THE USE OF BARAJEEL AND MASHRABIYA IN CONTEMPORARY ARCHITECTURE IN THE UNITED ARAB EMIRATES

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ABSTRACT

This thesis aims to examine the link between the traditional and contemporary architectural designs in the United Arab Emirates (UAE). It specifically investigates the uses of traditional architectural elements in the contemporary architecture. The thesis starts with a literature reviewing, which has concentrated on approaches towards the utilization of historic and traditional elements in architectural design since the 19th century revivalism. This is followed by a surveying of the main elements of the historic and traditional architecture in the Gulf Region, explaining two of the most prominent architectural elements: the *Barajeel* and the *Mashrabiya*, which are considered as the environmental and aesthetic elements all in one. In terms of the original functions of the elements, they were built to control humidity and air circulation in buildings, as well as aesthetic features on building facades. This is followed by information on historical and geographical aspects of the UAE. Based on this background information, case study buildings of contemporary architecture, which utilized *Barajeel* and *Mashrabiya*, are analyzed. Analyses includes brief information about the concerned buildings, followed by descriptions regarding the use of traditional elements.

This thesis reveals how the past constantly inspires the present and the future in terms of architectural elements, even if remains mostly confined to aesthetic related decisions. This indicates that no matter how developed the contemporary building technologies are, there is always a taste and demand in the communities that requires and motivates the use of traditional and historic elements, especially when there is a demand for the creation of architectural identity reflecting the history and culture of people.

Keywords: UAE; *Barajeel*; *Mashrabiya*; traditional architecture; contemporary architecture

Özet

Bu tezin amacı Birleşik Arab Emirlikleri (BAE)'ndeki çağdaş mimarlık örnekleri ile geleneksel mimari arasındaki ilişkiyi incelemektir. Tez özellikle geleneksel mimari elemanların çağdaş binalarda nasıl kullanıldığını araştırmaktadır. Tez literatür taraması üzerinden başlamakta ve önce 19. yüzyıldan günümüze kadar olan süreçte tarihi ve geleneksel elemanların mimariyi nasıl etkilediğini ve ortaya çıkan mimari stilleri kısaca gözden geçirmektedir. Bunun ardından Körfez Bölgesindeki tarihi ve geleneksel mimaride on plana çıkan elemanları ele almakdatır. Bu elemanlar, yani Barajeel ve Mashrabiya, hem işlevsel hem de estetik elemanlar olarak ortaya çıkmaktadır. Yani, bir taraftan binalarda doğal iklimlendirme sağlarkenü diğer taraftan da cephelere estetik görünüm kazandırmaktadırlar. BAE'nin tarihi ve coğrafik özelliklerinden kısaca bahsettikten sonra, bu ülkedeki geleneksel ve çağdaş mimari örnekleri üzerinde yapılan inceleme ile devam etmektedir. Ülkedeki farklı kentlerde seçilen örnekler üzerinden yola çıkarak özellikle Barajeel ve Mashrabiya'nın günümüzde hangi şekillerde kullanıldığı analiz edilmektedir. Bu tez, ağırlıklı olarak estetik çerçevede olsa da, tarihi ve geleneksel mimarinin günümüz mimarisinin oluşumunu etkilemeye devam ettiğinini ortaya koymaktadır. Bu ayrıca, inşaat teknolojisindeki gelişmelere rağmen, toplumların mimari kültür ve kimlik olusturma kaygılarının her zaman tarihi ve geleneksel elemanların kullanımı için bir motivasyon olduğunu ortaya koymaktadır.

Anahtar kelimeler: BAE, Barajeel, Mashrabiya, geleneksel mimari, çağdaş mimari

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CHAPTER 1

INTRODUCTION

Sociopolitical and technological transformations that has dominated since the Enlightenment and Industrial Revolution in the 18th and 19th centuries have introduced industry and machinery as an essential part of everyday human life. The emergence of new technologies has strengthened economies. Whilst new job opportunities attracted rural-urban migrations, since the beginning of the 20th century there has been unprecedented developments in the field of architecture and urbanism. The stages experienced by mankind in modern times can be summed up as: industrialization, urbanization, modernity, post-modernity and information. People accepted urban life and urban areas quickly replaced rural and nomadic areas where central administrative, educational and healthcare systems became easily available. This has also instigated modern life, relying on mechanization in production and daily life. The means of communication and media have changed the way of life even in around the world. Modern people started to live and produced in a different level compared to ancestors, which has also been evidenced in architectural production. Modern lines devoid of architectural expressions of the past has dominated the first half of the 20th century. However, starting from 1970s onwards, a longing for the past has emerged, which has influenced the direction the modern architecture has been moving. The postmodern era is characterized by the availability of means of communication, computer and information exchange. The whole world has become a "small village" whose members share information without being influenced by geographical and physical distance. Similarly, post-modern architecture aims for sharing information with the past cultures and traditions. In other words, it is the employment of the information of the past as a constituent for the creation of the present.

Humanity during the 20th century has witnessed many devastating wars that showed the vulnerability of the urban and human heritage in general to the destructive power of weapons and wars. With the disappearance of many archaeological buildings during the Second World War, people began to realize the importance of working to preserve the architectural heritage. Despite the impact of time, natural erosion and the impact of natural disasters such as earthquakes and floods, on urban heritage, the human impact on urban heritage was

greater. Technology has also contributed to facilitating the rapid urban development and the disappearance of many buildings and archaeological sites to make way for roads and large public and industrial projects. Ever since man's historical awareness of the past, the present and the future, he tried to record his present and preserve his past for the future. The urban heritage reflects the cultural identity of man: his past, his present and his future. With the continued cultural invasion of Western civilizations in the Third World, the preservation of cultural identity through the preservation of urban heritage has become a fundamental objective. Hence, post-modern era opened a new horizon, not only for the preservation of the architectural heritage, but also its employment in new architectural works as a symbol of cultural identity.

The urban heritage of the United Arab Emirates (hereafter UAE) has been greatly affected by the economic, cultural and social developments since the independence in 1971. For decades, before the discovery of oil, the local communities in the country has lived in a quiet and traditional life. This is well reflected in the characteristics of local architecture in the region and the contributions to provide a suitable environment for the local people to protect them from the extreme heat conditions of the hot climatic region where the country is located. Sustainable solutions, which is visible in taking advantage of the available construction materials, and innovative solutions for acclimatizing the buildings such as the use of *Barajeel* and *Mashrabiya*, is well reflected in traditional architecture of the UAE.

The economic boom generated by the discovery of oil in the 1960s has fueled sociocultural and economic transformation. This has been followed with a massive construction boom in the UAE cities as old cities have been modernized and dramatically expanded. Urbanization plans emerged aiming for the provision of comprehensive structures and infrastructure. Investments in construction have accelerated and especially Abu Dhabi and Dubai have become model cities and global players in the marketplace with their rapid urbanization (Dayeoub, 2015). The region has become a theater and experiment laboratory for architecture in which everyone tries to show his art and abilities. The buildings and facilities that are in line with the distinctive modern architecture of this era have been used.

Reinforced concrete, iron and glass have been used air conditioning systems have been adopted as a basic element of building acclimatization. The different architectural styles and

shapes imported from different parts of the world have been influenced by the nature of modern architecture and reliance on imported construction materials and systems. Thereby, as a natural consequence of the UAE's openness to the West without any reservations, Western values have come to change the architectural and planning style of cities across the country. As it has been elsewhere in the world where fast urbanizations took place, the rapid development of the cities of the UAE has led to the disappearance of traditional architectural heritage. Architectural styles that do not have the character and identity of the region have spread and found popularity in the growing cities. This phenomenon arose out of lack of awareness of the importance of a distinctive architectural character of the region as well as the prevailing instructions of the modern architecture. The latter has disregarded the inherent cultural features of the traditional architecture and placed all the emphasis in technological development in order to achieve an architecture commensurate with the requirements of the age and technological progress.

Although there has been a visible increase in the architectural projects since the independence of the UAE, 1972, the beginning of the millennium has been a milestone. Cities in the UAE especially Dubai and Abu Dhabi have become home of big architectural projects. Well-known architect group offices from around the world and local design studios have produced hundreds of various projects, therefore the growing cities in the UAE has provided space for the implementation of newly developing architectural ideas, construction, technologies and materials. Since the beginning of the new millennium and in line with post-modern ideas, there has also been variations in external architectural expressions, re-introducing elements of traditional architecture into new buildings.

1.1 Research Problem

The contemporary UAE architecture demonstrates varieties of architectural styles, visible on the volumetric expressions of the buildings. As a result of fast urbanization that followed the discovery of oil, and development of tourism which put cities like Dubai and Abu Dhabi in world map of architectural developments, various architectural styles found acceptance. Alongside global styles such as modernism, high-tech and de-constructivism, which found popularity around the world and do not reflect any cultural links, recently there have also been interest in creating external expressions using the country's traditional architectural features. Two traditional elements that gained popularity in contemporary buildings is the

Barajeel and *Mashrabiya*. This thesis documents and examines the ways traditional elements are employed in contemporary buildings in the UAE.

1.2 Research Objective

This thesis aims to investigate how the traditional architectural features have inspired the contemporary projects in the UAE. It specifically looks into the use of *Barajeel* and *Mashrabiya* though a selected set of case study buildings, built in various cities.

1.3 Research Questions

This thesis is developed along two key questions:

i. How traditional architectural elements gained significant role in architectural design in the UAE for promoting local and regional identity?
ii. How the traditional elements and motifs are utilized the architectural expressions of contemporary buildings in the UAE?

1.4 Research Methodology

This study aims to investigate how the traditional architectural features have inspired the contemporary projects in the UAE. In order to achieve the objectives of this research, this study deploys the qualitative research methodology. The research method used for the thesis is a combination of physical observations and documentation on case study buildings and secondary literatures. Case study method is particularly useful in situations where the target is to shed light on the 'how' and 'why' of phenomena, especially in situations where researchers have little control over the events studied, and in situations where the attention is directed to contemporary phenomena in a real-life context. The case study is appropriate when one is more interested in the links in time that unite elements, than in frequencies or incidences, especially when links are too complex for survey strategies or experimental strategies (Zainal, 2007).

The case study is also useful for learning from events that occur infrequently, such as investigating the effectiveness or usefulness of using traditional elements in contemporary architecture. This very rare situation would lend itself poorly to a sample treatment. On the other hand, a careful study of a precise reconstruction would make it possible to learn very

useful things, thereby; the case study method will be particularly relevant for the aim of the present thesis. According to Zainal, (2007), this inductive approach makes it possible to proceed with several case studies and compare them to detect recurrences and establish if modeling is possible.

1.5 The Sequence of Research

CHAPTER 1: This chapter introduces the research questions, aim and objective of the thesis.

CHAPTER 2: Since the beginnings of architecture in the ancient times, architects have explored ideas that led the development of volumetric expressions. In the preceding periods of history of architecture, architects joined forces to bring ideas from different sources such as nature, mathematics, arts, and human behavior in order to create models and spaces with complex and precise meanings. Different range of ideologies, cultures and tastes became influential in the evolution of architectural styles throughout history and during the modern era. In aiming for preparing the theoretical framework for situating the use of traditional elements in contemporary architecture, this chapter reviews the main architectural styles which draws ideas and features from historical and/or traditional architecture and became influential since 19th century to present.

CHAPTER 3: This chapter presents a literature review on the most characteristic elements of the traditional architecture in the Gulf region, in which UAE is a part. Two characteristic elements, *Barajeel* and *Mashrabiya* are reviewed extensively in order to understand their formations and uses in traditional architecture. This will aid in the subsequent discussion regarding their use in contemporary architecture, which is presented in case study chapter of the thesis.

CHAPTER 4: This chapter presents information regarding the historical and socio-geographical context of the UAE. It starts with a review on the socio-geographical aspects and continues with a brief review on the characteristics of traditional architecture in the country. Selected examples from traditional architecture are described. In aiming to prepare a background for the case study chapter that follows, the last part of this chapter presents visuals from contemporary use of *Barajeel* and *Mashrabiya* in contemporary architecture in the UAE.

CHAPTER 5: This chapter addresses in depth use of traditional elements in contemporary architecture of the UAE. It classifies both the *Barajeel* and *Mashrabiya* into two groups according to their typologies:

1) Functional
2) Aesthetical

As it will be seen in the case study analyses, because of the mechanical ventilation and cooling systems, pure functional use of these two traditional elements are not seen in contemporary architecture any more. On the other hand, aesthetic use for symbolic reasons is seen as the main reason behind their continuing use in new constructions around the country. Another feature that is used in the classification is whether they are used in new buildings in a revivalist manner, which results an architectural expression similar to the traditional use, or whether they are abstracted.

CHAPTER 6: This chapter presents the discussions and conclusion based on the findings of the research (Figure 1.1).

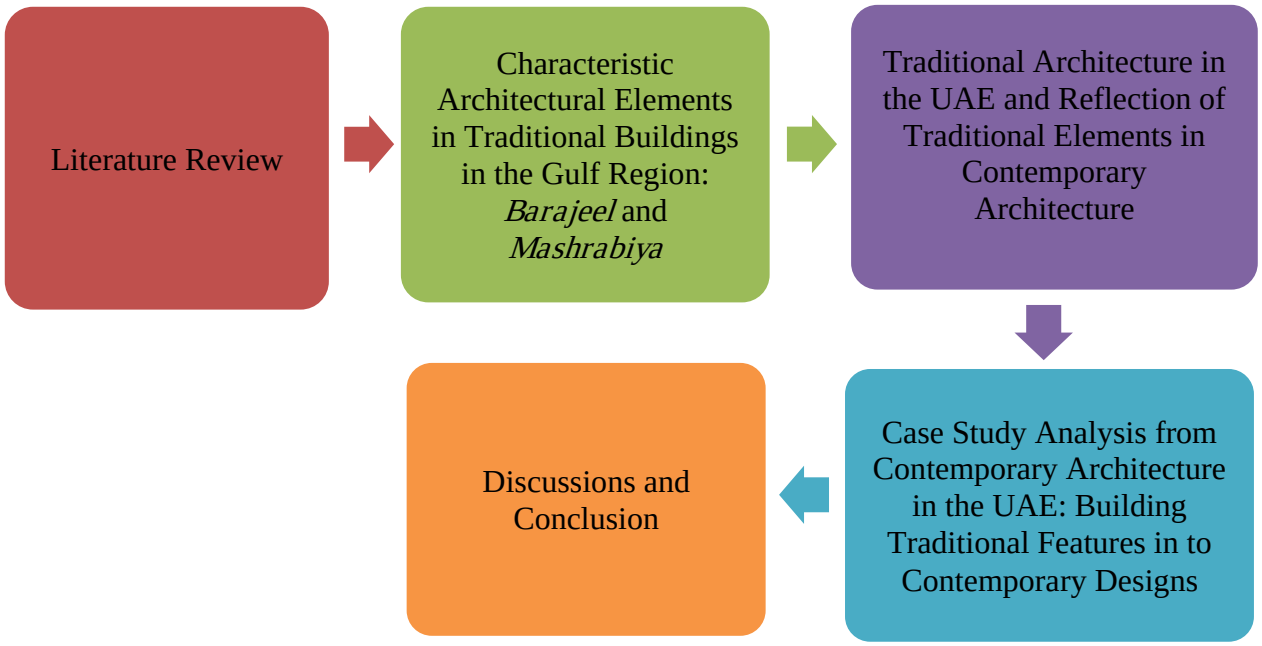


Figure 1.1: Schematic chart of the research (Koujan, 2018)

CHAPTER 2

LITERATURE REVIEW

Since the beginnings of architecture in the ancient times, architects have explored ideas that led the development of volumetric expressions. In the preceding periods of history of architecture, architects joined forces to bring ideas from different sources such as nature, mathematics, arts, and human behavior in order to create models and spaces with complex and precise meanings. Different range of ideologies, cultures and tastes became influential in the evolution of architectural styles throughout history and during the modern era. In aiming for preparing the theoretical framework for situating the use of traditional elements in contemporary architecture, this chapter reviews the main architectural styles which draws ideas and features from historical and/or traditional architecture and became influential since 19th century to present.

2.1 Revivalism and Eclecticism

Revivalist and eclectic architectural styles gained common ground in the West from the beginning of the 19th century until the first decade of the twentieth century. Revivalism aimed for the use of architectural features of a single historical period, whereas eclecticism echoes a combination of various styles.

The revivalist style of architecture has emerged as a response to proceeding architectural periods through which different elements of architectural styles such as Greek, Roman were used for the creation of architectural expressions that reflecting the chosen historical style. Revivalism emerged and gained popularity in late 19th century and early 20th century under the so called Eclectic Movement.

The revivalist approach to architectural design can be configured in several ways. One of them is to solve current issues using solutions from the past with modern materials. Another way is to build in the present using the techniques of the past. Trends and sub-tendencies, within this order, have no relevance. The revival concept itself absorbs the tendency or style to which it is ascribed, emerging even the mini-revivals, as is the case of the revivalist English architect Edwin Lutyens (1869-1944), that transcribes to the present moment.

Lutyens' architectural endeavors, as it is seen in some of his works, has led to the creation of a Neo-Georgian style (Adam, 2016). Hence, it is possible to find the emergence of a new style following a revivalist beginning. Direct Revivalism, as this term indicates, includes a series of design attempts that are often created in a certain fidelity to the parts of traditional styles. In other words, the copy cannot be easily differentiated from the original source (Jencks, 1991). Amongst the well-known buildings of revivalist architecture are the Palace of Westminster. And Tower Bridge in London. Both structures are examples of Gothic revivalism. Sir Charles Barry (1795-1860) designed the Palace of Westminster, which houses the British parliament, in 1834 (Figure 2.1). Tower Bridge, On the other hand is one of the later examples and it was designed and constructed in the 1890s (Figure 2.2).

Figure 2.1: Palace of Westminster (©Peregoy, 2016)

Figure 2.2: Tower Bridge, London (©Peregoy, 2016)

Eclectic architecture, on the other hand, although contemporary with revivalist architecture of the 19th century, aimed at electing, compiling or fabricating elements of previous architectural styles in a deliberate way to create a new work (Carroll & Meeks, 1953). Eclectic architects resorted to the preaching of global selectivity, praising selectivity as a synthesis of the ideas of earlier civilizations. Eclectic architects sought to blend old aesthetics in the crucible of contemporary scientific sources and industrial achievements.

