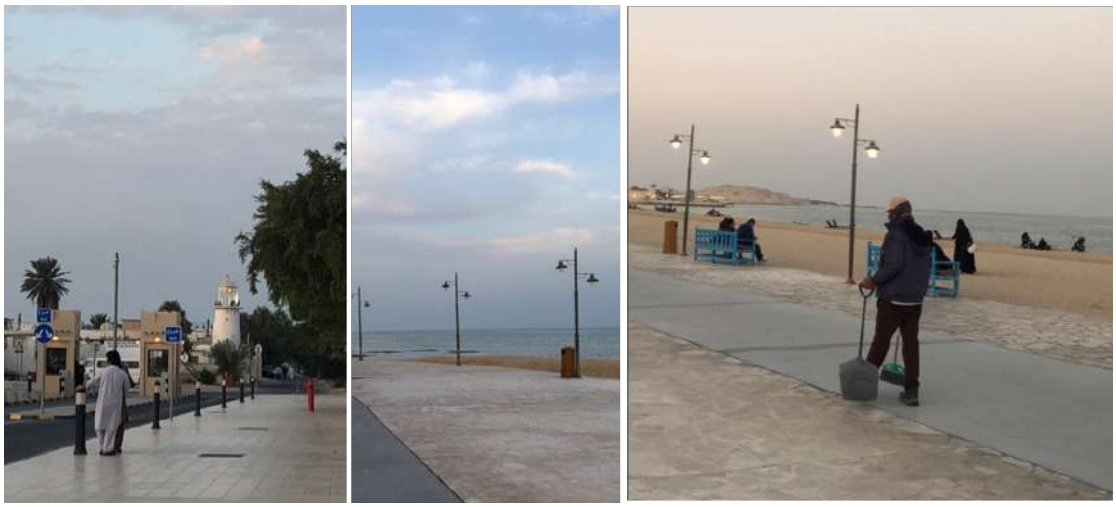

Figure 66: Multiple photos showing Bollards and Litter Bins in Souq Al Wakrah (Source: Author).

Information signage are designed in two different shapes and colors. One exists along the promenade using a wooden design (Figure 68). The second type are simply poster type (and fire safety) maps to show ‘you are here'. Both types seem to be in excellent physical condition. They are designed to allow more than 3 people at a time to examine at the maps without interrupting each other’s personal space. The size of these maps appears to be suitable and easy to read.

Figure 67: Photos showing Information posts in Souq Al Wakrah (Source: Author)

Flag barriers are used by most of the cafes and restaurants within the souq. They are utilized as walls to delineate the property limit of the restaurant's frontages (Figure 69). These flags represent an essential element to separate and identify the seating of each restaurant. However, many restaurants prefer to add these barriers with harmony so it's not visible instantly by users and adds an attractive aesthetic aspect to the space. On the other hand, it noticed in some other restaurants that barriers are seen and highly visible.

Figure 68: Multiple photos showing Barriers in Souq Al Wakrah (Source: Author).

Menu displays and signage are part of the street furniture with a strong presence in the souq as a traditional method of advertisement for catering places (Figure 70). They attract the attention of pedestrians for a short stop and look, mostly along the promenade area. As most signs are located within the pedestrian circulation zone, they become a focal point for many users to pause around them for a short and quick conversation. The display boards represent an essential street element of the souq due to its inward urban form. They are designed to support and facilitate pedestrian awareness of the location of shops, restaurants, and the activities occurring inside of the courtyard houses.

Figure 69: Multiple photos showing Menu displays and signage in Souq Al Wakrah (Source: Author).

Trees in Souq Al Wakrah are one the of preserved elements. They are arranged along the routes of the souq to add the natural element to the fishing village theme (Figure 71). The number of trees also appears to be reasonable for enhancing movement, providing shading, and generating a traditional aesthetic for the souq.

Figure 70: Multiple photos showing trees in Souq Al Wakrah (Source: Author).

Overall, the souq has several important features serving the needs of its users. However, there is a considerable number of street furniture items that do not adequately fulfils the requirements of a public space corresponding to its value and the history of the place.

4.5 Spatial Analysis of Souq Al Wakrah

Settlements are a composition of the built environment and its users. The more integrated urban form, the better interaction between the built environment and users' utilization of space. The integration of an urban form is measured based on several mathematical calculations, a few of which few were discussed in a previous chapter. Measuring the integration and connectivity of settlements, neighborhood, street, or even a single building, Hillier and Hanson have been developed the theory of space syntax where streets are represented and measured as a linkage of spaces forming a relationship between layout and human activity patterns in an urban area. The global choice measurement in space syntax highlights all streets and major routes in a network for through-movement in an urban environment. Choice is a measure based on all streets receiving a value of 1, that value is shared among all streets directly connected to it, and then totaling the amount of reciprocally shared values for all streets.

The space syntax model of Al Wakrah city is composed slightly less than 3,000 axial lines representing streets. The global choice model tends to represent the pattern of through-movement in an urban spatial network (Figure 72). The measurement of the global choice in the model of Al Wakrah highlights several significant roads of the urban spatial network, Al Wakrah Road, Al Wukair Street, new orbital highway of Al Majed Street, Hamad Street, G Ring Road, and Mesaieed Road. These series of streets

tie together different areas with the new Al Majad Road radiating outward to the edges of the settlement, as well as smaller routes radiating outward from the old core of Al Wakrah city. The main street of Al Wakrah runs next to the souq area, specifically next to the surface parking area.