Amongst the most famous architects of eclecticism is Louis Charles Boileau (Paris 1837-1910), who designed the Bon Marche building in Paris, (Figure 2.3). and was one of the first to use reinforced concrete; and Charles Garnier (Paris 1825 - 1895), the designer of the Opera House in Paris (Gyetvai-Balogh, 2007).

Figure 2.3: View of Bon Marche building in Paris, designed by Louis Charles Boileau (Bolileau, 1920)

As regards the aesthetic consequences, the eclecticism sustained in the defense of spiritualism, encouraged an exaltation psychology and morality of the individual conscience, and thereby enhanced the poetic of feeling and imagination. Idealism, subjectivity, spiritual freedom and humanitarian ethics are concepts that introduced by eclecticism, which survived during the 19th century and which gained wide expansion across the world (Gyetvai-Balogh, 2007).

As it has been noted earlier, eclecticism comes to be developed as a cultural style by virtue of the exercise of intellectual freedom of creative artists and the triumph of the poetic imagination. Eclecticism could not create new and original architectural designs as it is a transitory endeavor. One of the most suggestive and at the same time most controversial aspects of nineteenth-century architecture is that of eclecticism. It is a subject of its own controversies, because controversy is the very essence of the meaning of eclecticism (Carroll & Meeks, 1953). At the same time, the frequent error of naming the whole architecture of the nineteenth century eclectic, just as Romanticism called all medieval architecture Gothic, only further confuses the terms of the problem. On the other hand, the use of the term eclecticism with pejorative meaning, as synonymous with bad taste, has made this subject

something closed and lacking interest, without realizing that it is a historical-aesthetic phenomenon of critical importance that affected whole Europe during the last century (Carroll & Meeks, 1953).

2.2 Post Modernism

It should be noted that a major trend in architecture and urban planning of the late 20th and early 21st century clearly differs from the modernist trend which has had a profound impact on the period immediately preceding and which had voluntarily broken with previous traditions. Post-modern term is started to be used in 1945 in architecture. American architect Robert Venturi's house project, designed for his mother in the late 1950s, is considered the first post-modern building (Frearson, 2011). In this project, Venturi has reintroduced the elements traditionally used in house architecture, such as the gable roof and the arch framed entrance in a new way by stripping them of their original functions. According to (Frearson, 2011), the Vanna Venturi House has prepared the foundations for the entire Postmodern movement (Figure 2.4). Another key example from postmodern architecture is Portland Building, which was designed by architect Michael Graves. When the Portland Building was completed in 1982, it became an icon of postmodern architecture. It is as 15-story structure, which is embellished with stylized classical elements, including an oversize keystone and pilasters (Figure 2.5). These bold buildings ushered in a new, colorful era of design.

Figure 2.4: The facade of the Vanna Venturi House (©Smallbones, 2011)

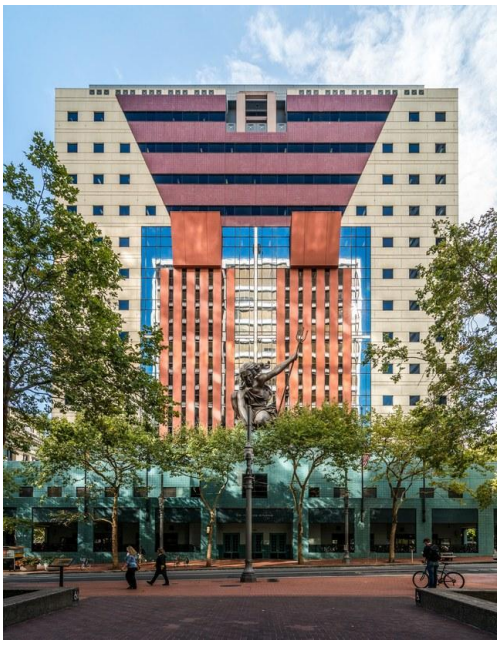


Figure 2.5: Portland Building, Portland, Oregon (©Stamp, 2016)

Post Modernism came to respond satisfactorily to the problems posed by the reorganization of cities and dwellings (Jencks, 1991). The term was widely marked by the work of Charles Jencks "The Language of Post-Modern Architecture" (1979), in which the author claims that modern architecture made of boxes of glass and steel, and was symbolically dead. Jencks opposes an architecture that, without excluding modernism, is open to the pluralism of styles, forms and references, in relation to the diversity of cultures. He also notes that, unlike the modernism that was formed in school and developed its charter (The Charter of Athens), the post-modernism has no school but expresses itself through a series of diverse tendencies such as the vernacular, the metaphorical, and the historicist. Jencks' way of thinking and his ideas have later been echoed by other architects.

According to the evolutionary tree prepared by Charles Jencks, 'Historicism' and 'Direct Revivalism' which gained new popularity in architecture starting in the 1970s, as part of the postmodern movement, shares in part the ideas of Revivalist and Eclectic architects of the 19th century. This overlap or fusion takes place in the tendencies that dominated ornament and postmodern classicism (Jencks, 1991). Jencks (1991) argues that direct revivalism is equivalent to the translations of traditional architecture to the current moment. As Jencks points out, there has been a paradigm shift in contemporary architecture. The new styles that

use the historical forms can generate attractive solutions, which can manage to be sensitive to the previous cultures and traditions.

One of the handicaps of modern architecture has been its alienation from anything traditional, historical and symbolic. Modern architecture gained familiarity around the globe, and turned into the so called 'international style'. However, modern buildings of made of steel, concrete and glass, has offered identical forms whatever their uses: housing, offices, services, businesses, even prisons occupy indiscriminate towers and bars which stress the notion of semantic reduction, the forms becoming autonomous of the meaning and losing their status of symbols to become abstract signs which can be understood only through the addition of a lexicon or abstract which breaks itself even with the concrete character of earlier designations (Steen, 2015).

This mode of modern architecture and urbanism is, first and foremost, conceived with the aim of endowing the economy with operating spaces that are functionally specialized and designed in a bureaucratic fashion, in the sense of the term. It is indeed this type of rationality that dominates: it explains the preference for the orthogonal syntax, the right angle and the straight line, for the naked raw material that do not hide any decoration or any added color, possibly except the white. The important use of glass must, for its part, respond to a desire for clarity, which is to be understood not only in its concrete physical dimension but also as a means of expressing and promoting the transparency of activities. The interior design of these buildings is also fully rational: each function has its own space and vice versa and everything that appears as not directly and pragmatically useful is excluded. All interior spaces are thus designated a particular function which it is desired that it is exercised with reference to the rules of ergonomics (Jencks, 1991).

In addition, the internal functionality of buildings refers to their layout: separate spaces are reserved for the four activities considered to sum up the whole human existence - to live, work, recreate and circulate - which leads to the creation of spaces mono-functional, separated from each other like scattered islands and connected by traffic axes, themselves ranked according to the types of uses and users. The composition is intended to be clear and unambiguous; often prohibiting any subsequent development and special appropriation, it is

designed to remain as it is and to remain unmodified - the rationality that controls it being conceived as certain and definitive (Jencks, 1991).

The postmodern architecture and urbanism that appeared more or less in the last quarter of the twentieth century is quite another figure, even if there are various illustrations of it before. Differentiation in terms of styles, references, eras and all local specificities is the major characteristic of post-modernism. Postmodernism thus rediscovers many architectural archetypes: the column and the pediment, the hipped roof and offset walls. It borrows as much from the architecture of Palladio as the strip of Las Vegas and does not distinguish between scholarly compositions and popular forms, sacred references and commercial inspiration (Jencks, 1991)

2.3 Critical regionalism

The architectural regionalism dates back to the first half of the 20th century. Critical regionalism is an architectural approach that aims to reverse International Style's lack of identity, while at the same time it rejects the ornamental approach of postmodern architecture.

This architecture draws its inspiration from the popular architecture of the place. It uses the identity of this architecture, anchored in a territory, to give it a cultural dimension it is this aspect that is particularly sought after in regionalism, sometimes to the detriment of the relationship with the environment. Regionalist architecture can be considered as close to the vernacular because it is one of the few that promotes the cultural dimension of a building (Wu, 2006). One of the drawbacks of this architectural trend is perhaps the fact that it has given rise to a stereotyped architecture focusing on form and appearance rather than the essence of architecture (Figure 2.6).

Figure 2.6: Bait Ur Rouf Mosque, Dhaka, Bangladesh (2016), designed by architect Marina Tabassum (Tabassum, 2016)

According to (Frampton, 1983), reactions towards the ‘regionalism of restriction’ has given birth to "regionalism of liberation". It is the manifestation of a region which is particularly suited to the nascent thought of the time. (Frampton, 1983) argues that an event or creation is called "regional" only because it has not emerged elsewhere. The genius of this region comes from being more conscious and freer than usual. Critical regionalism is less a particular style or ideological tendency than an effort to resist.

The term "critical regionalism" does not represent the vernacular, formerly produced spontaneously by the combined interaction of the climate, the culture of the myth and the craft industry. According to Paul Ricoeur (quoted by Frampton, 1983. one can speak about a paradox concerning the idea of local regionalism: ‘indeed, there is regional culture and universal civilization; but we cannot speak of pure regional culture, because it is an integral part of world civilization.’ Critical regionalism seeks to be the synthesis between regional culture and universal civilization. According to (Frampton, 1983), it translates into a form of dialectical expression, a reflection. Critical regionalism is thoughtfully seeking to destroy universal modernism in terms of locally cultivated values and images while altering local elements with models from foreign sources.

At the end of the 19th century, a civilization on a universal scale is emerging but is far from blossoming everywhere in a uniform way. But what is common to all countries is the same conception of space, corresponding to the sensitivity of the period as well as to its turn of mind (Jencks, 1991). The common characteristics of a "universal" architecture are reflected in the design of space, the interaction of volumes in space and the interpenetration of outer and inner spaces. Another major factor that can be found in any contemporary "quality" architecture is the concern to respect the climatic and geographical conditions of a given region by not considering them as obstacles, but as stepping stones for the artistic imagination (Frampton, 1983).

For architectural historian and critic Siefried Giedon, critical regionalism translates into architecture by adapting to climatic and social data, not by an imitation of the forms of the past, but by a deep kinship (Kousidi, 2016). The reference to the past becomes creative only to the extent that the architect is able to grasp the deep and exact meaning of this past. Kenneth Frampton in his reasoning strives to identify the different schools of regional thought in their process of re-interpretation. It highlights their ability to recreate a new regional tradition while absorbing foreign influences at the level of culture and civilization. This can be achieved by, among other things, the appropriate exploitation of our current technical capacity related to various parameters specific to the local architecture. According to Frampton, "topography, context, climate, light, tectonics, touch can be interposed between the impact of universal civilization and the elements that directly describe the particularities of a given place. Here are some thoughts and works of architects from all over the world, sensitive to the problem of architectural identity that illustrates this idea (Kousidi, 2016). states that projects must be able to evoke the dreamlike essence of the site and thus awaken unconscious images of thought. The process of "creation of the place" refers to the existing one including the geographical and social parameters. An architectural proposal whose objective is to go deep, seeks to be more than a passive materialization.

Vernacular houses have been built around the world and have a wide variety of forms from one geo-climatic zone to another. There are steep roofs in areas of heavy rainfall, flat roofs in dry climate areas, overhanging roofs in wet areas and roofs without overflow in dry areas, small holes in walls in cold areas and hot and almost nonexistent walls in moist heat zones. Houses driven into the earth in extreme temperature zones and others raised above ground

level in hot, humid areas. If determinants such as roof slope, roof overhang, the proportion of penetrations and the level of the pedestal relative to the ground level are taken into consideration, it is seen that the visible envelopes of the houses are very different from each other in different geo-climatic regions. It is possible to observe in different climates how the strength and frequency of precipitation strongly influences the slope of the roof. As a result, in climatic zones with heavy rains or snow, there are steep roofs and in those with weak or very light rains flat roofs can be found. Departing from the geo-climatic conditions and locally available materials, critical regionalism has generated works of architecture which are in harmony with regional characteristics. Amongst the most popularly known regionalist architects is Hassan Fathy, an Egyptian architect who strongly favored use of locally available materials and construction techniques as opposed to imported Western architectural styles and technologies (Figure 2.7- 2.8).

Figure 2.7: Hassan Fathy's New Gourna Village in Upper Egypt, c.1945

(Fathy, 1945)

Figure 2.8: Mosque at Hassan Fathy's New Gourna Village in Upper Egypt, c.1945 (Fathy, 1945)

2.4 Symbolism

The changes and transformations that occur in the language of architecture can obscure, reinforce or confuse meanings in the physical environment, but the basic symbols that can be read through time and history are fixed and stable (Jencks, 1991). As a result of the continuous attempts and competition between architects to distinguish from each other and from the others and because of the absence of the impact of architectural committees in the provision of a unified character of the city or even at the level of residential neighborhoods, the residential and commercial neighborhoods have become a large mixture of symbols and messages that impose itself on the citizen daily through their presence In the field of visual vision of the day to deal with the neighborhoods and streets of the city. It is therefore necessary to know how to read the surrounding physical environment in the right way so that it can be assessed and judged.

The Grays is a designated group of architects, federated around the refusal of modernist functionalism of the years 1920-1930. The group consisted of Robert Venturi, Charles Moore, Robert Stem, Aldo Rossi, Oswald Mathias Ungers, Ricardo Bofill and Hans Hollein, all rejecting the 'white style' in favor of historicist styles. They have promoted an evocative, meaningful architecture, employing symbolic ornamentation and explicit "denotative" symbolism (Jencks, 1991). The elements of this symbolic language consist of architectural motifs belonging to vernacular and historical traditions.

Historicism and symbolic eclectism has introduced into the field of references of the building a variety and pluralism, which characterizes the postmodern spirit. This language integrates the whole of the aesthetic-architectural repertory with the metaphor, ornament or polychrome to make them the vectors of meaning. Symbolism draws its motives from the historical past, but also from local traditions, notably constructive, and vernacular styles. An example is the Children's Museum of Houston, (Figure 2.9). Designed in 1992 by architects Robert Venturi and Brown Scott. The project combines a characteristic variety of means of expression. The architects are inspired by the materials, shapes and images.

That have marked the traditional folk imagination. It incorporates into its language a vernacular symbolism, which allows it to inscribe its building in the urban environment (Jencks, 1991).

Figure 2.9: Children's Museum of Houston (©Mark Scheyer, 2014)

CHAPTER 3

CHARACTERISTIC ARCHITECTURAL ELEMENTS IN TRADITIONAL BUILDINGS IN THE GULF REGION: *BARAJEEL* AND *MASHRABIYA*

This chapter presents a literature review on the most characteristic elements of the traditional architecture in the Gulf region, in which UAE is a part. Two characteristic elements, *Barajeel* and *Mashrabiya* is reviewed extensively in order to understand their formation and use in traditional architecture. This will aid in the subsequent discussion regarding their use in contemporary architecture, which is presented in case study chapter of the thesis.

3.1 Barajeel: A Functional and Aesthetic Element in the Traditional Architecture in the Gulf Region

Architecture is usually an outcome of culture, climate and tradition put together. The needs of people and communities are what shapes traditional architecture and helps it take the path to satisfy these needs. Traditional architecture was environmentally suitable and provided what is called realistic solutions for social and environmental issues. Due to the prominent need for natural ventilation at a time where no advanced technology was available, *Barajeels* were invented for regulating air circulation and humidity, hence improving indoor thermal comfort (El- Shorbagy, 2010).

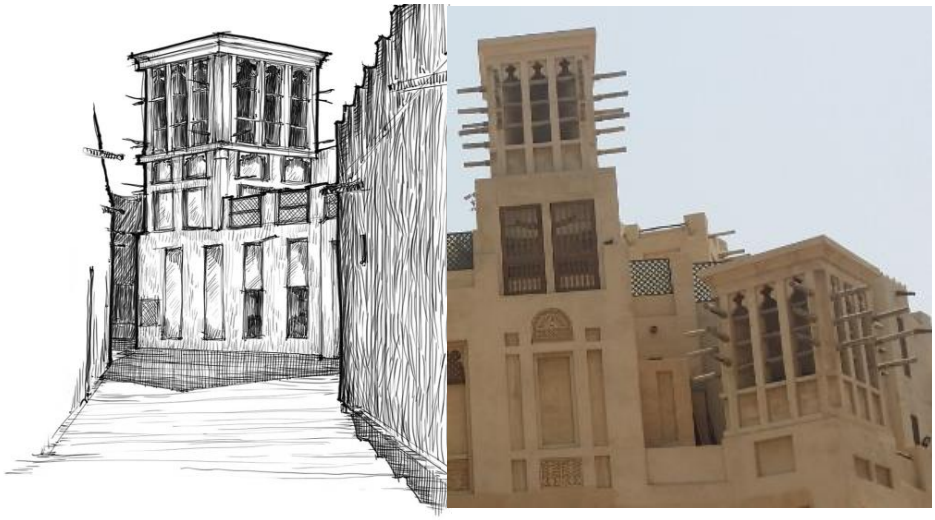


Figure 3.1: Sketch and photo of *Barajeel* in traditional houses in the UAE (Koujan, 2018)

Although there are various descriptions for the *Barajeel*, it is widely accepted that it is a structure the catches wind and pulls it down the shaft into the space which is required to ventilate (Shalbaya, 2011). *Barajeels,* which are in the form of rectangular architectural structures placed on top of buildings, range from a height of 2-20m (Figure 3.1). They are 'placed on top of buildings according to location, that specifies the height since the higher the tower the faster the wind and the less dust is collected' (Ghadir, M et al., 2011).

Figure 3.2: Storages with wind catchers in the city of Naeen (Yazd, Iran) (A. A'zami, 2005)

Barajeel is believed to have originated in Iran and date back to 1500 years ago (Figure 3.2). Afterwards, it made it all the way to Egypt and the Arabian Gulf (Table 3.1). The *Barajeel* have been common in Egypt since before the 11th century, where they were called *Malqaf*. Theyare still being used in Iraq and in many other Arab countries. After the 11th century and in the 12th and 13th centuries hardly any house was seen without *Barajeel* in the construction. Some of them were simple, while others were large and extensive. Sometimes they were decorated elaborately for the mere purpose creating an impressive structure. 'They have been a vital element of traditional architecture in Gulf region' (Dehjani-Sanij, 2015).