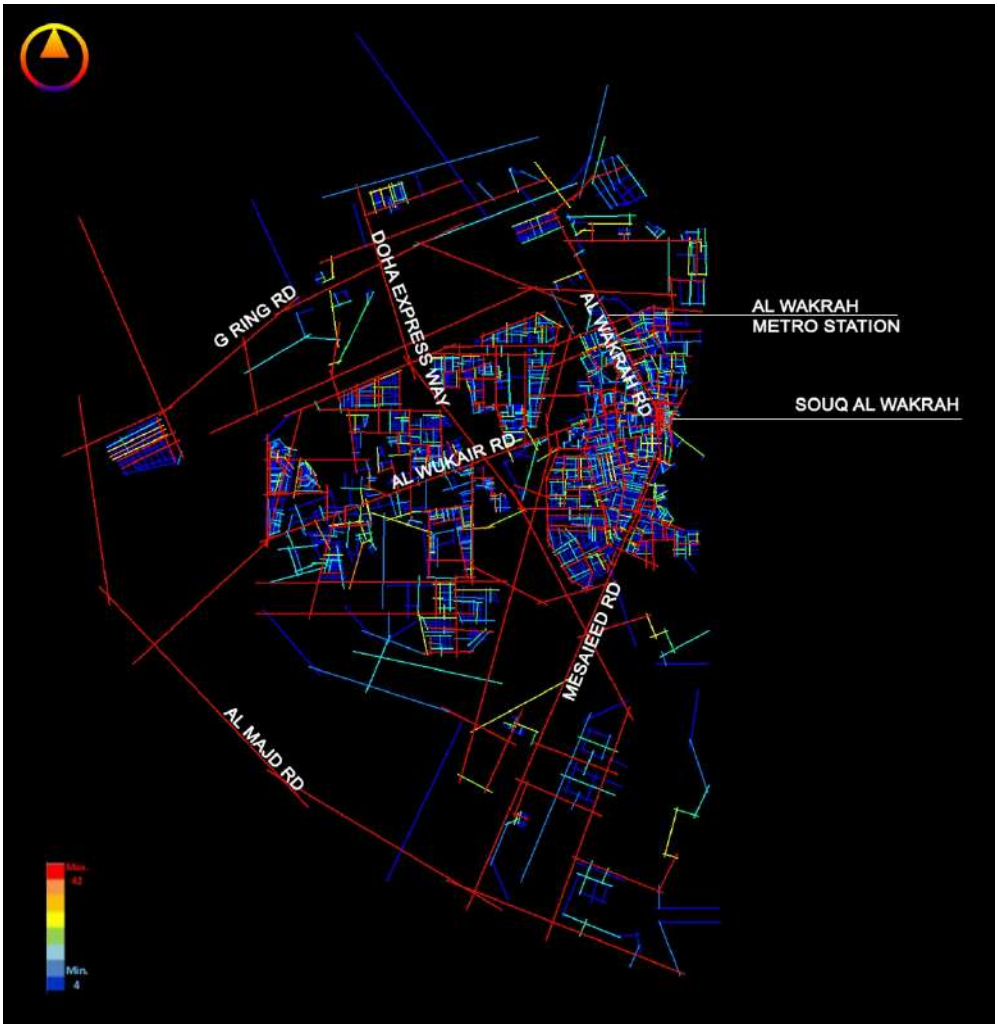

Figure 71: Space Syntax model: global choice (Source: Author).

The global integration measure of the space syntax model of Al Wakrah (radius=n) based on mean depth of all streets to all others in the network highlights the central integration core of Al Wukair Road and Al Wakrah Road running adjacent to the souq. It was the first vehicular road established to Al Wakrah Village. The main

street (Al Wukair Street) connecting from the souq operates as an east-west connector in the larger settlement. The axial model network highlights another major road, the new orbital highway of Al Majed Street, which recently introduced a significant pattern change in the street network. This new major highway connects instantly to Doha Expressway from the north and runs along with the Al Janoub Stadium site to the south and reaches the Musiaeed area (Figure 73). The new linkage between these two highways results in a shorter route from Al Wakrah to Doha in the topological terms of space syntax.

The space syntax model of the mean depth from the most integrated line, i.e., radius=5 to eliminate edge effect (i.e., streets at the edge of the network are segregated by virtue of being located on the edge), highlights the consistent and robust street significance and spatial structure of the Al Wakrah settlement's urban grid. Similarly, the most extended length of Al Wukair Street establishes consistency for the importance of significant roads connecting important nodes in Al Wakrah to the larger Metropolitan Doha region further to the north. The axial model also highlights the importance of the souq's primary and secondary spine and some of the roads perpendicular to the coast.

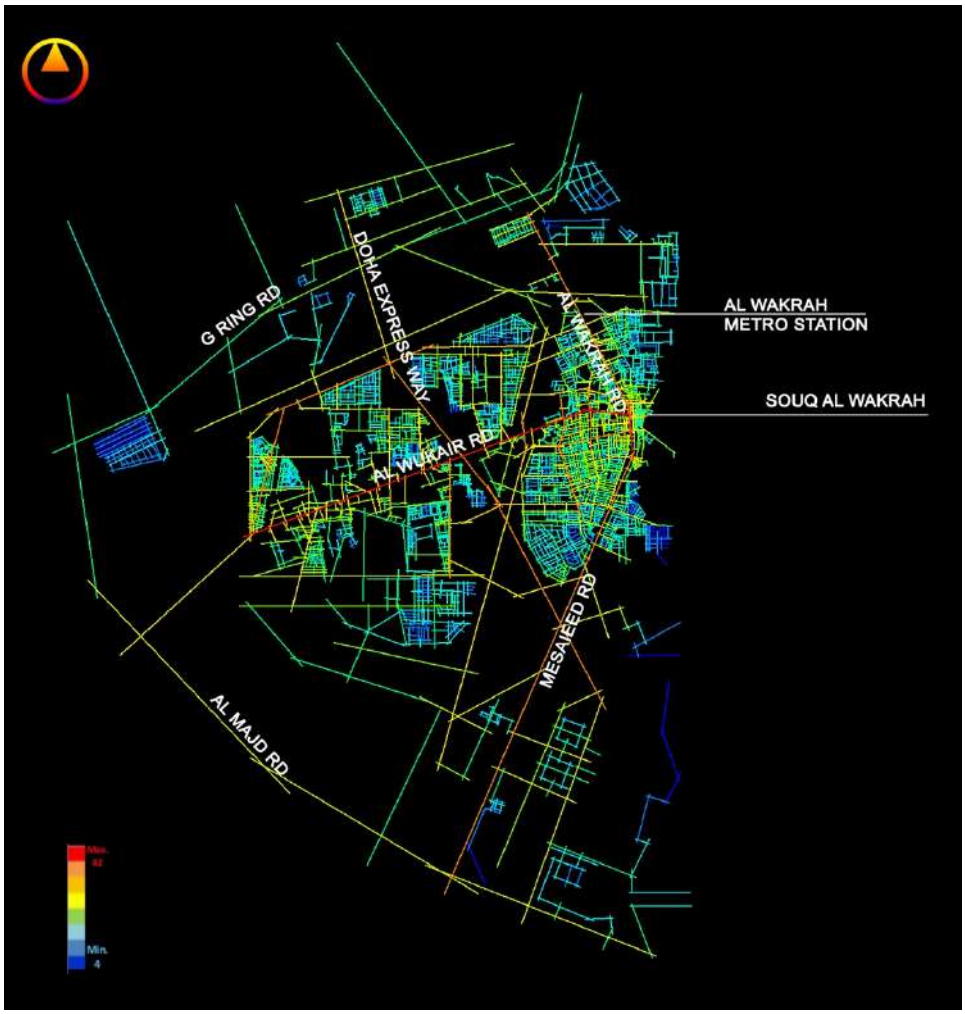

Figure 72: Space Syntax model of global Integration, r=n (Source: Author).

There are two main streets directly linking to Doha via Al Corniche and Doha Expressway. Both streets intersect with Al Wukair Street's major route, allowing accessibility in both a north-south and east-west direction. The integration map also highlights the significance of the land use pattern since these routes access essential areas such as the souq in the east and the central core of Al Wakrah Hospital and Al Janoub Stadium to the west. Its highlights the shift of the expanded central core of Al Wakrah over time from the old area adjacent to the coast to further inland in relation to the enlarged size of the settlement (Figure 74).

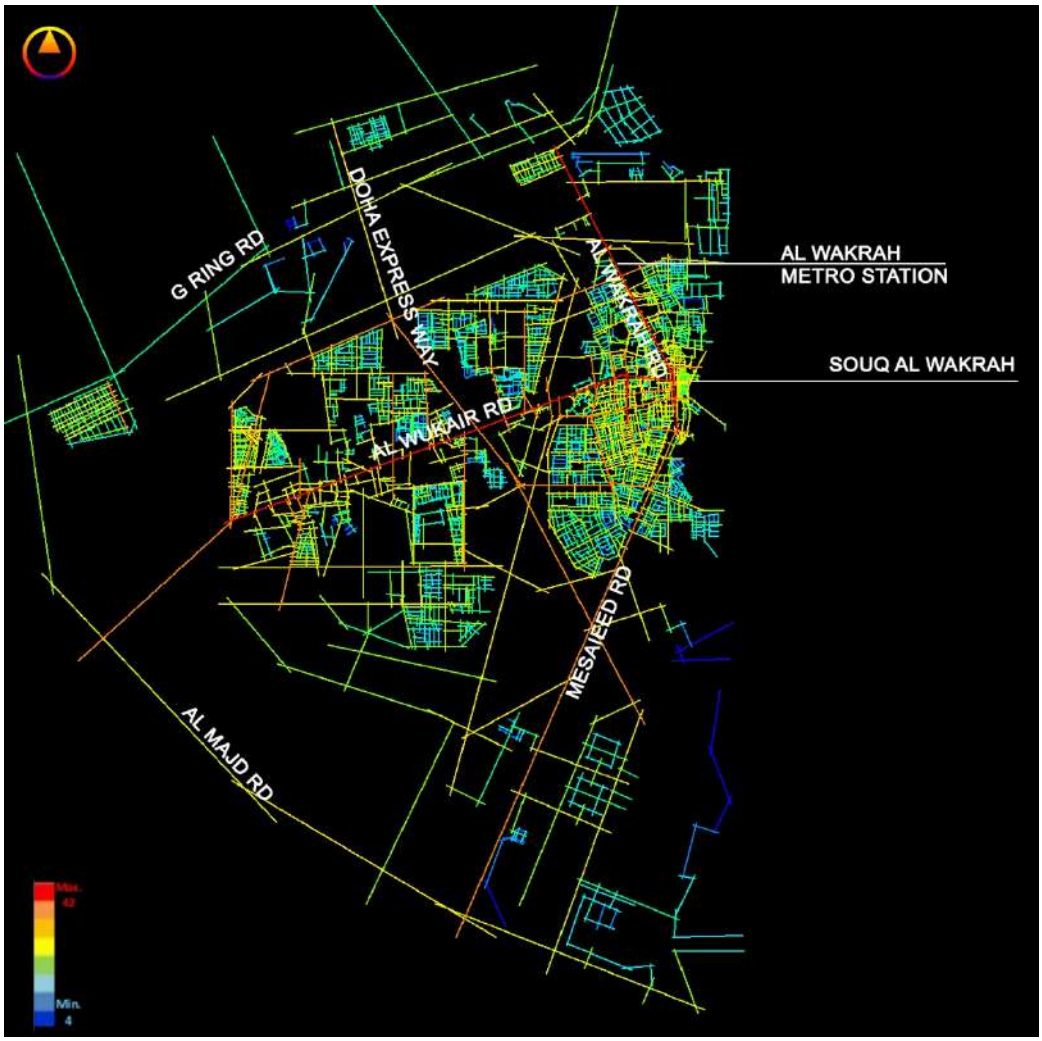

Figure 73: Space Syntax model of integration based on mean depth from the most integrated line (radius=5) (Source: Author).

In this sense, space syntax modeling of Al Wakrah appears to provide a very realistic picture of urban functioning in the larger settlement, which we can utilize to suggest design enhancements for Souq Al Wakrah within its urban context.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Chapter Introduction

This chapter concludes the study of Souq Al Wakrah and Al Wakrah settlement's urban form and discusses some key findings. This chapter answers the research questions by highlighting the findings from the morphological analysis of the souq, the relationship between the form and the function of the souq within its surroundings, the impact of reconstructing the fishing village into heritage marketplace, and, finally, highlighting potential to enhance the built environment of the souq and Al Wakrah. This chapter highlights the contribution of this research to our existing knowledge and identifies future avenues of research for more in-depth analysis of Souq Al Wakrah.