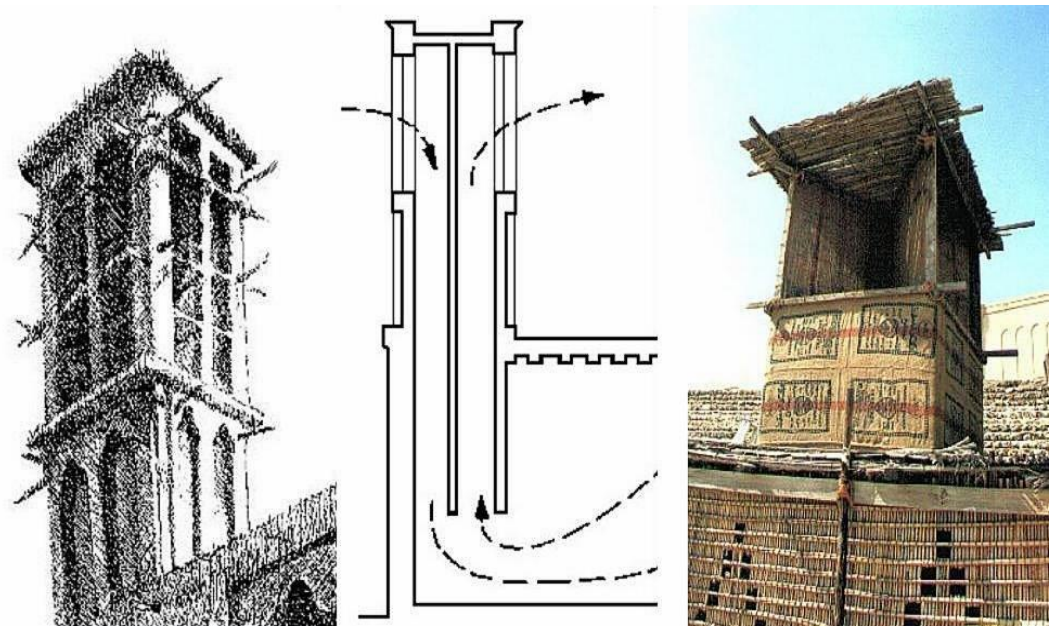


Figure3.3*:* *Barajeel* in the United Arab Emirates (Gari, 2008)

The main purpose of integrating the Barajeel system is to improve indoor ventilation and keep air circulated inside houses. 'In order to achieve the proper function of the *Barajeel*, the height, proportion and wind direction have to be taken into consideration in order to avoid the warm air and dust entering through the cooling device' (Dehjani-Sanij, 2015). Hence, the *Barajeel* can be considered a sophisticated device, designed to cope with direction changes of prevailing winds (Figure 3.3). It is known that winds coming from the direction of land are dry and hot whilst the winds from sea are cool, strong and humid (Damluji, 2006). Countries in which *Barajeel* have originated and gained popularity are

categorized into two main types of climates. ‘They are either hot and arid like Iran and Iraq, or highly humid like countries in the Arabian Gulf’ (Shalbaya, 2011).

It is noticeable that the *Barajeel* have not spread in the Arabian Gulf as much as they have in the UAE and Bahrain, where they represent the main traditional architectural elements.

Table 3.1: Traditional *Barajeels*, used in the Middle East (Dhegihan - Sanij, 2015).

Types of *Barajeel* (Wind Towers) in various countries	 Iran’s arid zone	 Persian gulf	 Egypt
Climatic zone	Hot and dry	Hot and dry	Hot and dry
Shop of cross - Section	Square / Rectangle Hexagon, Octagon	Square	Rectangle
Ceiling of the Wind Tower	45 Slope	30 Slope	30 Slope
Ventilated Area	Dining room and basement	Dining plus other	Dining plus other

Barajeel is not only a traditional architectural style known to the Emirati people, it is in fact an integrated visual language that flirts with air and words flying in space to tell the stories of early masons and their creations to get pure air and natural and healthy ventilation. For the purpose of this, the high summer heat of traditional household residents before they know the "air conditioners" and the modern refrigeration means is one of the expressions of the originality of the population in their organic connection with the local environment by linking construction to nature. The features of local architecture in the UAE are clearly visible in buildings constructed decades ago, as simplicity is the general character of these buildings characterized by an identity that is associated with the taste of society, people and

ordinary architects, and reflected an important aspect of the life of this people, whether it was or not, expressing social life of traditions and customs, in addition to being suitable for the local environment in all its aspects. In the past, Emirati people have been keen to employ architecture in building their home for basic purposes, including protecting them from the difficult weather conditions in the region, in addition to preserving the privacy of family life, customs and traditions, while using the decoration and vocabulary of Islamic architecture to improve the aesthetic aspects of the buildings. Because there were no external windows looking over the streets, wind catchers helped in ventilating the indoor spaces (Brown, 2009).

3.1.1 Functional and Formal Typologies of *Barajeel*

Barajeel are divided into 4 general types. The first type is the one-sided through which wind comes in one direction. It is usually short and simple, used in dusty areas. This type is found in cities where wind blows in certain directions, especially near the sea where the prevailing wind would be transferred into cool air inside the houses (Figure 3.4). Secondly, the two sided *Barajeel*, are more efficient as they allow more air flow and circulation through. The third type of *Barajeel* is the 4, 6, 8 sided tower. They are mostly seen in desert climate cities like Yazd in Iran. They are taller than the other types, they are also more complex and sophisticated, yet more beautiful.

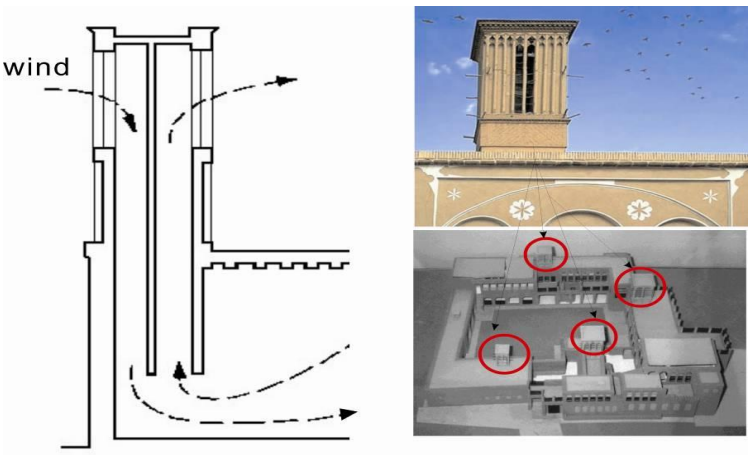


Figure 3.4: Section and photo of Barajeel from the Middle East (Bahadori, 1994)

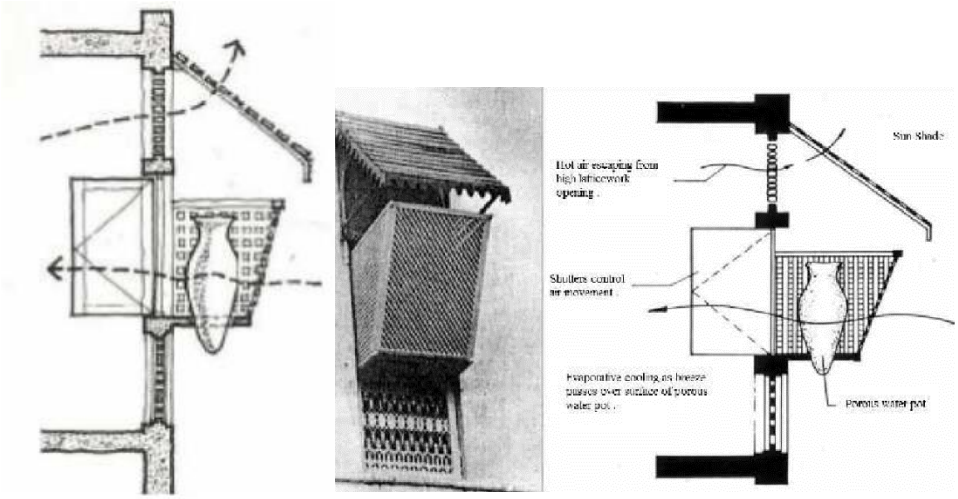
The fourth type of *Barajeel* is that of cylindrical nature, but that one is rarely used in the Gulf region. Just like the previous type it is a complex structure with aesthetic qualities, usually used in large buildings, especially in public buildings. Apart from functional typology, *Barajeels* can also be classified according to being either operational or decorative. 'The former being the regular cooling device and the latter is a cooling device with the ending closed, making it purely aesthetic' (Dehjani-Sanij, 2015).

Figure 3.5: *Barajeel* with dual slot and multi slot (Bukhash, 2003)

There are two main types of *Barajeel* used in the UAE (Figure 3.5). The first one is the *Husn*, which is a four sided, and multi-directional wind catcher. The second type is the *Barj*, which is a one sided model. Both of these models are prismatic. They are placed on top of the building, 'rising up from 2-20 meters, depending on the location of the building in order for it to capture the most wind' (Dehjani-Sanij, 2015).

3.2 Mashrabiya: A Functional and Aesthetic Element in the Traditional Architecture in the Gulf Region

The origin of the word is ‘sharab’ in Arabic, which is translated literally as ‘to drink’. This is coming from the original use of the *Mashrabiya*, when it was a place in which drinking water was stored. Some may argue that the origin of the name could be ‘*Mashrafiya*’ translated literally as ‘to observe’, hence another function of the structure, where it served that purpose through the small opening of the lattice grid (Figure 3.6) (Fathy, 1986). The origin of the *Mashrabiya* was a small lattice balcony, structured to be used for storing water containers. Due to the air circulation through the lattice openings it would keep the water cool. Later, it has evolved into a lattice screen consisting of a close knit of geometric patterns in defined shapes with defined dimensions, serving the same purpose of ventilation and air circulation, as well as allowing light to enter indoor space behind *Mashrabiya*. *Mashrabiya* gained popular use in Islamic architecture since the Mamluk period in the 13th century onwards. It has been popularly used in the Middle East ever since (Fathy, 1986).



Figures 3.6: Sections and photo of *Mashrabiya* (Dayyoub, 2001)

As the study of comparing and contrasting the literal translation of the most common traditional names that has been used for this traditional element reveals, ‘al-rawshan’, ‘al-shanshool’, and ‘al-mashrabiya’ , varying in different locations in the Middle East (Table 3.2). The theory behind the Egyptian name is either , a place to store the drinking water pots as previously mentioned or ” mashrafiya, which derives from the verb Ashrafa with

the meaning of "the place to overlook or observe," most likely from a higher stand or position. (Fathy, 1986).

Table 3.2: The Various Name of *Mashrabiya* around the World (Al Othman, 2017)

The Name	The Countries
Mashrabiya	Egypt, Syria, Palestine, Lebanon, Sudan, Australia, Spain, Peru …
Roshan/Roche	Arabian Gulf Countries , Iran
Shanshol	Iraq
Jali	India, Pakistan, Bhutan
Aggasi	Bahrain
Takhrima	Yemen
Mushabek	Iran
Barmaqli	Maghreb Countries
Cumba	Turkey

3.2.1 Functions of *Mashrabiya*

It is generally accepted that *Mashrabiya* has 4 climatic functions:

1) Regulating the amount of light, which enter indoor spaces
2) Regulating air movement
3) Cooling down the indoor spaces
4) Help in decreasing the humidity levels in indoor spaces

It also has a social role for providing privacy for the household, especially the female folk. For effective *Mashrabiya* design, the spacing of the lattice pattern is important. Also, it must relate to direction the structure is facing. Hence, the cardinal points are taken into consideration whilse designing and situating it. By doing so, the quantity and quality of light and air coming through it is well controlled. When facing the south direction, obviously light is the major issue to deal with for the design of that facade. Light consists of two parts, the direct light hitting the surface in an almost perpendicular angle, and the glare from the excessive amount of light entering a room. The direct light generates heat as it touches the objects and walls of a space, therefore heating up the space in general. The glare is unwanted in the interior space as it hurts the eyes. In order to avoid both problems, various *Mashrabiya*

designs have been invented and used in the past. According to the practice, when the pattern design of consists of smaller voids the light and the less entering the indoor space is much better controlled. This has a positive impact on cooling the indoor space as well. It is also known that another precaution to prevent glare is to keep the balusters closer to each other, especially when they are at eye level (Fathy, 1986).

When facing the north façade of a building, larger lattice patterns can be used because there is no risk of glare in this direction. In this case, the balusters can also spaced apart from each other (Fathy, 1986).

A standard *Mashrabiya* is made up of two parts: the bottom part is made up of fine balusters and the top part consists of the lattice pattern. If the size of the lattice pattern is small, this situation constricts air and light flow (Figure3.7). Then the size of the *Mashrabiya* would extend as far as the wall would go to increase light and air penetration. As mentioned earlier, the lattices have predetermined size and spacing, depending on the surface exposed and how much air is to pass through. Therefore, if the space is larger than the baluster, there will be more airflow and more ventilation. However, having larger balusters allow more humid loaded air to penetrate indoors, a situation which is needed to be well controlled (Fathy, 1986).

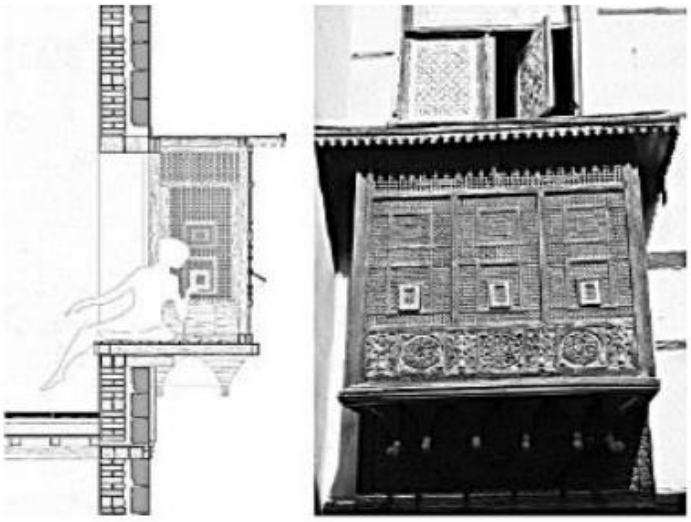


Figure 3.7: Section and façade view of a *Mashrabiya* (Ficarelli, 2008)

As mentioned above, alongside the physical benefits, the *Mashrabiya* also has a social benefit, namely the privacy. It allows the user a view while maintaining privacy with certain seclusion from external world. The view would be limited in a way, but the user would be

benefiting from the social privacy s/he is gaining. Although its functional use has diminished with the invention of mechanical ventilation and cooling systems, its aesthetic factor encourages its use in the present time. Hence, it is used conceptually in contemporary architecture and interior design projects, aiming in maintaining culture and preserving tradition in contemporary buildings. According to Fathy (1986) 'it is also commonly abstracted and used in façade designs and double façade treatments in modern buildings.' Conceptually it has been used in the design of contemporary buildings in the UAE, which is investigated in the following chapters of this thesis.

3.2.2 Design of *Mashrabiya*

The design of the *Mashrabiya* is mainly generated from geometric shapes used in the design of arts and craft in the past. The openings in the lattice design vary according to the functional requirement, especially on the direction of the façade that this element is installed. As mentioned earlier, the smaller the openings the less light and glare is allowed into the room. On the other hand, bigger openings allow more air circulation (Figures 3.8 - 3.9).

Figure 3.8: *Mashrabiya* design and production (Luxy Crafts, 2011)

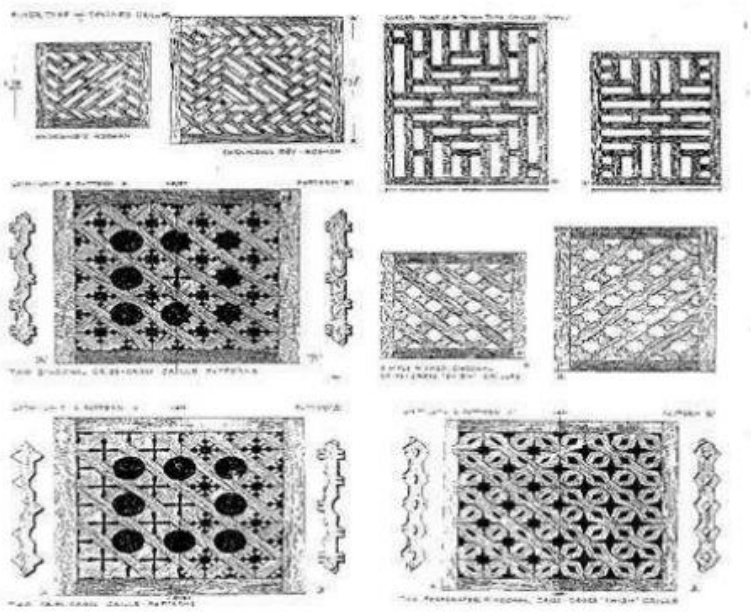


Figure 3.9: Various designs of lattice work (Jean, 1976)

3.2.3 *Roshan:* A *Mashrabiya* Model Characteristic to the Arabian Gulf

The *Roshan* has been one of the unique aspect of traditional architecture in the Gulf region, especially in Jeddah and Hijaz in Arabian peninsula. It is a type of *Mashrabiya*, with a difference that it gives the appearance of a full façade: it runs in front of the street facades of the rooms on the first floor or above and extends over the street or inside the courtyard of the building. They are frequently used in traditional palaces and houses and have been used in the cells and hospital

Figure 3.10: A façade with *Roshan* (King, 1998)

The word *Roshan* is derived from Indian word " Rushaadan " mening the source of light. nd it is associated with clerestory windows near the ceiling (Al Shareef 1996; Al Jofi, 1995). Its most characteristic feature is it runs along the façade from floor to the ceiling of the upper stories.

Roshan has been the most characteristic aspect of traditional Architecture in Hijaz and Jeddah due to its important benefits, which are:

1 Privacy of the houses : The *Roshan* can let the people inside the houses to see out of it without being seen .

2 Thermal insulator : The *Roshan* also work as thermal insulator as it is made of wood which reduces heat transfer from outside to the house, and keeps the temperatures low.

3 The flow of air in the interior spaces is governed by the openings and apertures in the various kinds of *Rawashin*, as well as the *shish*, which act as layers of filters for both the air and the dust.

4 Control of the desired amount of light: *Roshan* regulates the entry of light and brightness into the interior spaces and solve the problem of glare. Also amount and proportion of light can be controlled by closing and opening the shutters of the openings, regardless their various kinds Harir, (1991).