5.2 Revisiting the Aims of the Study

The study started with an overview of the current academic literature via a brief discussion of the multidisciplinary perspective for investigating of various aspects of Souq Al Wakrah and Al Wakrah settlement. The analysis began with a brief historical overview of the case study by examining the morphological changes in Al Wakrah settlement over time and the probable consequences for its socio-economic and functional use. We then applied this analysis to define Al Wakrah as a historical settlement and the dimension of its change over time, initially as a fishing village in the past and the basis for the reconstruction of its historical identity into a marketplace and heritage district today.

5.3 Key Findings

Studying and understanding the urban form of Al Wakrah and its changes over time from a multidisciplinary point of view and considering the morphological determinants including social, cultural, economic, and political factors that influenced its urban form generates a more complete picture about Al Wakrah today than previously available in the literature. This is especially true concerning the Souq Al Wakrah as a public space within its urban context.

Studying Souq Al Wakrah using space syntax theory to underpin the research foundations of this thesis helped to understand the morphological changes in Al Wakrah over time and addresses a significant gap in our knowledge about settlements on the Arabian Peninsula. This tied back to how the settlement of Al Wakrah grew and expanded around the historic location of the fishing village (now Souq Al Wakrah) as a part of the city center in the past and a redeveloped heritage center and marketplace in the present. The research emphasized that the study of urban form should occur at its different scales and layers, which this thesis adopted for its recommended procedures throughout the data analysis. The case study analysis occurred with the city level at 2 km^2, then the souq itself within 1 km^2, and ending up with the layered analysis of the current condition of the souq by layering based on the physical, social, and functional aspects at the larger scale including space syntax modeling of Al Wakrah settlement.

5.4 Reflection on the Research Questions

The main research questions of the thesis and key findings are briefly summarized below with underlining of original contributions to our existing knowledge.

What are the morphological characteristics of the reconstructed Souq Al Wakrah initially from a fishing village?

- Urbanization and rapid economic growth changed the physical characteristics of morphology in the Al Wakrah settlement over time. These forces resulted in excessive expansion over the empty land, and distinctly different urban form typologies emerged based on Westernized urban patterns, including suburbanization.
- Souq Al Wakrah's urban blocks are **strongly oriented inward for functioning due to incorporating the courtyard houses typology** in its reconstruction as a marketplace, which starkly contrasts with the urban pattern of the surroundings primarily based on the contemporary residential villa's typology.
- The settlement **started linearly and densely but continued with fragmentation and pixilation of the urban fabric**, which is visible in the figure-ground presentations of Al Wakrah. While the redevelopment plan restored the continuation of its urban fabric, **significant voids remain in the urban fabric** due to the demands of modern transportation planning.
- The morphological analysis of Souq Al Wakrah highlighted the importance of the social-cultural aspect of the area based on **preservation of the exact location and form of the previous mosques in the reconstructed heritage district**, which was demonstrated with reference to the old maps and satellite imagery of the original fishing village of Al Wakrah.

What were the historical and morphological influences for the reconstruction of the old core and how did it impact the design and planning of the souq today?

- After rapid urbanization and economic growth, heritage identity became an increasingly important national priority for preserving and redeveloping the historical traces of the traditional urban fabric in the State of Qatar. This was the principal influence for redeveloping historical sites in Qatar and similarly for the reconstruction of the original Al Wakrah fishing village into the Souq Al Wakrah heritage district today.
- Cultural heritage and identity were essential elements in the reconstruction of the original fishing village into the traditional marketplace Souq Al Wakrah today, which can act as a model of the revitalization of traditional heritage public realms to attract diverse types of users, especially tourists.
- For the most part, the implemented redevelopment plan **appears to achieve *genus loci* (or a 'spirit of place') characterizing the original settlement streets and buildings of Al Wakrah**. This is especially true since the coast reflects the story of the past, showing who lived there and the way they lived. Hence, the Souq Al Wakrah coastal promenade became a prominent feature of the reconstruction plan. Nonetheless, there is room for enhancements.
- The reconstructed form of the souq **reestablishes a strong relationship to the coast while suffering from a weak connection to the urban surroundings** to north, south, and west of Al Wakrah settlement. This degree of dis-attachment of the souq from its surroundings appears problematic for its long-term future as a civic place.
- The new contemporary villas imposed on the traditional urban form of the Al Wakrah settlement appear to **accentuate the physical, architectural, and visual gap generated between the modern contemporary urban pattern and the reconstructed souq area**.

- The large surface parking lot and high-speed vehicular road (Al Wakrah Road) is the primary deterrent, isolating the reconstructed heritage district from the old fort and a mosque on the other side of Al Wakrah Road. The relative closeness of the old fort and a mosque on the other side of roads indicates some potential for generating a solid physical connection between the souq heritage district and the western areas of the Al Wakrah settlement. The **potential for additional links** to the west, as well as to the urban surroundings from north and south, **could effectively overcome the separations caused by modern planning transportation measures**.
- The initial picture of the figure-ground representation offers a deceptive impression of the large block sizes in the reconstructed souq area compared to the surrounding areas. However, closer examination demonstrates a relatively dense compact urban form in the reconstructed souq, in line with the original fishing village of Al Wakrah. Because of this, **there is a gap in the urban block pattern and hierarchy between the souq and the western sides of Souq Al Wakrah (surface parking lot) and Al Wakrah Road**.

What is the relationship between the form and the function in the souq today, and how does it related to its surroundings in the continuous urban fabric of Al Wakrah?

- The block size of Souq Al Wakrah encourages walkability due to the interconnected houses and narrow passageways easing the connection between the parking area and the promenade on the opposite edge. However, the **courtyard house typology does introduce some problems for circulation and wayfinding in the souq**,

especially in a north-south direction, due to limitations on visual fields between critical locations.

- The inward-looking urban form typology and limited visibility also generate a curious degree of **'hidden activeness'** for people in movement through the souq. They **can hear retail activities taking place but cannot see them** unless they actively elect to enter one of the courtyards where there are retail units.
- The typology of the most important streets in Souq Al Wakrah appears strongly connected to their urban functioning. The souq's main spines (along the coast and the parking area) are dedicated to dynamic functions to attract the users and generate lively active spines, especially the promenade itself. The same for the spine along the parking area appears to be adequate for the time being (see recommendations below).
- The land use pattern in Souq Al Wakrah is **an 'attraction-based arrangement** due to the clustering of retail types within the courtyard house typology, **as opposed to a 'movement-based arrangement** to enable retailers to take advantage of passing movement (primarily from the parking to promenade and *vice versa*). Retailers adopt spatial strategies (such as small, ground-based billboard signage) to compensate for these design issues. While the series of inter-connected courtyard houses do offer a collective sense of shared space, there is greater demand for more public activities and connections to the perpendicular routes in Souq Al Wakrah, which will allow greater visual connectivity and could introduce more vibrancy along the souq's main cross-circulation routes.
- The social aspect analysis of the souq highlighted human behavior and active spaces preferred by visitors. It identified the promenade as the busiest space in the souq with spine adjacent to the surface parking lot as the second busiest, perpendicular routes serving primarily as through-movement channels between the coast and

parking, and the north-south parallel, narrow passageway routes being the least active, quietest spaces in the souq. It demonstrates the issues arising from the **souq's lack of activities and active frontages along the internal parallel and perpendicular passageways**.

5.5 Reflections and Outcomes of the Study

The recommendations in this section for Souq Al Wakrah and Al Wakrah derive from the issues highlighted by the previous analysis in this thesis about the urban morphology of the souq and settlement. These recommendations consider the Islamic settlement's rules and regulations as articulated by Arab scholars discussed in the literature review. A set of planning conditions or principles discussed in the literature review relates to the political, social, philosophical, mathematical, and urban planning topics of this Islamic framework. Ibn Abi al-Rabi'a highlights the different fundamental elements of Islamic cities in creating their image and identity. The principal Islamic urban form elements are streets, souqs, mosques, and open spaces. These elements are considered with reference to the broader concept of connectivity. The proposal for new connections to the souq will be based on two scales. The first focuses on external connectivity (macro-scale), and the second is internal connectivity (micro-scale).

The proposed urban form aims to reflect the Islamic settlement's theme with the consideration of the demands for contemporary life. The implementation of the Islamic settlement criteria with the integration of contemporary needs could help to generate an enhanced urban environment for the souq – and Al Wakrah settlement in general – that influences user behavior, including the visibility, openness, and activeness of retail units.

5.5.1 External Connectivity

Because the souq is shaped linearly along the coast, the robust connectivity within its urban form can be seen clearly. However, the souq lacks contextual connectivity due to the urban typology of the souq and its surroundings in three different directions (north, south, west), even though the direct connection with the sea has been re-established and enhanced by the reconstruction. The dis-attachment is divided into several factors. One factor is evident in the contrast between the pseudo-traditional urban fabric of the souq and the immediate surroundings generated by the contemporary villa typology. Another aspect includes the souq's isolation from its nearby historic resources, including the fort and old mosque on the western side of Al Wakrah Road. This persists even though it is only a short walking distance from the souq, making it easy to reach a higher degree of connectivity. Generally, the surrounding land uses of the souq limit the use of the area for residential populations unless they make a specific decision to visit. The souq has great potential for enhancing economics and social areas within the overall Al Wakrah settlement (C. Caccam & Furlan, 2018). The isolation of the souq to the west caused by the high-speed vehicular traffic on Al Wakrah Road indicates an opportunity for a road tunnel running parallel to the souq area in this location, infilling the parking area with an extension of the souq based on the continuation of the elements shaping the elements of Islamic settlements. In other words, there is a need for a more robust physical connection between the souq and the western side of Al Wakrah Road. By extending the souq fabric further to the west, north, and south to introduce more links in the urban form, physical and social interaction of the souq with its direct surroundings would achieve a significant aim of reconstructing the heritage district in the first place. The generation of an enhanced

visual connections in the heritage site represents a tool to improve community connectivity related to the physical realm based on walkability (Alfaraidy & Furlan, 2017).

The distance from the edge of the souq to that of the old fort is only slightly more than 300 meters, which is a reasonable walkable distance. In-filling the areas in-between will allow for a more walkable and enjoyable environment for everyone between the fort and the souq. Green and shaded areas along this main route can further promote walkability, generate a comfort zone, and promote citizen well-being (Tannous & Furlan, 2018). The extension of the west area of the souq could be achieved using diverse design methods. Still, the best solution might be shifting the surface parking and a segment of Al Wakrah Road to underground facilities and implementing the Islamic settlement's sense of place by expanding the linear bazar continuation and plazas to the west. In-filling the urban voids and extending the street hierarchy and typology of the souq would further emphasize the traces of the original fishing village in the heritage district and preserve and enhance physical connectivity in the larger Al Wakrah settlement. Since Al Wakrah lacks a central square, the extension of the existing plaza could also offer a civic place for larger social gatherings, serving the souq and serving Al Wakrah itself for diverse cultural celebrations such as National Day. The generation of a central plaza in such a strategic location would, in effect, represent a new town center within Al Wakrah strongly related to the souq. The intersection of the Al Wukair Road and Al Wakrah Road possesses an exciting potential for generating a functional large-scale public space instead of a dead zone of parking lots. Also, since it surrounds one of the oldest mosques in the Al Wakrah settlement, it could contribute to the sense of civic spaces around the mosques in other Islamic cities of the world. While the northern part has

already been abandoned for pending a future regeneration project, such a strategy based on connectivity could enhance the relationship to the northern neighborhood. Finally, the southern part of the souq requires additional in-fill to complete the souq's language of the urban form for developing better cohesion of the urban tissue to the south (Figure 75).