The construction of Roshan:

There are different shapes and sizes of *Roshan* with various levels of heights, seen on the facades of traditional buildings in the Gulf region (Figure 3.10). The traditional *Roshan* is assembled from identical parts and units sourced locally, so that the side panels have one standard height, which also applies to the front panel. There can be slight variations both in the production and in little details.

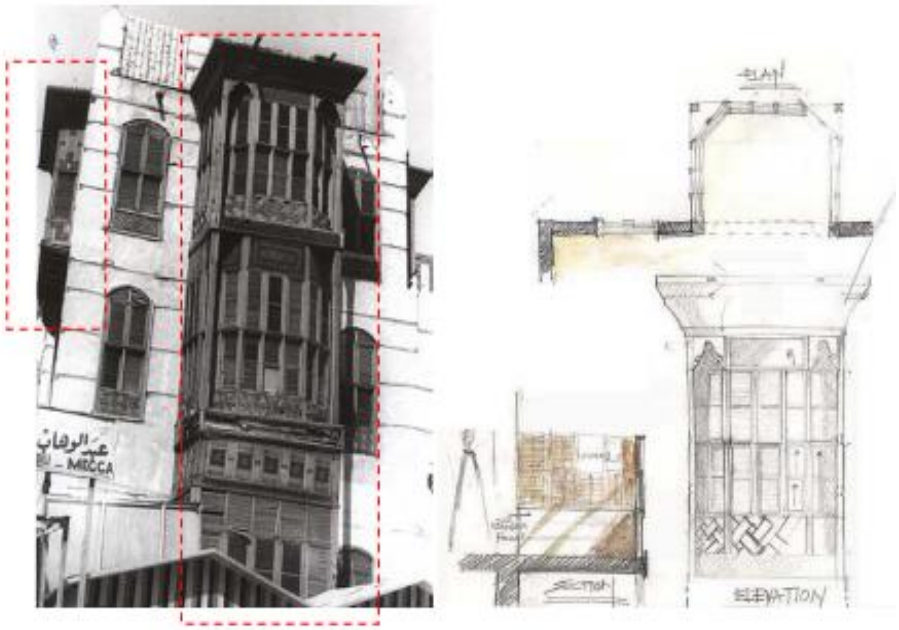


Figure 3.11: Roshan as a continuous element on the façade (Al Murahhem, 2008)

Hariri, (1991) has argued that generally 'the width of the side panel should be equal to the distance between the uprights that divide the panels of the Roshan'. According to Taha, (1984). The interior division of the vertical board has to be accurate and well adjusted. Taha, (1984). Also states that it is divided into a number of vertical parts and horizontally a symmetrical design is aimed to be achieved (at least in most cases). Vertically there is no need for being symmetrical because of the variations in the constituting elements and their functional role (Figure 3.12).

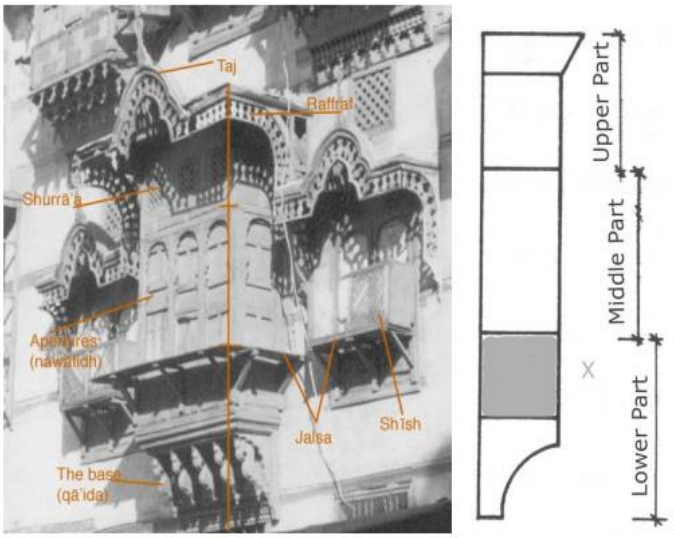


Figure3.12: Construction parts of Roshan (AL Murahhem, 2008)

Roshan consists of three significant parts which makes it both functional and aesthetic:

I. The first part: lower body

It is consisted of two sections: the support, which is also called as the *da'ama* and the base, which is also called as the *qa'ida*, (Figure 3.11). This lower body can be treated with decorations on the external surface and left plain on the inner surface. The reason for the latter is to create a harmonious appearance with the interior walls of the room. From inside of the room it looks like a cover resting on a frame, and this part of the room is usually used as a sitting area. The area between the floor of the roshān and the lower panels may be covered with horizontal panels varying in height between 40 and 50 cm. According to Hariri (1991), this frame forms a ergonomic height for supporting the back of persons sitting there, while at the same time allowing them with a clear perspective towards the external world, usually to the street. The body of the Roshan is always fixed, meaning it cannot open. Its height varies between 30 and 70 cm.

For the support of the lower body of Roshan, wooden rafters are used, which are placed between the floor and ceiling of the room. They project forward as much as it is needed for the Roshan to protrude from the facade. These are strong wooden rafters, placed close to each other. Alternatively, the supports may be on both sides of the lower part of the *Roshan*, making a relatively triangular form (Figure 3.11 -3.12) (Khan Sultan, 1986).

Figure 3.13: Views from roshans, underlined by wooden elements (AL Murahhem, 2008)

ii. The middle body

The middle part consists of movable lattice panels. Therefore, there are apparatus fixed on the sides. It can be either one or two moving section; or one fixed and the other moving. In order to control the air and light penetration to the room behind the roshan, it is important to habe the flexibility of movable parts. So if it's making of one section it consists of panels that open sideways or sidles upwards they may be either plain or perforated or have small sliding shutters. If it is made of two sections, they are usually sliding shutters as shown in (Figure 3.14). Louvres are usually used in these shutters which help controlling air and light intake. These louvres control the direction of air which flows towards the interior space. Alternatively it may also direct the airflow upwards if it is required. This part has an important role in controlling most of functional use, namely the view and as well as the air and light intake to the interiors.

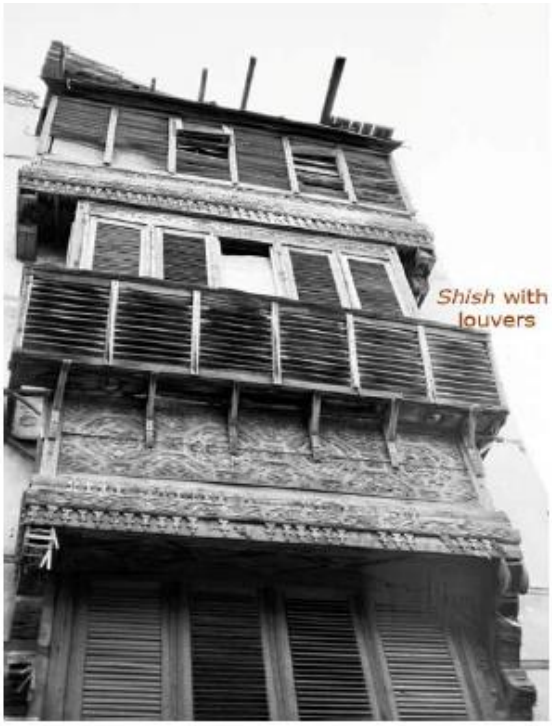


Figure 3.14: Louvers on a traditional facade (AL Murahhem, 2008)

iii. The upper body

The upper part is made of two sections. These are the upper window, which is also named as *shurra'a*, and the top treatment. The *shurra'a* connects to the apertures, which as mentioned earlier, is at the middle part. A *shurrā'a* can have a plain horizontal surface. Alternatively it may be decorated with floral or geometrical patterns. These patterns can extend from the top of the apertures to the top end of the Roshan. At the top of the Roshan, there can be various decorative geometrical or floral decorations. Especially popular is the floral decorative crowns (Figure 3.12- 3.13). The upper body can be plain or partly perforated. Often, there is a decorative composition which consists of plain and perforated parts arranged in an order which creates an aesthetic pattern (Figure 3.11). Through these perforations light comes in the rooms permanently. If more light is desired for a particular room, more perforations there are arranged. In addition, clear or colored glass is fixed from the inside from preventing dust from entering the rooms in stormy weather.

CHAPTER 4

TRADITIONAL ARCHITECTURE IN THE UAE AND REFFLECTION OF TRADITIONAL ELEMENTS ON CONTEMPORARY ARCHITECTURE

This chapter presents information regarding the historical and socio-geographical context of the UAE. It starts with a review on the socio-geographical aspects and continues with a brief review on the characteristics of traditional architecture in the country. Selected examples from traditional architecture is described. In aiming to prepare a background for the case study chapter that follows, the last part of this chapter presents visuals from contemporary use of *Barajeel* and *Mashrabiya* in contemporary architecture in the UAE.

4.1 United Arab Emirates: Historical and Geographical context

Following a tribal system, the UAE was divided in history into states which were under the control of the tribes that have occupied each state at the time. For each state, a Sheikh was assigned to be the ruler and had the full authority to control and manage the tribes and their affairs. In the 7th century, the people in the region has embraced Islam (Federation Research Division, 2007). The Emirati nationals descend mainly from two major tribes, the Qawasim and the Bani Yas tribe. The former are land and sea traders and dominated the area that is now known as Ras Al Khaimah and Sharjah. As for the latter, who were agricultural and took care of cattle; they occupied what is now known as Dubai and Abu Dhabi (Federation Research Division, 2007). The UAE was a British colony and it has been announced independent in 1968, confirmed in 1971 by the United Kingdom. With that the treaty relationship would end, since the UAE has been under Britain's protection since 1892. Post-termination of treaties with Britain, six of the trucial states of the UAE made up what is now known as the United Arab Emirates, and were joined a year later in 1972 with Ras Al Khaimah to complete the seven states of federation (Federation Research Division, 2007).

In 1971, the UAE embraced a transitional constitution that had a lifespan of five years, but was renewed until the appointment of a perpetual constitution in 1996. The centralization of the country took place in 1976. The federal government has control over the whole country and its aspects. At the time of independence Sheikh Zayed Bin Sultan Al Nuhayan was

assigned as the President of the United Arab Emirates, a duty he fulfilled until his death in 2004 (Federation Research Division, 2007).

4.1.1 Geography

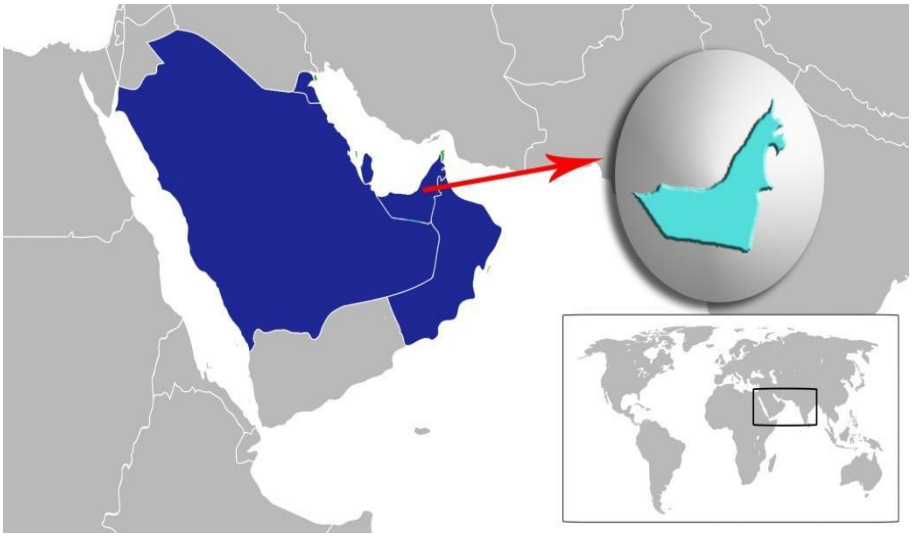


Figure 4.1: Map and location of the UAE **(**Koujan, 2018)

The United Arab Emirates (UAE), (Figure 4.1) is a seven-emirate federation created through treaties in 1971. It is encircled by the Arabian Gulf, Saudi Arabia, Qatar and Oman. The federation is made up of Abu Dhabi, Dubai, Sharjah, Ajman, Um Al- Quwain, Ras Al-Khaimah and Fujairah; The capital of the UAE, Abu Dhabi is considered the economic and investment capital of the country, as well as being the residence of the ruler. Dubai, on the other hand, has been a trade center for many years. It has recently become the focal point for the country especially as a hub of business and tourism industry. Dubai holds the international city due to the most diverse number of residents, facilities and attractions for international community (Al Ali, 2010).

Before the discovery of oil the economy of the UAE was dependent on trade and pearl fishing in the coastal areas and agriculture in some other parts. The pre-oil phase was characterized by a clear reflection of the cultural, social and environmental values on architecture. It consisted of the functional organization of the elements of the dwelling and the reliance on the inner courtyard to provide the necessary privacy to the population and the use of local construction materials such as sea stones, plaster, stone and palms. The forts spread at the entrances of cities to provide protection to the population. There are many examples of

heritage architecture throughout the United Arab Emirates such as Al-Fuhaidi Castle in Dubai, which has been converted into a museum, and fortress Al-Hosn Babu Dhabi, the Eastern Castle and Al-Marboa square in Al Ain. One of the most important architectural examples of this period is the Sheikh Saeed House in Dubai, which has recently been renovated to become a heritage landmark of a distinctive architectural state belonging to the region and reflecting all its cultural, environmental and social conditions. All examples of heritage architecture in the United Arab Emirates share a distinctive architectural character that belongs to the region and reflects all of its cultural, environmental and social conditions.

4.1.2 Topography and Climate

The land is made up of 3 main zones, desert zone, coastal zone and mountain zone, with the desert and coastal zone being dominant (Al Ali, 2010). With an area of 83,600 square km, the land is mainly flat or rolling deserts. The coastal line extending along the South of the Arabian Gulf is made up of salt pans that extend inland. The climate of the UAE is hot and dry in general in the summer months (July and August), with an extensive amount of humidity. Whereas in winter months temperature tends to fall, with an average of 17ºC - 20ºC, with an average rainfall of 100-200mm annually (Federation Research Division, 2007).

4.2 Characteristics of Traditional Architecture in the UAE

Cultural geography is a wide field which requires the analytical study of all of the geographic factors of a region, and this is important because it is only through this analysis that information regarding architectural identity is generated. The architecture and culture of the UAE has always been intricately related to each other (Abduljaleel, 2000).

The geography and environment in this region has determined in the past the techniques and materials people used in order to adapt to the harsh environmental conditions and endure its circumstances. Hence, studying the cultural and vernacular architecture built by the people has always attracted the scholars of architecture, historians, and cultural geographers. That is because vernacular architecture proposes a unique trend of construction, suitable only for that geographical location, and it finds solutions for climatic issues. In most countries in the world there is an architectural duet between traditional architecture and modern architecture. Where the former reflects the climate, culture and environment and the latter shows the

evolution and development of construction materials that have revealed to be unsuitable for local climate conditions (Abduljaleel, 2000).

There are clear similarities between traditional architecture and in the UAE and the rest of the countries in the Arabian Gulf. In general, houses were built and design to provide privacy and secure the needs of the growing trade businesses. In both cases homes were built from coral stone and mortar, materials which are available locally. Courtyard houses were the largest and most privacy oriented. The nature of traditional buildings in the UAE depends on the style and culture of the people in the past. People were actively involved in sailing and trading to make a living for their families. Therefore, the houses were designed to match the nature of their lifestyle and environment (Abduljaleel, 2000).

Remarks that vernacular architecture is distinguished by the unity of the architectural texture and the way it is to deal with the common environmental issues, like in the Arabian Gulf. Vernacular architecture has blended locally available construction techniques with regional-Islamic design elements. For instance, thick walls were constructed in order to reduce the amount of heat transfer between the interior and exterior. Openings were placed strategically on walls and facades, and courtyards and wind towers were used for ventilation and air circulation. Although traditional houses are distinguished by special characteristics, some of which are a response to climatic conditions and some are responses to particular functions, there has also been aesthetic consideration as well (Abduljaleel, 2000).

The most predominant type of house in Arabian region and in the United Arab Emirates is the courtyard house. Courtyard houses in the UAE, like their counterparts elsewhere in the world, have been designed to meet climatic requirements as well as family privacy and security. Maintaining privacy has been the most important criterion in designing the facades of the traditional houses in the UAE as it was the case in the other Islamic countries. Perhaps the most prominent features of the facades in the UAE is the *Barajeel* (also known as the wind catchers and wind towers), *Mashrabiya* (a type of grilled oriel window), as well as stucco decorations on the walls (Ragette, 2003). *Mashrabiya* (or its Saudi Arabian variation *Roshan*) also is considered one of the elements of traditional desert architecture in the region, which began to appear in the thirteenth century AD and continued to use until the early twentieth century. The traditional desert architecture has developed innovative solutions that

have dealt with various environmental factors. Many types of architectural elements have been developed, including the *Mashrabiya* (or *Roshan* as known in Saudi Arabia), which are suitable for hot climates. Through *Mashrabiyas* enter the air and large amounts of indirect light, and prevent direct solar radiation accompanied by high temperatures from entering their openings.

4.2.1 Examples from Traditional Architecture in the United Arab Emirates

This section presents a selected set of traditional building and sites from the UAE, There are Shikh Sa'eed AL Maktoum house and AL Ahmadiya School and AL Bastakiya Dubai.

4.2.1.1 Sheikh Sa'eed Al Maktoum house

Located in the Shindig neighbourhood in Dubai, the house was erected in 1896 (Figure 4.2) as the house of Sheikh Sa'eed, the ruler of the city. The house is a typical representation of traditional Emirati architecture. The house has been built in four blocks around a central courtyard. Each block contains a ground floor, first floor and roof terrace. The house consisted of two main cooling strategies, the upper rooms has the perforated gypsum panels. The second strategy is that every block had a *Barajeel*, rising 15m into the air. The wind towers are designed with an X- shaped design open on four sides in order to catch more air and cool the rooms beneath it. The house has four remarkable wind towers, oriented in a way that they pick up the air and circulate it inside the rooms under them. The morning air was warm and the afternoon air was cooler. The house was converted into a museum in 1980s (Hawker, 2002).