Figure 74: A figure ground representation of a proposal for Souq Al Wakrah at the scale of (left) 2 km^2 and (right) 1 km^2 (Source: Author).

To demonstrate the implications, the researcher utilizes space syntax as a design intervention tool to model the proposed urban form and compare the integration levels between the proposed urban form and the existing situation. It is based on measuring differences in the number of changes of directions necessary from the souq to everywhere else in Al Wakrah in the before and after scenarios. Step-depth is based on the connectivity of all the internal streets and edges of the souqs to all other streets in Al Wakrah. This analysis helps identify the resulting enhancements for accessibility within the urban form at the level of the souq in relation to the surrounding context and *vice versa*.

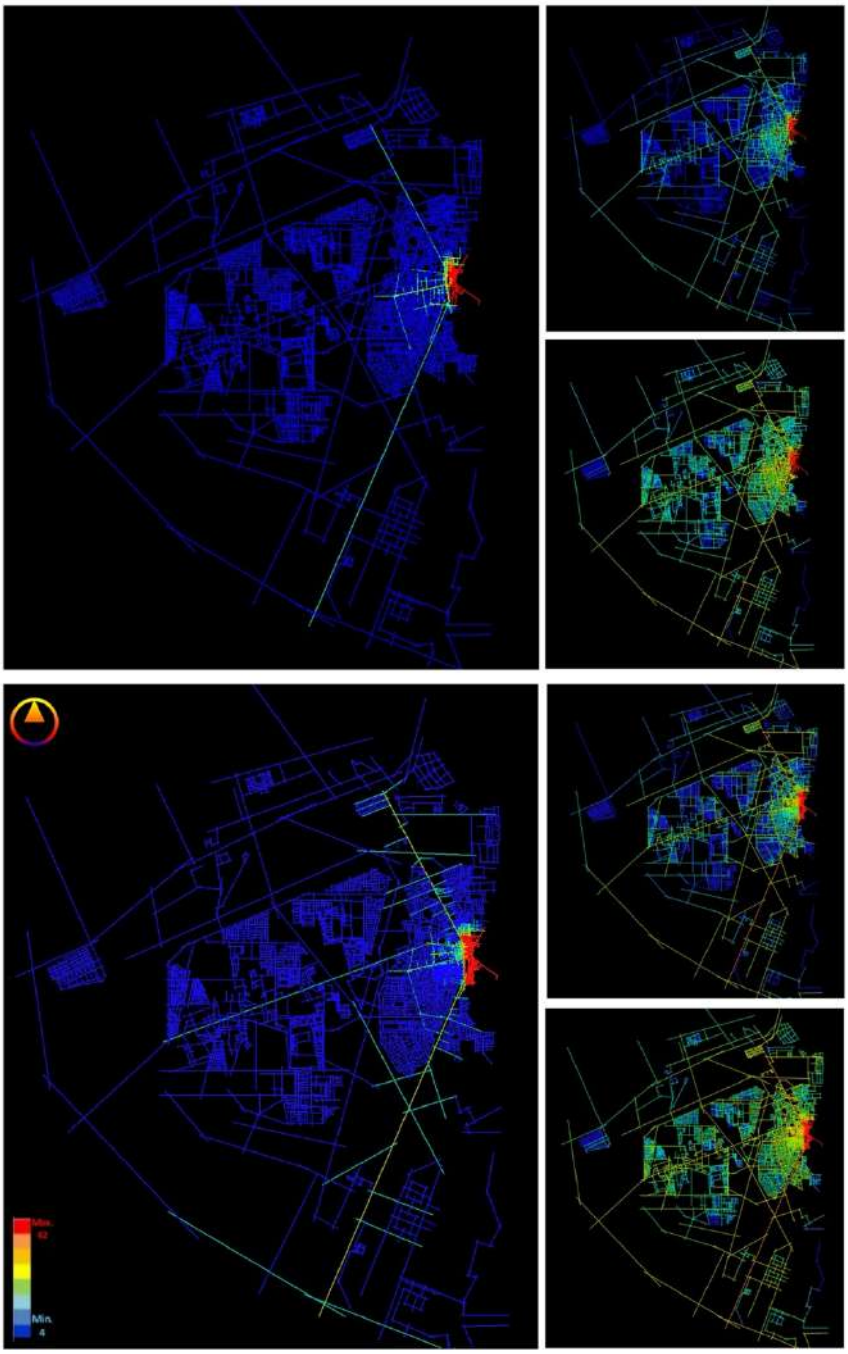

Figure 75: Space Syntax model showing step-depth analysis of (top 3) exisiting and (bottom 3) proposed (Source: Author).

The models above highlight the changes in direction, starting with the three changes of direction, followed by six, and finally, nine changes of direction. The existing urban form of the souq and Al Wakrah settlement within three changes of

direction highlights north-south connections, nominally in connecting Al Wakrah to Doha at the large scale. In contrast, the proposed urban form extends further in a west direction to reach all the way to Al Wukair Street. The proposed urban pattern demonstrates a higher degree of connectivity – and hence integration - in three directions, e.g., north, south, and west, compared to the existing situation. The comparison between six and nine changes of direction highlights additional changes with the proposed urban form, suggesting an opportunity for enhanced urban functioning within Al Wakrah settlements compared to the existing conditions (Figure 76).

5.5.2 Internal Connectivity

The morphological transformation discussed in this thesis highlighted the physical changes that occurred in the old core of Al Wakrah before the 1990s and the primary functional change from a fishing village to a reconstructed public heritage marketplace in the early 21st century. However, the urban form of the reconstructed souq maintained the courtyard house typology of the original fishing village, where the houses were transformed into retail unit clusters. One of the research's key findings was about the inward-looking nature of the urban form design in the souq, which resulted in the disconnected visual field defined in three different ways: point, line, and convex spaces. It occurs clearly in all of the routes of the souq (except for the promenade), generating the sense that many quiet public spaces compose the souq. However, many of these routes (especially the east-west ones connecting the parking and the coast) should reflect greater vibrancy and activeness for a public marketplace. The research recommends some strategic subtractions from the existing urban form by

eliminating some compound walls and opening courtyards adjacent to main routes to increase the visual field opportunities in movement through the souq (Figure 77).