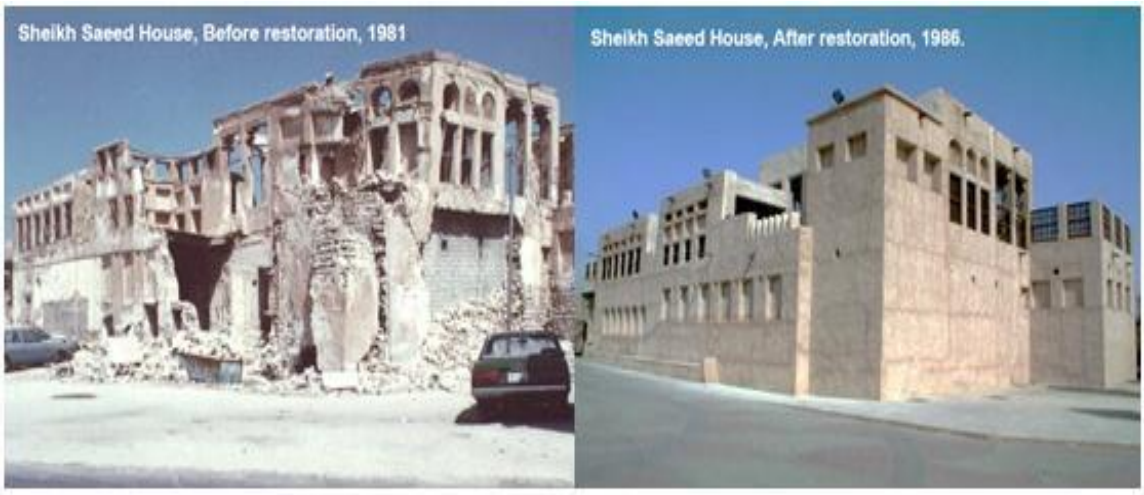


Figure 4.2: Sheikh Saeed house before 1981, and after restoration 1986 (Bukhash, 2003)

4.2.1.2 Al Ahmadiya School

Al Ahmadiya School is located in Al Ras residential area, in Dubai. It was one of the first official schools in Dubai, constructed in 1912 by Sheikh Ahmad Bin Dalmouk, hence the name. The school was built in three phases (Figure 4.3). Developing the structure and enhancing the functions inside. The initial phase was the use of the ground floor, which was a residential home until it was converted into the school. The second stage would be the addition of the upper level, that being a room as accommodation for teachers. The wind tower was built in the 1920's and removed in the 1940's. The final phase of the construction and enhancement of Al Ahmadiya school is that the roof terrace was covered, creating an arcade overlooking the courtyard and by that a space for traditional classes to be held is created.

Figure 4.3: Al Ahmadiya School (Bukhash, 2003)

The plan of the original building is still the same but with minor changes after restoration. The courtyard of the school is where the morning recitals and recess from classes would be held. The arch style was a full, false arch; meaning the arch was on a lintelled frame with no construction base to it. These arches surrounded the courtyard creating a veranda, which shades the area in front of the classrooms reducing heat and glare from the sun. The upper floor addition had simple frames for arches, they had no decoration and minimal shading (Damluji, 2006). Being a very primitive example of what a school looked like in the past, the Al Ahmadiya School had only one *Barjeel* in the whole building (Figure 4.4). It was placed on top of one of the main areas of the school and that was the classrooms.

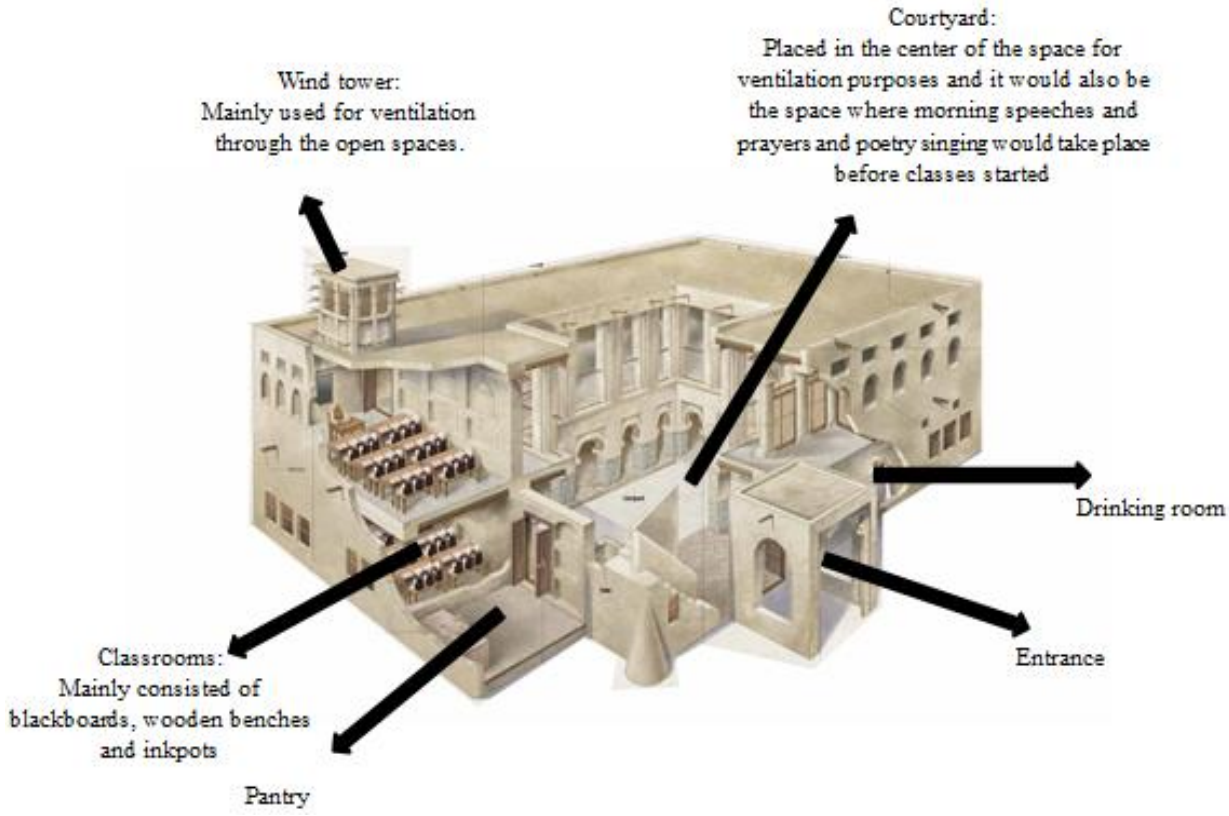


Figure 4.4: View of different parts of the school, showing *Barajeel* as ventialtion technique (Babu, 2015).

4.2.1.3 Al Bastakiya Dubai

Since the early history, Dubai was a small city of major trade and trade routes. Tradesmen and immigrants settled in different part of the Bastakiya (Figure 4.5). As the immigrants increased the tradesmen increased. Most of these immigrants were from a district in Bastak in the Fars province, and that is how the district got its name, Bastakiya .The geography and climate of the region has allowed the introduction and the emergence of this architecture.The Bastakiya is a historic area in Dubai that displays the traditional architecture of the UAE. Houses in the area have been built by master builders and mason in accordance to acces to the creek, which was a result of the trade routes and tradesmen. *Barajeel*s were introduced to the region via Iran, and they have been found more abundantly on the coastal regions. In

places like Shindagha district in Dubai, *Barajeels* were only existant in homes of merchants or people who could afford to actually build them.

Figure 4.5: Bastakiya District**, (**(Bukhash, 2003)

4.3 Use of *Barajeel* and *Mashrabiya* in Contemporary Architecture in the UAE

Barajeel and *Mashrabiya* have lost their functional role with the invention and wide use of mechanical air conditioning systems. However, they gained an aesthetic role in the volumetric expressions of new buildings. This new role of *Barajeel* and *Mashrabiya* will be addressed in detail in the next chapter on case study analyses. However, a group of street shots are presented here, in order to strengthen the argument of the present thesis that these two traditional elements have gained currency around the country as symbols of cultural identity in architecture (Figure 4.6- 4.15).

Figure 4.6: Miscellaneous commercial buildings on Um Suqeim street in Dubai employing Barajeel and decorative stucco to create traditional looking architectural expressions (Koujan, 2018)

Figure 4.7: Tesla car showroom, Dubai (Koujan, 2018)

Figure 4.8: Dubai holding building in Jumeirah, using the *Barajeel* to maintain authenticity and tradition in the architecture (Koujan, 2018)

Figure 4.9: Gypsum *Mashrabiya* used in the Main building at the University of Sharjah (Koujan, 2018)

The architecture of the University of Sharjah is based on traditional elements and Islamic design patterns. The traditional *Mashrabiya* has been applied on the facade designs. It has been used in various forms, either to cover the window openings or extending from ground floor up the the ceiling, which can be considered as an abstracted version of *Roshan*. The *Mashrabiya* in this case has not been materialized traditionally, as the expected material would be wood. In this case, the *Mashrabiya* is part of the exterior wall made of concrete and painted to have the authentic look of traditional buildings (Figure 4.9).

Figure 4.10: Views from Souk Al Bahar in Dubai Mall, showing the different kinds of *Mashrabiya* and Roshan (Koujan, 2018)

Figure 4.11: Souk Al Bahar in Dubai Mall, using projecting *mashrabiyas* (Koujan, 2018)

Figure 4.12: Omni Restaurant- Wafi, Dubai using *Mashrabiya* to cover external openings (Koujan, 2018)

Figure 4.13: Ayla Bawadi Hotel, Al Ain, using *Mahrabiya* and *Roshan* on the main façade (Koujan, 2018)

Figure 4.14: Khan Marjan restaurant in Wafi City, Dubai, using *Mashrabiya* in the interior facades of the main hall. (Koujan, 2018)

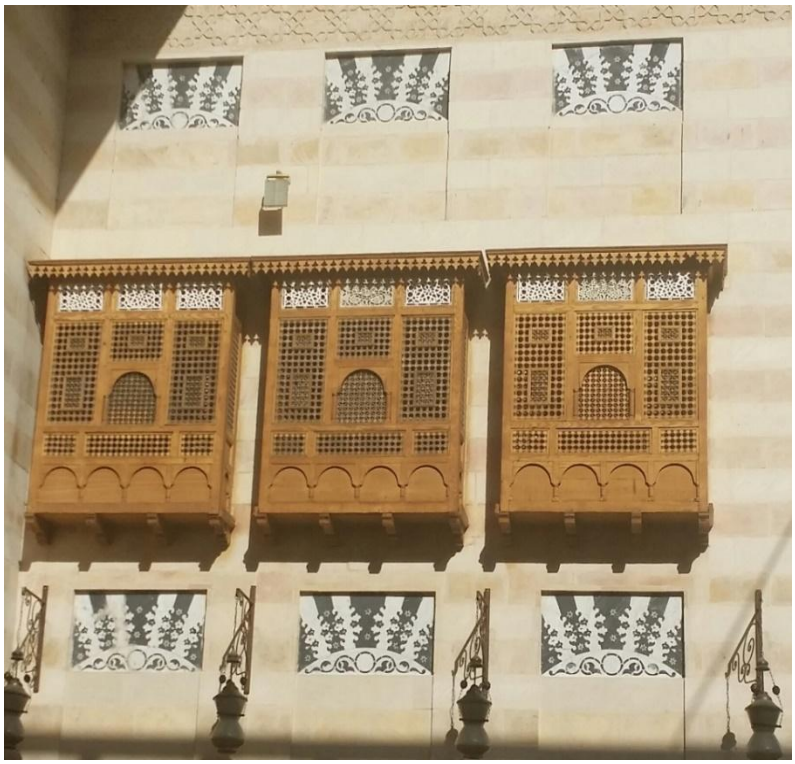


Figure 4.15: Khan Marjan restaurant in Wafi City, Dubai, using *Mashrabiya* in the interior facades of the main hall. (Koujan, 2018)

CHAPTER 5

CASE STUDY ANALYSIS FROM CONTEMPORARY ARCHITECTURE IN THE UAE: BLENDING TRADITIONAL FEATURES INTO CONTEMPORARY DESIGNS

This chapter addresses in depth the use of traditional elements in contemporary architecture of the UAE. It classifies both the Barajeel and Mashrabiya into two groups according to their according to their typology:

1) Functional
2) Aesthetical

As it will be seen in the case study analyses, because of the mechanical ventilation and cooling systems, pure functional use of these two traditional elements is not seen in contemporary architecture any more. On the other hand, aesthetic use for symbolic reasons is seen as the main reason behind their continuing use in new constructions around the country. Another feature that is used in the classification is whether they are used in new buildings in a revivalist manner, which results an architectural expression similar to the traditional use, or whether they are abstracted.

5.1 Use of *Barajeel* in Contemporary Architecture in UAE

This use of *Barajeel is* mostly aesthetic where the identity of the structure is grounded by the traditional elements. The *Barajeel* used are more of a proof that the past can still thrive in the present and they are not functional in most places as they would have been in past buildings.

5.1.1 Central Souk in Sharjah

The construction of the souk started in 1976, proceeding for 29 months ending in 1978. Upon completion, an extravagant work of art had been produced: it was unique in terms of design and architecture. The massive structure has elements and patterns representing traditional architectural features and elements in the UAE (Figure 5.1). The high *Barajeels* and multiple openings in the façade represent in one way or other the style of a traditional house. The In

fact, once the Financial Times newspaper has described it to be to most exquisite architectural structures in the Middle East, after the Umawi mosque in Damascus (Kharoob, 2009).

Figure 5.1: The wind towers of the Central Souk (Koujan, 2018)

This 80,000 sqm structure is comprised of two buildings connected with two bridges. It consists of about 600 shops, dispersed around the souk on the ground and first floor. The shops can also be found around the staircases and the bridges. Cafes and restaurants are also part of the souks division. Parking spaces are enough to contain 700 cars situated around the souqs entrances (Kharoob, 2009).

5.1.1.1 Analysis of the use of traditional elements in the Central Souk

The Central Souk in Sharjah is based on the pure traditional elements used in the Emirati architecture. The most prominent element that has been used is the *Barajeel*. The wind towers are distributed along the parallel structure of the souk implementing the identity on what was considered a contemporary building when it was first built. The souk was constructed using materials that can uphold through time and represent the traditional architecture in the most modernized way; concrete and glass are the only two materials to support that effect (Figure 5.2).

Figure 5.2: Blue characteristic tiles of the Central Souk (Koujan, 2018)

The souk consists of 20 *Barajeels* distributed along the two large structures. The wind towers were operational in the initial years after construction. However, following the renovation of the building, mechanical air conditioning systems were installed in the mall. Although *Barajeels* remained as an ornamental feature afterwards, they gained a stronger role, which is to maintain the identity on which the architectural concept was based. They are four-sided model of Barajeels, which has been explained in the 3rd chapter of the present thesis, giving the full view of the details in all directions. The materials used in constructing these wind towers are the concrete of the base structure and the wood used in the decoration of the wind towers in the openings and at the top parapet.

The aligned buildings of the Central Souk are connected with two bridges decorated with rich blue tiles and window, and covered by *Mashrabiya* element all along. All the openings and pseudo openings of the Central Souk are covered with a wooden screen panel of intricate *Mashrabiya* grilles. The extruding structures surrounding the building represent colonnades and arches used in the traditional residences of the UAE. The function of the colonnades is only to allow light to enter the interior of the Souk.

These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.1, B 5.1).

Table A 5.1 : General analysis of Central Souk (Koujan, 2018)

Site layout

Facade organization : Traditional elements

Main Traditional Elements :	Yes	No
Barajeel		
2 sided	■	□
4 sided	□	■
6 sided	□	■
8 sided	□	■
Mashrabiya		
Wood Full	□	■
Wood Partial	□	■
Gypsum Full	□	■
Gyspum Partial	□	■
Gyspum partial glass	■	□
Other	■	□
Steel	■	□
Concrete	□	■
Dome	■	□
Roshan	□	□
Gypsum Panels	□	■
Floral Motif	□	■
Animal Motif	□	■
Pattern Motif	□	■
Grille Motif		
Columns		
Circular	■	□
Angular	□	■
Brackets	□	■
Keystone	□	■
Crenellated parapets	■	□
Crenellated arches	□	■
Cornice	□	■

Elevation (inside)

Elevation (street view)

Aesthetic Role

Table B 5.1 : Integration between traditional and contemporary architectural values in Central Souk, (Koujan, 2018)

Aesthetic Role	traditional architectural values	Contemporary architectural values
  	The design of the Central Souk aims at highlighting UAE traditions in traditional architecture in harmony with modernity. The design focuses on the privacy of the building, shows the sustainable environmental future, uses *Barajeel* in its typical form, The lower section mimic the Islamic structures with semi-circular windows that lined up at the walls	Traditional elements comply with the requirements of the 21st century, elements used in an abstract way that combines modernity and originality. The designer reconstructed the vocabulary of the traditional architecture of the Central Souk but with modern building materials of reinforced concrete to give it a shape that is suited to the surrounding environment.
Integration between traditional and contemporary architectural values	It is clear from the result of the above evaluation that the designer was able to employ the characteristics and elements of traditional architecture in the project in a contemporary style, combining the requirements of time and space, using the abstract style.	

5.1.2 Madinat Jumeirah in Dubai

Figure 5.3: Madinat Jumeirah gateway (Koujan, 2018)

The Jumeirah district is considered the oldest and one of the most elegant neighborhoods in Dubai, consisting mostly of low rise buildings. Madinat Jumeirah is a shopping mall and hotel complex, developed by Mirage Leisure and Development Incorporated in 2003, with an aim to create a resort within city (Figure 5.3). The main goal of the project was to restore life as it used to be in terms of waterways, *Barajeels* and souks (markets) for the residents. The design of the mall of Madinat Jumeirah carries the lines of traditional souks which were popular in Dubai's past (Figure 5.4). In addition to the souk, the facility consists of three 5-star luxurious hotels offering top notch services in traditional atmosphere. The Mina Al Salam hotel is the first that has been constructed. The Qasr hotel represents the summer house of the ruler of the country. Dar Al Masyaf hotel consists of villas that are replicas of traditional Emirati houses of two floors; only they have been developed to cope with modern technologies and trends.

The old market in Madinat Jumeirah consists of various shops ranging from jewelry to clothing and garments, mostly belonging to international brands. In addition to the retail shops, there are bars, restaurants and open spaces along the manmade river, running through the facility giving it an authentic atmosphere. There are water taxis moving on the waterways to transport customers from one place to the other.

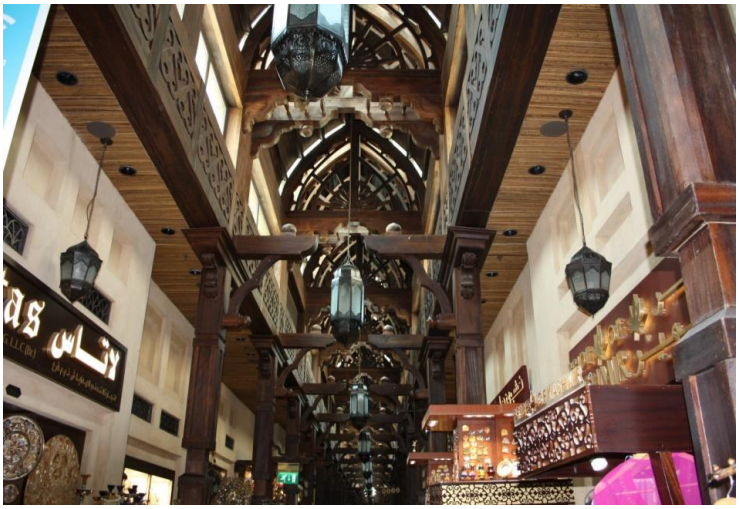


Figure 5.4: Interior view from Madinat Jumeirah 'Old Souk' (Koujan, 2018)

Figure 5.5: *Barajeel*s, rising from the roofs of Madinat Jumairah (Koujan, 2018)

5.1.2.1 Analysis of the use of traditional elements in Madinat Jumeirah.

Madinat Jumeirah is a contemporary building, designed on the concept of traditional architecture in the UAE. Therefore, the main concept is to mimic the traditional architecture of the country and convey the characteristic features of traditional architecture in the modern world. The main idea, underlining its design is to create a place that is luxurious as much as it is traditional in the sense of maintaining a cultural identity along the lines external and internal façade expressions and the architectural elements used.

The main and most obvious element used in the construction of the Madinat Jumeirah is the *Barajeel*. (Figure 5.5). They can be seen clearly all around the facility in a way that they reflect the traditional elements used in vernacular architecture of the UAE. The *Barajeel* are purely aesthetic, as the building is air conditioned with mechanical systems. The materials used are concrete for the main structure and aluminum. However, both plaster work and aluminums has been rendered to give the effect of traditional natural materials of mud plaster and wood (Figure 5.6). Windows have been designed in the shape of traditional windows, which have been used in traditional houses. The only difference is that the wood has been replaced with aluminum, rendered in wood texture. Arches, topping the windows represent luxury, as is the traditional houses they represented signs of wealth, and they were not to be found on the houses of middle or low-income people. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.2 , B 5.2).

Figure 5.6: External walls of Madinat Jumeirah showing arches and *Barajeel* (Koujan, 2018)

Table A 5.2: General Analysis, Madinat Jumeirah (Koujan, 2018)

Site layout

Elevation (inside)

Elevation (street view)

Facade organization : Traditional elements

Main Traditional Elements :	Yes	No
Barajeel		
2 sided	■	□
4 sided	□	■
6 sided	■	□
8 sided	□	■
Mashrabiya		
Wood Full	■	□
Wood Partial	■	□
Gypsum Full	□	■
Gyspum Partial	□	■
Gyspum partial glass	□	■
Other	■	□
Steel	□	■
Concrete	■	□
Dome	□	■
Roshan	■	□
Gypsum Panels		
Floral Motif	■	□
Animal Motif	□	■
Pattern Motif	■	□
Grille Motif	□	■
Columns		
Circular	□	■
Angular	■	□
Brackets	■	□
Keystone	□	■
Crenellated parapets	■	□
Crenellated arches	■	□
Cornice	□	■

Aesthetic Role

Table B 5.2: Integration between traditional and contemporary architectural value in Madinat Jumeirah, (Koujan, 2018)

Aesthetic Role	traditional architectural values	Contemporary architectural values
  	The designer used the *Barajeel* to overlook the area. The external gate represents a fortress gate showing luxury. The gate is a semicircular entrance that shows projects of various forms. The entrance was inspired by the original traditional architecture. The designer used the colors of the local materials, color contrast was used to distinguish the doors and windows at both sides. Façade looks beautiful and attractive by contrasting the color of the building with the color of the openings.	The designer reconstructed the vocabulary of the traditional architecture of the region but with modern building materials of reinforced concrete to give the entrance a shape that is suited to the surrounding environment and to emphasize the preservation of the local traditional architecture. Harmony achieved through the building materials used and unified architectural elements, openings take the rectangular shape, and show the color contrast between different materials such as cast and white stone. The facade gained a dynamic character and artistic sense
Integration between traditional and contemporary architectural values	Harmony is achieved between traditional and contemporary architectural values through the building materials used and standard architectural elements. Most of the openings take shape in the same shape	

5.1.3 Marsa Al Seef

Figure 5.7: Marsa Al Seef (Koujan, 2018)

With architecture, representing the past and the present, Al Seef extends on the shore of Khor Dubai. It is surrounded by the city and cultural neighborhoods enhancing the modern vibe with the taste of the past through which it all originated. A composition of retail shops, restaurants and a hotel are part of the master plan project. The Emirati culture is deeply embedded in the concept of the Al Seef design ensuring the reference to the past of the city

and its importance (Figure 5.7). The project is a master plan/ mixed use facility and completed in 2017 (Meraas, 2017).

5.1.3.1 Analysis of the use of traditional elements in Marsa AL Seef.

Al Seef is a recreational area, mainly consisting of hospitality and retail services. The restaurants and cafes are the main attraction in the area, where the tradition of the city is emphasized and modernized at the same time without contrasting each other.

Figure 5.8: *Barajeel* at Marsa Al Seef (Koujan, 2018))

Being located in what is considered a traditional area, the modern façade on the overall style of Al Seef is eye-catching. The mixture of the old and new with the concentration on the past and its architecture has given the facility character and attraction. The buildings are designed to represent vernacular architecture, especially the traditional houses in the UAE. *Barajeel* is the Mostly utilized element for this purpose. It is to be found on every rooftop. There has also been wide use of arched niches and arched windows on the upper levels of the buildings. The wooden posts used in the past to support structures and maintain their shape are visible in the facades of the buildings and the *Barajeel* (Figure 5.8).

Colonnades that were once the sitting areas for the household members are now used as sitting areas for restaurants and cafes, enhanced by lighting techniques. The perforated panels used as handrails in between columns on the upper levels of houses are visible.

They represent the *Mashrabiya* in terms of pattern or material and they are often used functionally as much as they are asethetical. The arch decoration is maintained from the traditional buildings in Dubai. The *Mashrabiya* on the windows serve the purpose of privacy and air circulation. It simply represents an old neighborhood with the streets entwining and leading to everywhere all around the facility. On the other hand, structures representing shipping containers are installed to be retail areas and shops (Figure 5.9).

Figure 5.9: Barajeel at Marsa Al Seef (Koujan, 2018)

This modern touch in the deep sense of the past could only mean that holding on to the roots that got us where we are is the stable foundation of what we have now, shown evidently in the development of such a place to be a metropolitan of time and place. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.3 , B 5.3).

Table A 5.3: General Analysis, Marsa AL Seef (Koujan, 2018)

Site layout

Elevation (inside)

Elevation (street view)

Facade organization : Traditional elements

	Yes	No
Main Traditional Elements : Barajeel		
2 sided	■	□
4 sided	■	□
6 sided	□	■
8 sided	□	■
Mashrabiya		
Wood Full	□	■
Wood Partial	□	■
Gypsum Full	□	■
Gyspum Partial	■	□
Gyspum partial glass	□	■
Other	□	■
Steel	□	■
Concrete	■	□
Dome	□	■
Roshan	■	□
Gypsum Panels		
Floral Motif	□	■
Animal Motif	□	■
Pattern Motif	■	□
Grille Motif	□	■
Columns		
Circular	□	■
Angular	■	□
Brackets	■	□
Keystone	□	■
Crenellated parapets	■	□
Crenellated arches	□	■
Comice	□	■

Aesthetic Role

Table B 5.3: Integration between traditional and contemporary architectural values in Marsa ALSeef (Koujan, 2018)

Aesthetic Role	Traditional Architectural value	Contemporary Architectural value
 	The design of Marsa Al Saeef reflects local traditional and culture. It integrates the city of Dubai with old architectural style, all inspired by the fifties of the last century, which reflect the lives of the people of the emirate in that period.	The contemporary section of Marsa Al Seef has emerged with elegant designs whose lines have been harmonized smoothly and harmoniously. The new destination for visitors and residents has provided an inspiring experience with its elegance and style.
Integration between traditional and contemporary architectural values	The design is a combination of modernity and heritage in the modern urban style.	

5.1.4 Sheraton Hotel in Sharjah

Figure 5.10: Side view of Sheration hotel (Koujan, 2018)

Sheraton hotel in Sharjah is a traditional soul in a contemporary body, dominating the coastal skyline of Sharjah. It has a distinctive structure and authentic elements of traditional architecture of the UAE. It has been constructed in 2015, adding to the traditional architectural portfolio of the Sheraton line of hotels in the UAE. The Sheraton Hotel is a 5-star faciltiy that provides luxury and taste to guests. The main function of the hotel is the accomoation of guests and the services provided in addition to that are the restaurants and cafes; pool areas and other facilities needed to maintain a certain standard in the hotel (Figure 5.10).

5.1.4.1 Analysis of the use of traditional elements in Sheraton Hotel.

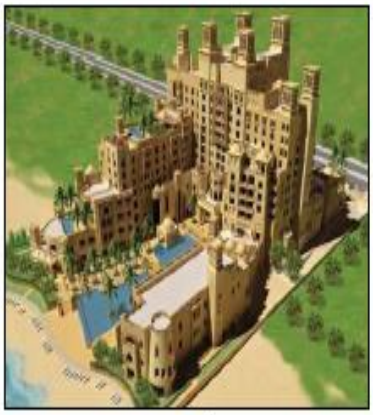
The Sheraton Hotel in Sharjah, has been constructed to match the overall style of the city being traditonal and preserving the culture of the UAE in almost all its public buildings. The main traditional element used in the hotel construction is the *Barajeel*. The hotel consists of about 8 wind towers overall; all of which are not operational and purely aesthetic. They are built in the form of multi-directional wind towers, which let air circulate through all four

sides of the wind tower. However, since they have been given an aesthetic function in this building, the opening has been covered with glass, and they serve as skylighters, leting in light through all four directions. They are used as lighting features in the main facades of the building, on the seaside and the city direction. There is a minor use of *Mashrabiya* on the sea facing façade (Figure 5.11). this is to prove the original function of the *Mashrabiya* and where it was used to the most. The former being the circulation of air in the traditional houses and the latter being that it was used in houses on the coastal area in order to reduce humidity and circulate the cool air coming from the direction of the sea. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.4, B 5.4).

Figure 5.11: *Barajeel* of the Sheraton Hotel (Koujan, 2018)

Table A 5.4: General Analysis, Sheraton Hote (Koujan, 2018)

Site layout



Facade organization : Traditional elements

Main Traditional Elements :	Yes	No
Barajeel		
2 sided	☐	■
4 sided	■	☐
6 sided	☐	■
8 sided	☐	■
Mashrabiya		
Wood Full	☐	☐
Wood Partial	■	☐
Gypsum Full	☐	■
Gyspum Partial	■	☐
Gyspum partial glass	☐	■
Other	☐	■
Steel	■	☐
Concrete	■	☐
Dome	■	☐
Roshan		
Gypsum Panels		
Floral Motif	☐	■
Animal Motif	☐	■
Pattern Motif	■	☐
Grille Motif	☐	■
Columns		
Circular	☐	☐
Angular	☐	☐
Brackets	■	☐
Keystone	☐	■
Crenellated parapets	■	☐
Crenellated arches	☐	■
Cornice	☐	■

Elevation (inside)

Elevation (street view)

Aesthetic Role

Table B 5.4: Integration between traditional and contemporary architectural values Sheraton Hotel (Koujan, 2018)

Aesthetic Role	traditional architectural values	Contemporary architectural style
 	The Sheraton hotel presents the belief in the necessity of reviving traditional values of architecture. It refuses to follow Western models, while developing them to suit modern requirements. This architecture expresses the local personality of the UAE and thus gives continuity to this civilization, which makes man more capable of building a stable future.	The Sheraton hotel presents the concept of originality and creativity. This concept is based on two axes: the first is the originality and the elements of the fixed heritage, the second is the creativity which is meant by modernity or contemporary and which carries the changing character, and contemporary through the preservation of the human scale,
Integration between traditional and contemporary architectural values	The relationship between originality, tradition and modernity is not an antagonistic or contrasting relationship, but in fact a relationship of integration at the same time, making every creative work rooted in heritage.	

5.1.5 Ajman Palace in Ajman

Figure 5.12: Ajman Palace main entrance (Koujan, 2018)

The Ajman Palace Hotel is located across the road from the Ruler's Palace in Ajman. It overlooks the Arabian Gulf. The construction has been inspired by Arabian architecture with brocades, *Barajeels* and a crenellated arch-shaped entrance (Figure 5.12). The construction has been completed and the hotel has been opened in 2012 the hotel is a luxurious facility offering services and facilities that are standard to the five-star hotels. It has swimming pool areas, lounges, restaurants and spa facilities. The private beach and pool areas are offered including the outdoor water sports.

5.1.5.1 Analysis of the use of traditional elements in Ajman Palace.

Ajman Palace Hotel is the epitome of the use of traditional elements in the contemporary architecture. The elements in the construction of the facility are indeed mainly *Mashrabiya* and *Barajeel* features (Figure 5.13). There are wind towers distributed along the structure of

the hotel, on the roof. The *Barajeel* are strictly aesthetic and mainly serve for bringing in daylight. They stand on top of the building like beacons representing the past in the present. They are located on the main facades of the hotel, the back and the front. The *Barajeel* in this hotel, differ in size depending on their location. In analysis of their location and their current function, some of the larger wind towers are used in lighting the façade of the hotel; while the smaller ones could be used as ventilation columns or minor core for the hotel services.

In terms of *Mashrabiya*, this feature has been used on the main entrance mainly. The style is authentic and intricate in design. There is an imitation of old windows on the façade of the hotel; these have been covered by the *Mashrabiya*, giving the aesthetic meaning it holds and the social aspect of the *Mashrabiya*. For the current case, it has been used for decoration and emphasis on the tradition and culture that was meant to be maintained in the concept and the construction of the hotel. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.5, B 5.5).

Figure 5.13: *Barajeel* beacons in different sizes on the hotel roof (Koujan, 2018)

Table A 5.5: General Analysis, Ajman Palace (Koujan, 2018)

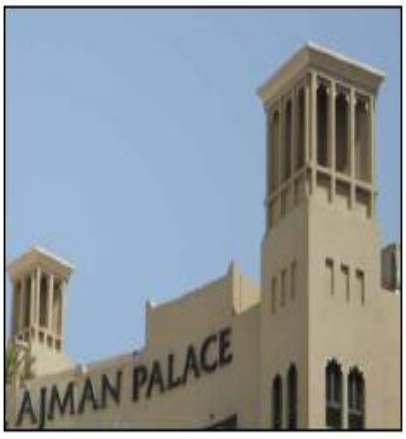
Site layout		Facade organization : Traditional elements		
				
Elevation (inside)	Elevation (street view)			
				
		Main Traditional Elements :		
		Barajeel		
		2 sided	■	□
		4 sided	□	■
		6 sided	□	■
		8 sided	□	■
		Mashrabiya		
		Wood Full	□	■
		Wood Partial	□	■
		Gypsum Full	■	□
		Gyspum Partial	□	■
		Gyspum partial glass	■	□
		Other	■	□
		Steel	□	■
		Concrete	■	□
		Dome	□	■
		Roshan	□	■
		Gypsum Panels		
		Floral Motif	□	■
		Animal Motif	□	■
		Pattern Motif	■	□
		Grille Motif	□	■
		Columns		
		Circular	□	■
		Angular	■	□
		Brackets	□	■
		Keystone	□	■
		Crenellated parapets	■	□
		Crenellated arches	□	■
		Cornice	□	■
Aesthetic Role				
				

Table B 5.5: Integration between traditional and contemporary architectural values in Ajman Palace **(**Koujan, 2018)

Aesthetic Role	**traditional architecture values**	**Contemporary architectural values**
 	In the design is inspired by the use of the *Barajeel* topping the building,. The sincerity of the expression appears through the external of the design, the development of traditional elements and their signature in their functional positions.	The formulation of the element in a developed manner that reflects the vast potential of modern technologies while retaining the location and function of the element.The use of traditional elements in a studied manner gives the facade a dynamic character and achieves a visual movement
Integration between traditional and contemporary architectural values	The design presents the importance of preserving architectural heritage and how to link architecture with society for the purpose of finding civilized forms of architecture. The architecture becomes a mirror of the cultural perspective of society from the outside. There is a link between traditional and contemporary design to adapt to the environment	

5.1.6 Fairmont Hotel in Ajman

Figure 5.14: Fairmont Hotel Ajman (Koujan, 2018)

The Fairmont Hotel in the city of Ajmn, is a luxurious 5-star hotel; located on the coast line of Ajman. It represents the traditional hospitality in the mosr contemporary manner (Figure 5.14). The services provided in the hotel are varied. It has swimming pool areas, lounges, restaurants and spa facilities. The private beach and pool areas are offered in the most relaxing atmosphere and top-notch services.

Figure 5.15: *Mashrabiya* features on the façade near the main entrance (Koujan, 2018)

5.1.6.1 Analysis of the use of traditional elements in Fairmont Hotel (Ajman).

There are *Barajeels* situated on top of the roof of the Fairmont Hotel, which are visible from a distance and immediately reflects the country's traditional architectural identity. Another traditional element used is the *Mashrabiya*. It has been used in the traditional sense. It has been placed above the main entrance and on the sides of the main façade. The *Mashrabiya* grille has also been used in the parapets separating floors and terraces indented in the structure (Figure 5.15). The whole building has used the traditional elements in the original sense of the design. The arches and columns have been designed the same way as they would be seen in a traditional Emirati house. The carvings in the façade and the window sixes in the services areas also represent what would be seen in a traditional home. Even though the design of the *Mashrabiya* has not been abstracted in the case of the Fairmont Hotel, the function has been abstracted in a way that it has been used purely as an aesthetic factor and an indicator that reflects the cultural architecture of the UAE. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.6, B 5.6).