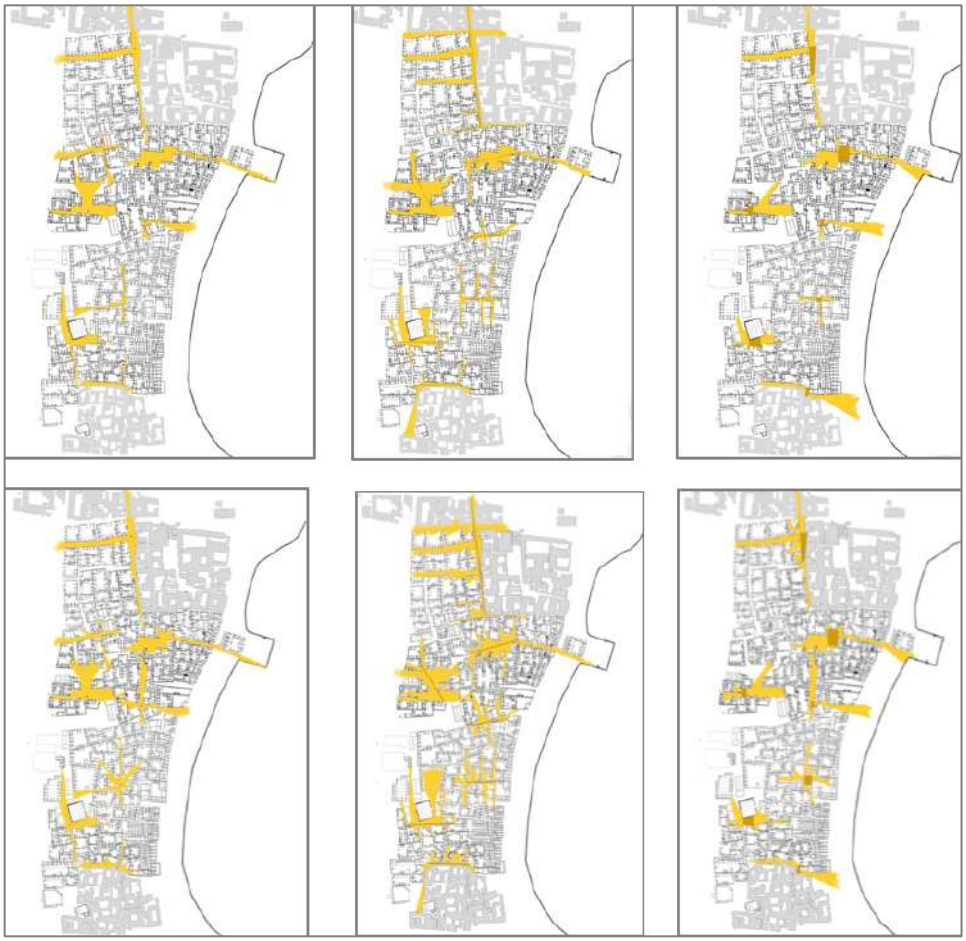

Figure 76: From left to right a visual field (in yellow) from a point, line, and convex space (in brown) in the plan of Souq Al Wakrah(Top) Existing (Bottom) Proposed. (Source: Author)

It will help promote greater connectivity in the public spaces of the souq and serve to assist retailers in economic terms by creating a more direct relationship between goods and visitors to the souq. It will also shape these routes into more vibrant passageways, enabling the courtyards to function as 'pause stations' for people on their way through the souq and operating more effectively as small plazas on which are

located the retail units. The shops will then be seen more regularly by visitors, and retailers will no longer have to rely on signage billboards to indicate their location and existence. It is not possible to convert Souq Al Wakrah into outward-facing blocks like Souq Waqif. However, it is possible to introduce a greater connection between movement flows and goods via enhanced visibility in the souq. The easiest way to achieve this is through strategic elimination of some compound walls, opening the courtyards to the larger souq, and (more or less) eliminating the phenomenon of 'hidden activeness' in the marketplace, so most people and goods in retail units are heard and seen by visitors. Figure 78 shows a comparison between the existing situation and the proposed layout of routes with more open courtyards operating as 'pause points.' The greater visual fields at crucial points to linear walking paths will encourage more time spent in the area browsing retailers' goods, strengthening the social network of the souq (Alfaraidy & Furlan, 2017).

Any remaining blank frontages will still generate quiet spaces for people only crossing the souq to reached the promenade in the absence of any attractive elements for users, especially at the entry points to the promenade and the drop-off area at the shifted landmark roundabout facing the hotels. Therefore, special attention in these areas could be required by adding temporary kiosks and designing additional sitting areas near the drop-off.

Figure 77: Before and after of the Souq Al Wakrah's main street layouts. Current situation (left), Proposed (right). (Source: Author)

Since the souq is some distance away from Al Wakrah metro station, a rapid public transportation bus link is necessary directly from the Al Wakrah metro station to Souq Al Wakrah. It will provide additional enhancement for connecting the souq into the larger Al Wakrah settlement. In the long-term, introducing a public transit system such as a tram network could further stitch together all parts of the souq, especially since many of the wide routes in the souq possess the width to accommodate a tram network. It could also help people (especially elderly and disabled persons) move between the spaces of the souq, thus further enhancing the walkability nature of a proposed expansion. However, the recommendation for the growth of Souq Al Wakrah to the west has much greater potential for a more dramatic effect on enhancing walkability in what would effectively become the new town center of Al Wakrah.

5.5 Avenues for Future Research

The findings of this thesis revealed the nature and dimensions of change in a historic settlement on the Qatari Peninsula by understanding the influences of changes and their consequences emerging during the growth of a settlement concerning its old core, whether existing or re-constructed as was the case with Souq Al Wakrah. This historical overview was tied to substantial data collection and analysis about the current situation in Souq Al Wakrah regarding urban morphology, blocks shape and form, land use, walkability and visibility, and the spatial context related to the social perception of a public place.