Table A 5.6: General Analysis, Fairmont Hotel Ajman (Koujan, 2018)

Site layout

Elevation (inside)

Elevation (street view)

Facade organization : Traditional elements

Main Traditional Elements :	Yes	No
Barajeel		
2 sided	☐	■
4 sided	■	☐
6 sided	☐	■
8 sided	☐	■
Mashrabiya		
Wood Full	☐	■
Wood Partial	☐	■
Gypsum Full	☐	■
Gyspum Partial	☐	■
Gyspum partial glass	■	☐
Other	☐	☐
Steel	■	☐
Concrete	■	☐
Dome	■	☐
Roshan	■	☐
Gypsum Panels		
Floral Motif	☐	■
Animal Motif	☐	■
Pattern Motif	■	☐
Grille Motif	☐	■
Columns		
Circular	☐	■
Angular	■	☐
Brackets	■	☐
Keystone	☐	■
Crenellated parapets	■	☐
Crenellated arches	■	☐
Cornice	☐	■

Aesthetic Role

Table B 5.6: Integration between traditional and contemporary architectural values in Faimont Hotel (Koujan, 2018)

Aesthetic Role	**traditional architectural value**	**Contemporary architectural value**
 	*Barajeel* and *Mashrabiya* elements were formulated in a developed manner commensurate with the rhythm of shape.Traditional architecture in this example provides inclusion of relations between the segment and parts which emphasize the obvious integration of these relationships in the construction.	The designer relied on the mental analysis of both elements to reach its basic lines.*Mashrabiya* units achieves the principle of continuity of the building as a whole by multiplying the unit in different sizes in a straight linear manner, forming a network of duplicate units that combine with each other producing a unit without being united in size and measurement around a specific building center.
Integration between traditional and contemporary architectural values	The principle of proportionality is of aesthetic values achieved in the design of *Mashrabiya* in the Islamic era and it is noted that the external divisions do not depend on a fixed proportion, but multiple ratios, where they complement each other to give *Mashrabiya* a unique aesthetic The proportionality in Islamic architecture was based on two factors: the aesthetic sense and the acquired knowledge of the mathematical engineering systems of Muslims.	

5.1.7 Fairmont Hotel in Dubai

Fairmont is a multi-story hotel, built in Dubai in 2002, as the first international property for this North America's leading luxury Hotel Company. The *Barajeel* (Figure 5.20) inspires its design. The overall volumetric expression of the building is an abstracted *Barajeel*, which successfully links this traditionally popular architectural element to contemporary world in a contemporary design understanding. With its icon boasting cutting edge design elements and traditional Arabic symbols, the Fairmont Dubai has turned into a landmark in the ever-evolving city skyline.

Figure 5.16: Fairmont Hotel Dubai (Koujan, 2018)

Fairmont hotel is a 5-star hospitality facility in which luxury and comfort is found. The hotel provides retail and restaurants as well beach activities and waterfront sports and activities (Figure 5.16).

5.1.7.1 Analysis of the use of traditional elements in Fairmont Hotel (Dubai).

The concept behind the structure of the hotel is the *Barajeel* (wind tower). It is clearly shown in the way the facades are oriented and designed. The design of the facades uses curtain walls indented inwards just like the way the *Barajeel* in the past were designed to keep air flowing in interiors, but this indentation serves shading more than it does air flow. The angle of the dent in the façade helps in keeping constant shade in certain areas near the center of the hotel. At the same time, the stepped inner facades of the rooms have been oriented in a way to allow city views to each room. The glass in that section is glazed and treated to minimize heat and maximize internal comfort (Figure 5.17). The shape of the concrete, glass and aluminum structure is a cuboid. The corners of the cuboid are glass and steel structures most likely housing service areas and lifts being smaller than the usual column and the panels have no interruption. Being a representation of a traditional architectural element in contemporary application the hotel is an extravagant abstraction of the *Barajeel.* These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.7, B 5.7).

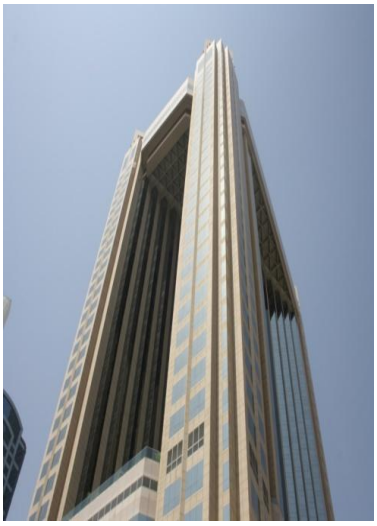


Figure 5.17: *Barajeel* inspired structure (Koujan, 2018)

Table A 5.7: General Analysis, Fairmont Hotel Dubai (Koujan, 2018)

Site layout

Facade organization : Traditional elements

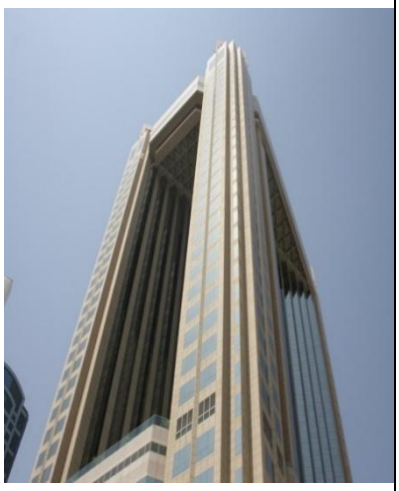
Main Traditional Elements :	Yes	No
Barajeel		
2 sided	☐	■
4 sided	■	☐
6 sided	☐	■
8 sided	☐	■
Mashrabiya		
Wood Full	☐	■
Wood Partial	☐	■
Gypsum Full	☐	■
Gyspum Partial	☐	■
Gyspum partial glass	☐	■
Other	☐	■
Steel	■	☐
Concrete	☐	■
Dome	☐	■
Roshan	☐	■
Gypsum Panels		
Floral Motif	☐	■
Animal Motif	☐	■
Pattern Motif	☐	■
Grille Motif	☐	■
Columns		
Circular	☐	■
Angular	■	☐
Brackets	☐	■
Keystone	☐	■
Crenellated parapets	☐	■
Crenellated arches	☐	■
Cornice	☐	■

Elevation (inside)

Elevation (street view)

Aesthetic Role

Table B 5.7: Integration between traditional and contemporary architectural values in Fairmont Hotel Dubai (Koujan, 2018)

Aesthetic Role	Traditional architectural values	Contemporary architectural values
 	The tower combines originality with modernity. The four *Barajeel* on the top are only for aesthetic needs. The designer aims to highlight new aesthetics by placing *Barajeel* on top of a tower. This example emphasizes the importance of employing modern construction techniques to create a distinctive architectural character inspired by architectural heritage on the one hand and modern systems on the other.	The construction is simply characterized by abstract expression, environmental buildings with high functional efficiency. This example reflects the views of the owner and designer. It features regional and global architecture, so that the construction balances between the thought and aesthetic harmony. The use of *Barajeel* elements in this modern design is due to their simplicity and relevance to the surrounding environment
Integration between traditional and contemporary architectural values	The Fairmont Hotel was designed to benefit from the spirit and concepts of traditional architecture. The fundamental feature in this building is its abstraction with no exaggeration in the formation, decoration and the adoption of frank and sincere forms, an aesthetic vision respects the human mind.	

5.2 Use of *Mashrabiya* in Contemporary Architecture in the UAE

This section the *Mashrabiya* features in contemporary buildings are keeping their original function in some cases and losing it to aesthetic use in other. The original use of *Mashrabiya* would still be useful when it is an outdoor feature, whereas when used indoors it is mostly as decoration and a vibe stirrer in order to maintain a certain atmosphere and style.

5.2.1 Al Bahar Towers

Al Bahar Towers are a development in Abu Dhabi, consisting of two 29 storey towers; one of which houses the Abu Dhabi Investment Council and the other is the head office of the Al Hilal Bank. The towers represent the innovation in architectural design in a developing country while maintaining the cultural identity and tradition in that context (Figure 5.18). That is clearly shown in the *Mashrabiya* inspired glass. Dynamic louvres that respond to light intensity in terms of opening and closing (Oborn, 2012). Al Bahar towers are an office facility. The main components of the interior are the offices and their services and utilities.

Figure 5.18: Al Bahar Towers (Koujan, 2018)

5.2.1.1 Analysis of the use of traditional elements in AL Bahar Towers.

Al Bahar Towers are an innovative project through which contemporary structuring is combined with traditional forms in the most convenient way. The panoramic, glass facades of the towers are partially covered with dynamic louvres shaped like the flower used in *Mashrabiya* designs in the past. The *Mashrabiya* being a wooden panel with intricate, wood designs forming a grille to cover windows for privacy and cooling inspired the same concept with the louvres on the skin of the towers. The shape is purely geometric and the joints of the flowers are controlled by a building management system (Figure 5.20). The louvres are made of aluminum, with the main function of controlling light and heat through the glass façade of the building. The louvres cover the sunny South, East and West facades of the towers.

Figure 5.19: Comparison of shading units fully closed left and fully open right (Aedas, 2012)

The façades of the East, Sout and West directions consists of double skin. A layer of geometric abstacted *Mashrabiya* skin sits two meters away from the original façade providing air space and cleaning space. The triangles on the façade are covered in fiberglass material and are computer controlled to move according to the amount of light hitting them during the day and night, all year round (Figure 5.20). It is powered by photovoltaic panels placed on the roof of the building.

During the night the façade would close showing more of the building under it and allowing more view of the surrounding area.

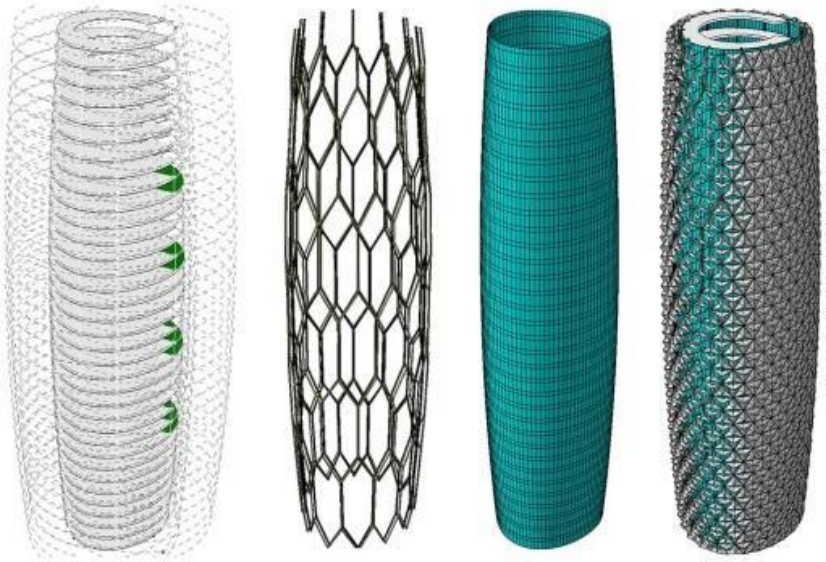


Figure 5.20: Cylindrical structure of the towers (Aedas, 2012)

The design of the building being a cylinder is beneficial architecturally and aesthetically. The former for the reason that there will be exellent floor area usage and creating the greatest volume with the least surface area. The main cylinder is covered by the *Mashrabiya* smart façade. The façade would help reduce glare and heat therefore there would be less stress on the air conditioning inside the building. Also, the façade allows in sufficient amount of daylight without the glare, allowing an adequate amount of light in reduces the use of artificial light inside the building during the day. Hence, the main purpose of the *Mashrabiya*. Although the technology implemented on this building is extravagantly evolved and has never been achieved on this scale before, yet it is still rooted to its culture and traditional architectural features. The concept has managed to maintain a cultural identity as well as introducing new technology to the field in large and extensive scales. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.8, B 5.8).

Table A 5.8: General Analysis, Al Bahar Towers (Koujan, 2018)

Site layout

Facade organization : Traditional elements

Main Traditional Elements :	Yes	No
Barajeel		
2 sided	☐	■
4 sided	☐	■
6 sided	☐	■
8 sided	☐	■
Mashrabiya (Abstracted)		
Matel	■	☐
Wood Partial	☐	■
Gypsum Full	☐	■
Gyspum Partial	☐	■
Gyspum partial glass	☐	■
Other	☐	■
Steel	■	☐
Concrete	■	☐
Dome	☐	■
Roshan	☐	■
Gypsum Panels		
Floral Motif	☐	■
Animal Motif	☐	■
Pattern Motif	■	☐
Grille Motif	☐	■
Columns		
Circular	■	☐
Angular	☐	■
Brackets	☐	■
Keystone	☐	■
Crenellated parapets	■	☐
Crenellated arches	☐	■
Cornice	☐	■

Elevation (inside)

Elevation (street view)

Aesthetic Role

Table B 5.8: Integration between traditional and contemporary architectural values in Al Bahar Towers (Koujan, 2018)

Aesthetic Role	Traditional architectural values	Contemporary architectural values
 	These towers were provided with the Islamic shading system "*Mashrabiya*" which envelops the building from the outside. The idea of *Mashrabiya* models for architectural uses that conform to the quality of the UAE environment is a method that achieves a very original and contemporary principle in the field of architecture and art	The design takes into account the cultural and environmental excellence of the region. The beehive type of mashrabiahas been developed to meet a variety of conditions. These functions include: light traffic control, airflow control, air flow reduction, increased humidity in the air stream, The design of each *Mashrabiya* is determined to achieve all these functions.
Integration between traditional and contemporary architectural values	Local materials are integrated with contemporary building techniques and methods, linking them to the cultural and social constants of the society will produce contemporary architecture new vocabulary reflecting contemporary (And originality) heritage values and social values of society.	

5.2.2 The Louvre Museum in Abu Dhabi

Figure 5.21: Roof with dome, Louvre Museum in United Arab Emirates (Nouvel, 2013)

The Louvre Museum in Abu Dhabi is a cultural facility located in the cultural district of Al Saadiyat island. Architect Jean Nouvel- a Pritzker prize winner architect- stated that he wanted this building to mimic a protected territory that belongs to the region and the geography in which it has been constructed. This would be achieved by merging modern architecture and the culture of the region of the United Arab Emirates. The museum houses public display and scientific study areas as well as galleries. It has been completed and opened to public since December 2017. The Museum is considered a monumental and cultural upturn in the Middle East and the Arab world.

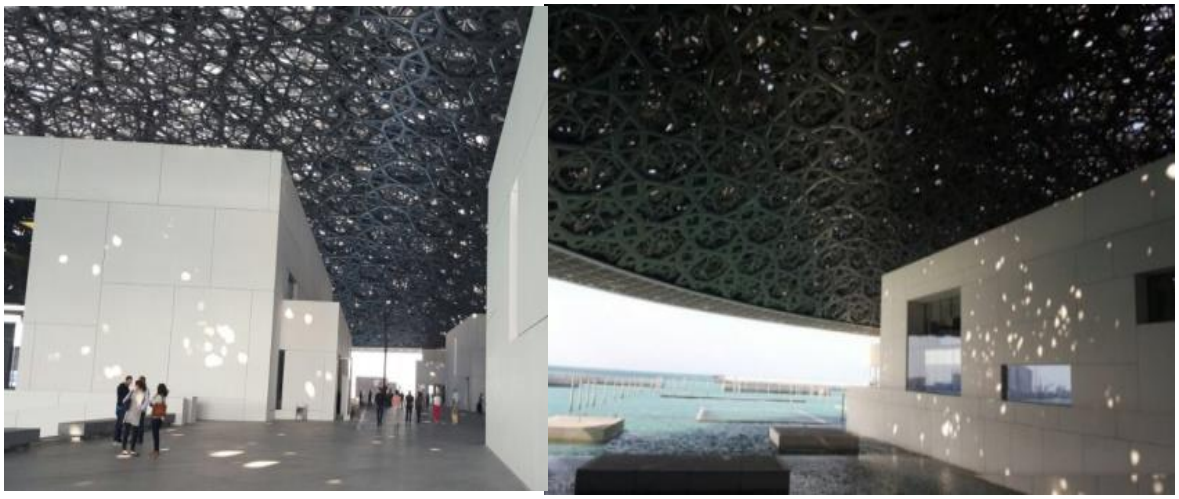


Figure 5.22: Light dispersion from the *Mashrabiya* inspired dome (Koujan, 2018)

Figure 5.23: Light dispersion from the dome (Koujan, 2018)

5.2.2.1 Analysis of the use of traditional elements in Louvre Museum.

The dome roofing the museum only covers part of the building. It consists of interlocking geometric design of palm frond, which has been one of the main elements of roof construction in vernacular architecture. Combined with that is the idea of the *Mashrabiya* which is clear in the way the dome is designed and perforated in order to allow light into the interior of the museum but only as 'rain of light' (Figure 5.22 – Figure 5.24).