The study has opened a way to investigate other issues in more detail about Souq Al Wakrah and Al Wakrah settlement for future research endeavors. The thesis already addressed some of the problems. However, the research did not have the time or opportunity to explore the multivariate nature of some issues in detail since they were not the primary focus of this thesis. Developing more research on these issues in future endeavors should be a priority. In particular, this study focuses on the most central portion of Souq Al Wakrah. There is a need to examine the northern and southern portions of the souq when they are fully open and effectively operating in the future. It will be critical in establishing contextual relationships to the surrounding areas to the north and south.

A more comprehensive study (instead of sampling) of movement and space use patterns in Souq Al Wakrah would also be valuable for understanding the urban functioning of the souq. Investigation of the distribution from Al Wakrah metro station and the current and potential availability of public transit connections between the metro station and the souq would also be valuable. At the building level, the analysis in this study could be expanded by investigating historical examples of houses

transformed into hotels, boutique hotels, and restaurants in other parts of the Western Arab world. There is scope also to expand the use of space syntax for analyzing Souq Al Wakrah and Al Wakrah settlement, including examining angular choice options in the layout and the consequences of land use in segment analysis.

Finally, a more expansive understanding of human behavior and user perspectives could tie together via a canvassing of users' opinions via surveys to understand better what people think about Souq Al Wakrah as a heritage marketplace in the State of Qatar. In any case, the thesis has sufficiently demonstrated that the study of urban morphology could help us physically anchor our studies of the built environment in the real world, provide credibility to our research findings, and help generate design and planning proposals for such places into the future. It is the key to a better urban environment and a more economically and socially sustainable future.

5.6 Conclusion

The thesis focused on the morphological transformation of the Al Wakrah settlement over time, emphasizing the re-construction of Souq Al Wakrah based on the original fishing and its functions today. The study covered various aspects of urban morphology for the settlement, souq, the potential impact on urban functions, and the opportunities for design and planning enhancements. The research involved many elements such as historical evolution and change, block sizes, urban patterns, building and plaza typology, social and cultural impressions of users based on their use, land use and active/inactive frontage, and space syntax analysis, especially the evaluation of visibility in the souq. The key finding of the thesis was that the re-construction of the traditional urban fabric of Souq Al Wakrah is mainly successful at preserving and enhancing the historical relationship between the sea and inland uses in Al Wakrah. In

contrast, 1) the utilization of the courtyard house typology in the reconstructed souq is a little too faithful for the new use of the old core area as a marketplace, and 2) there is a disrupted relationship between the reconstructed souq and the larger urban context of Al Wakrah due to allocated provisions for moving and stationary vehicles. The study's findings identified the significance of morphological relationships for promoting walkability in the souq, even in the hot and harsh climate of the Arabian region. Based on the study's findings, morphological analysis can play a vital role in redeveloping historical sites. In the case of Souq Al Wakrah via its re-construction, this means preserving historical traces (specifically, route integrity and religious buildings size and orientation) to maintain cultural identity in a new development. The morphological analysis does not only help for studying the pattern of an urban environment over time but also can help generate design and planning enhancements affecting the future of a studied urban area.

The creative reconstruction of the old core of Al Wakrah represents an intelligent weaving together of cultural identity via traditional building types and urban forms to create remarkable public spaces. The reconstruction of historical urban fabrics is a worldwide phenomenon in pursuit of generating *genus loci* or a 'collective spirit of place' for traditional marketplaces as destinations for people to visit and linger. Similarly, Souq Al Wakrah was a small fishing village reconstructed into a destination marketplace for visitors, residents, and tourists. The redeveloping, regenerating, and (in some cases) rebuilding historical sites in Qatar is a viable strategy for disseminating a positive message about our citizens and who they are as a people to generate a global and regional brand and, thereby, further promote the quality of life in our cities (Al Raouf, 2017).

This study demonstrated that cities' cultural resources build a sense of belonging and identity among local communities. The promotion of cultural conservation and identity are critical elements for an inclusive city. Cultural preservation in urban public spaces fosters social inclusion and dialogue among diverse communities. Generating tangible and intangible heritage senses can be seen in the parts of a city's identity, which creates a sense of belonging and cohesion. Since culture embodies the soul of a city, we must reinforce cities' cultural assets and their heritage, providing a sense of meaning and identity for their inhabitants and the creative opportunities that enhance vitality and livability. Cultural assets should not be perceived as museum pieces but represent enormous opportunities for sensitive adaptation to an ever-changing urban environment. The recommendations of this thesis offer such an opportunity for additional modification of the now-existing urban fabric of Souq Al Wakrah as a cultural heritage district and marketplace today. Such changes could enhance the quality of public space to become a more connected and welcoming place for visitors.

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APPENDIX

Appendix A: The following papers related to the author's master's thesis were published, and accepted for publication:

Journal Papers (Under Review):

Khan, A.H., Major, M.D., Tannous, H.O. (forthcoming) "Tradition, Transformation, and Re-creation in Two Marketplaces: Souq al Wakrah and Souq Waqif, Qatar," *Habitat International*.

Conference Papers:

Khan, A.H., Major, M.D. (2021) "From Residential Village to Heritage Market Place: Evaluating Morphological Transformations and Their Use Consequences Over Time in the Historic Settlement of Al-Wakrah, Qatar," *56th ISOCARP World Planning Congress-Qatar 2021 Conference*, November-February 2021, Doha, Qatar.

Major, M.D., Tannous, H.O., Al-Thani, S., **Khan, A.H.,** Hasan, M., Salaheldin, H. (2020). "Macro- and Micro-scale Modeling of Multi-modal Transportation Spatial Networks in the City-State of Doha, Qatar," *56th ISOCARP World Planning Congress-Qatar 2021 Conference*, November-February 2021, Doha, Qatar.