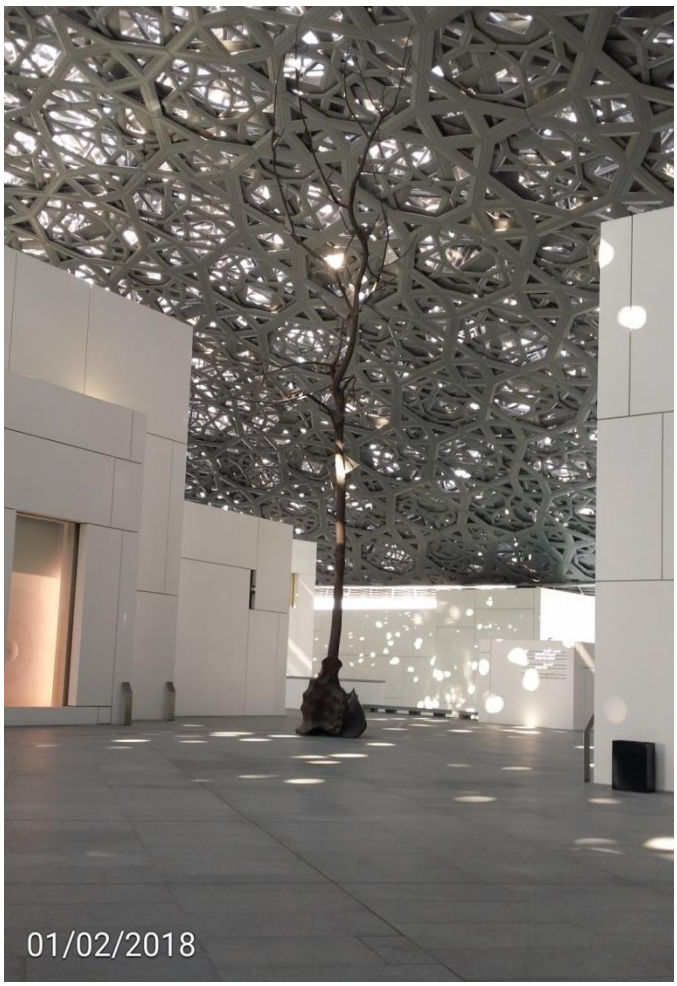


Figure 5.24: Rain of light concept (Koujan, 2018)

The *Mashrabiya* in its time was used for the same purpose of allowing partial light in and not flooding the place with it, it also protects the openings at which it is placed. (Koujan, 2018)

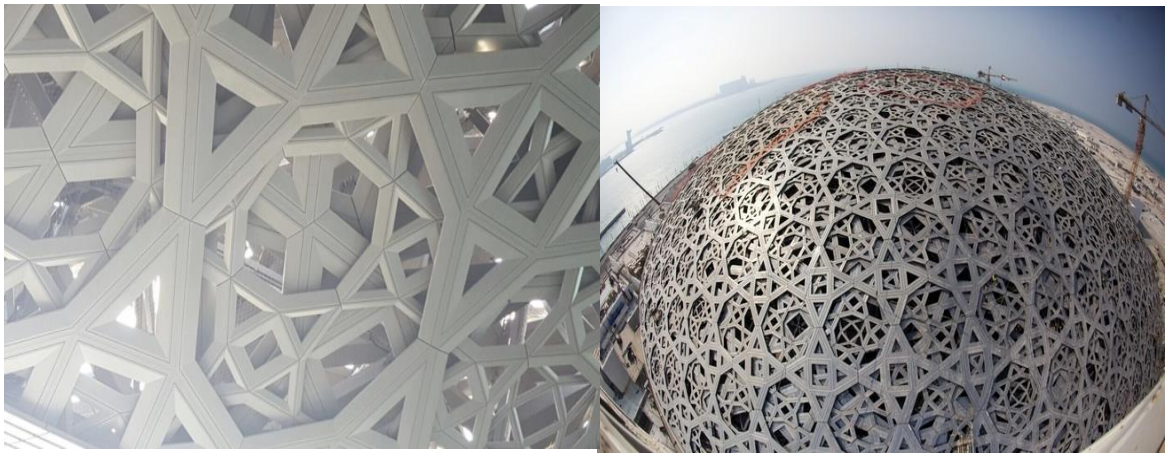


Figure 5.25: Layers of the dome (Koujan, 2018)

The dome is flat and radiating geometry. The perforations in the *Mashrabiya* inspired dome create shadow that is punctuated my rays of sunlight. At night, the veiled landscape under the dome is an array of light under a starry dome (Figure 5.25).

The dome of the museum consists of eight layers, four of which are internal and four are external, all interlacing forming the *Mashrabiya* style perforations in palm frond designs. The layers altogether are made up of 7850 Islamic stars.

The main purpose of the dome in the museum is not only to protect the building structure from the rays of the sun; but to decrease the amount of energy used in the building, this process is called local climate (Novel, 2017).

Beneath the dome, the architecture of the museum has been casually arranged in order to represent the form of the Arab city or Medina. Narrow alley ways and pathways have been implemented representing the ‘Freej’, which is the narrow alley ways between houses in the past.

Figure 5.26: Old neighborhood inspired design at Louvre Abu-Dhabi (Koujan, 2018)

Contrasting the exterior, the interior of the building comprises of large galleries and high ceilings. Moreover, the construction is reflecting culture and maintaining authenticity without being a redundant translation of what it has been inspired by. The materials used in the construction were kept to minimal and traditional elements like stucco, plaster and stone. Glass and metal add the contemporary touches but are rarely used in major areas.

Jean Nouvel, the architect of the project has a 'Falaj' inspired water system running through the building inspired by the old system of carving in the mountain rocks in order for rain water to run down the mountains for people to collect (Figure 5.26). These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.9, B 5.9).

Table A 5.9: General Analysis, Louvre Museum (Koujan, 2018)

Site layout

Elevation (inside)

Elevation (street view)

Facade organization : Traditional elements

	Yes	No
Main Traditional Elements : Barajeel		
2 sided	☐	■
4 sided	☐	■
6 sided	☐	■
8 sided	☐	■
Mashrabiya (Abstracted)		
Metal	■	☐
Wood Partial	☐	■
Gypsum Full	☐	■
Gyspum Partial	☐	■
Gyspum partial glass	☐	■
Other	☐	■
Steel	☐	■
Concrete	■	☐
Dome	■	☐
Roshan	■	☐
Gypsum Panels		
Floral Motif	☐	■
Animal Motif	☐	■
Pattern Motif	☐	■
Grille Motif	☐	■
Columns		
Circular	■	☐
Angular	☐	■
Brackets	☐	■
Keystone	☐	■
Crenellated parapets	☐	■
Crenellated arches	☐	■
Cornice	☐	■

Aesthetic Role

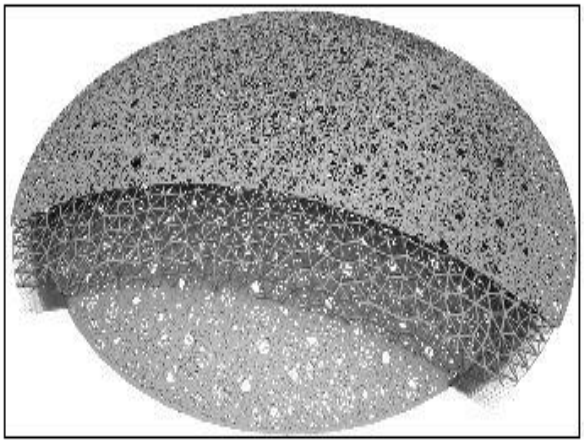
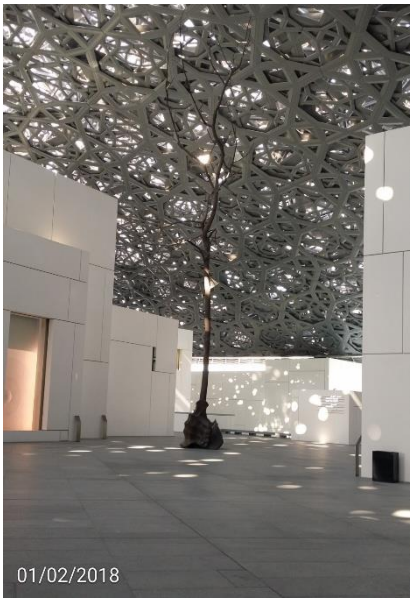


Table B 5.9: Integration between traditional and contemporary architectural values in Louvre Museum (Koujan, 2018)

Aesthetic Role	Traditional architectural values	Contemporary architectural values
 	The dome is inspired by the UAE's heritage environment and the shade of palm trees in the oases, makes it look like a parachute that allows the sun to enter the day. In the evening, the stars in the dome are illuminated by light to make the dome look like a starry sky Floating on the surface of the water that surrounds it.	The creation of a museum in Abu Dhabi is a Western concept exported, a creation unrelated to the history of the region. The museum represents risk of cultural hegemony. The museum is characterized by its distinctive level of innovation and professionalism as a symbol of renewal to enrich the built-up UAE environment.
Integration between traditional and contemporary architectural values	The design is characterized integrating UAE heritage with modern architectural innovation, by geometrical design, and is covered by geometrical shapes of different sizes on eight layers, penetrated by the sun, to create a cinematic influence during the day when the "light beam".	

5.2.3 Masdar Institute in Abu Dhabi

The Masdar Institute of Science and Technology (Masdar Institute) is a graduate level, research-based university which is focused on alternative energy, sustainability, and the environment. The whole idea behind the Masdar institute is using power from the natural elements (Foster + Partners, 2010). The design belongs to Norman Foster and Partners. The building has a perforated exterior made of glass reinforced concrete. The color and pattern details all refer to the Islamic and Arabian tradition and culture.

5.2.3.1 Analysis of the use of traditional elements in Masdar Institute.

The design of the buildings also uses the way the traditional houses were distributed, the narrow alleyways and pedestrian streets. The designers made sure to concentrate on the traditional architectural elements on the building, while using modern materials to execute it (Figure 5.27).

Figure 5.27: Masdar city façade designs with abstracted *Mashrabiya* (Caine, 2014)

The institute has two parts, educational and residential. The interior of the residential buildings are ventilated naturally using open louvres on the roofs of the buildings. The apartment's windows are enveloped with traditional design screens. The screens are very close in appearance to the traditional *Mashrabiya* and are used for the exact same purpose

back when it was used solely for the purpose of blocking out the sunlight and for privacy. The screens protecting the windows are made of reinforced steel.

The openings in the screen providing light and shade are cut in the style of traditional *Mashrabiya* patterns (Figure 5.28).

Figure 5.28: Precast façade before fixture to the building (Foster + Partners, 2010)

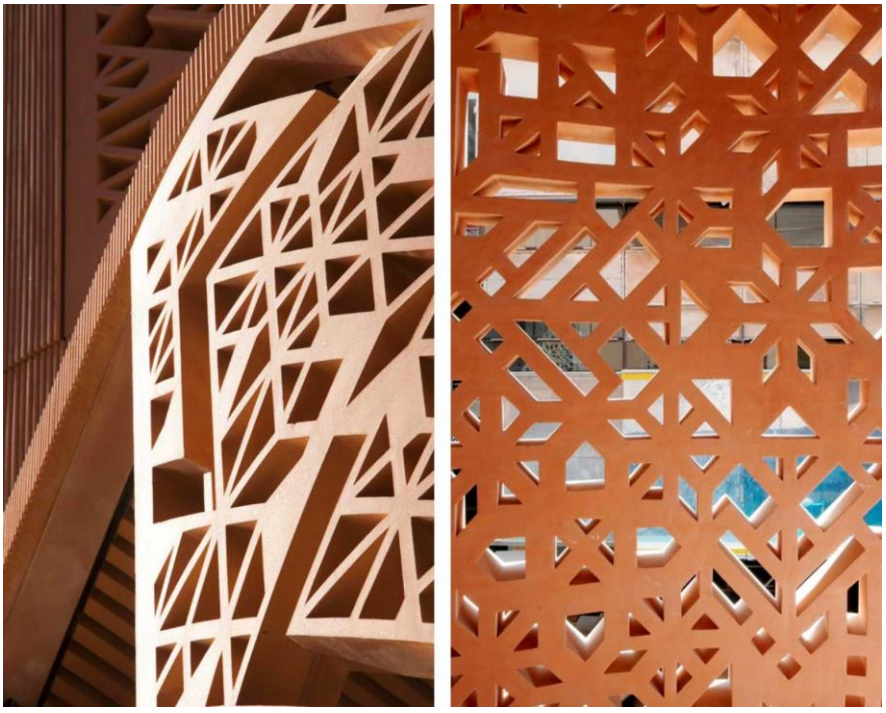


Figure 5.29: A ditails of *Mashrabiya* (Foster + Partners, 2010)

The main concept for the exterior façade was self-shading. *Mashrabiya* inspired, glass reinforced concrete screen layers provided for this. Facades were designed in three layers, external, inner façade and insulation layer (Figure 5.29). Balconies and vertical *Mashrabiya* screens form the first layer of the façade, oriented in a curved manner allowing maximum self-shading and shading for adjacent buildings. The screens were made in different scales to allow visual depth. The glass reinforced concrete material moulding possibilities allow the visual depth to show during the final installation phase. The result of this was the translation of tradition into modern state of the art design. These two tables explain general analyzing about material used in building and integration of traditional and contemporary architectural values (Table A 5.10, B 5.10).

Table A 5.10: General Analysis, Masdar Institute (Koujan, 2018).

Site layout

Facade organization : Traditional elements

	Yes	No
Main Traditional Elements :		
Barajeel		
2 sided	■	□
4 sided	□	■
6 sided	□	■
8 sided	□	■
Mashrabiya (Abstracted)		
Fiber concrete	■	□
Wood Partial	□	■
Gypsum Full	□	■
Gyspum Partial	□	■
Gyspum partial glass	□	■
Other	□	■
Steel	■	□
Concrete	□	■
Dome	□	■
Roshan	■	□
Gypsum Panels		
Floral Motif	□	■
Animal Motif	□	■
Pattern Motif	□	■
Grille Motif	□	■
Columns		
Circular	□	■
Angular	■	□
Brackets	□	■
Keystone	□	■
Crenellated parapets	□	■
Crenellated arches	□	■
Cornice	□	■

Elevation (inside)

Elevation (street view)

Aesthetic Role

Table B 5.10: Integration between traditional and contemporary architectural values in MASDAR INSTITUT (Koujan, 2018)

Aesthetic Role	Traditional architectural values	Contemporary architectural values
 	The main exterior design is inspired by was self-shading façade with *Mashrabiya*, glass reinforced concrete screen layers were used. Facades were designed in three layers, external, inner façade and insulation layer. Balconies and vertical *Mashrabiya* screens form the first layer of the façade, oriented in a curved manner allowing maximum self shading and shading for adjacent buildings. The screens were made in different scales to allow visual depth.	The design has been able to bring about the development of origin and heritage in the production of the architectural forms. By showing rich techniques in architecture, identity, art, history, integration and fusion.
Integration between traditional and contemporary architectural values	The design of the building is characterized by its smart and simple design, and takes into account the best practices and modern technologies in the field of sustainable development.	

Table 5.11: Use of Barajeel and Mashrabiya elements in case studied buildings **(**Koujan, 2018)

Project name	Function	City	Const Year	Main Traditional Element used in Architectural Design
Central Souk	Market	Sharjah	1978	*Barajeel* (traditional-aesthetic and symbolic)
Madinat Jumeirah	Hotel, Resort and Shopping facility	Dubai	2003	*Barajeel* (traditional-aesthetic and symbolic)
Maras Al Seef	Tourist Resort	Dubai	2017	*Barajeel* (traditional-aesthetic and symbolic)
Sheraton Hotel	Hotel	Sharjah	2015	*Barajeel* (traditional-aesthetic and symbolic)
Ajman Palace	Hotel	Ajman	2017	*Barajeel* (traditional-aesthetic and symbolic)
Fairmont Hotel	Hotel	Ajman	2013	*Barajeel* (traditional-aesthetic and symbolic)
Fairmont Hotel	Hotel	Dubai	2002	*Barajeel* (modernized-aesthetic and symbolic)
The Louvre Museum	Museum	Abu Dhabi	2018	*Mashrabiya* (modernized-functional)
Al Bahar Tower	Office Building	Abu Dhabi	2012	*Mashrabiya* (modernized-functional)
Masdar Institute	Educational Facility	Abu Dhabi	2015	*Mashrabiya* (modernized-functional)

CHAPTER 6

DISCUSSIONS AND CONCLUSION

6.1 Discussions

As it has been reviewed in Chapter 2 of the present thesis, using historical and/or traditional architectural characteristics and elements has gained ground since the 19th century. Initially, architects have copied elements from preceding historic eras and used them to design especially the facades of their buildings with revivalist expressions of the different styles. They even combined different styles together to create eclectic expressions. Although during the first half of the 20th century modern architecture has disregarded the use of historical elements and styles, with the advent of postmodern architecture since 1960s, historical features started to re-emerge in architectural design. Post-modernism has favored abstraction and use of historical elements, materials and textures. Another style that emerged more or less in the same period with post-modernism is critical regionalism. As it has been mentioned in Chapter 2 of this thesis, critical regionalism highlighted the use of local or regional materials, with locally sourced workmanship and design ideas. Critical regionalism has also favored the continuity of traditional building forms, whenever and wherever possible. Another dimension that emerged in the architectural design world is symbolism, which is the use of architectural elements, forms, and shapes for reflecting cultural and even national identities in buildings.

In order to prepare the framework to investigate the use of traditional architectural elements in the contemporary architecture of the United Arab Emirates, Chapter 3 has presented information of the two traditional elements, namely the *Barajeel* and *Mashrabiya*, which have been widely used in the Gulf region. Chapter 4 has presented a brief review on historic, geographic and climatic features of the UAE, followed by a review of the characteristics of traditional architecture in the country. Examples have been given both from traditional architecture, but also regarding the contemporary use of *Barajeel* and *Mashrabiya* around the country. Chapter 5 has addressed the use of these two traditional elements in case studies. Analysis has indicated a wide use of *Barajeel* as o decorative element topping the buildings, both low rise and high rise. These new *Barajeels* either are used as skylights, allowing in

daylight; or pure aesthetic elements. Although there have been examples for an abstract recreation of *Barajeel*, as it has been the case of Fairmont Hotel (Dubai), it is often preferred to be used in traditional form, giving the building an old ambiance. The bold use of *Barajeels*, as seen in the case studies in Chapter 5, reflects a post-modern architectural taste, which favor the use of traditional elements. Whilst it can also be considered as an attempt for regionalist architecture, the absence of locally sourced materials and dominance of decorative use rather than functionality makes it difficult to describe the use of *Barajeel* as an attempt of regionalist architecture. On the other hand, this reflects an attempt of symbolism. The bold use of *Barajeels* on top of the buildings around the country is a symbolic link with the history of the country. Today, *Barajeel* is used as the key form to reflect the UAE peoples' traditional and cultural identity in architectural expressions.

Case study investigation of *Mashrabiya* has indicated a continuity of using this element both for functional and aesthetic reasons. Abstraction of *Mashrabiya* has started to gain popularity in contemporary architecture of the UAE. Unlike *Barajeel*, which is a prismatic rigid structure, *Mashrabiya* is a flat element that can be used straight or curve, long or short, and horizontal or vertical. As in the case of Al Bahr Towers, it can be converted into a mechanically controlled skin façade; or as in the case of Louvre Abu Dhabi Museum, it can be used as a perforated roof that allows daylight in a controlled way. Design of the patterns of *Mashrabiya* requires accurate calculations if the element will function as a solar shading and air control system. However, as the examples in Chapter 4 and case studies in Chapter 5 indicate, often it is the decorative use which is preferred. There have been two preferences for *Mashrabiya*: the first one is using it in the form of window grills, which are designed in Islamic geometrical patterns and in a neo-historical style. Alternatively, as it has been seen in the case studies in Chapter 5, it can be abstracted, and used either as façade element or roof element. In this case, as it has been in Masdar Institute and Louvre Museum in Abu Dhabi, the *Mashrabiya* becomes a modernized element.

6.2 Conclusion

United Arab Emirates has seen unprecedented development in architecture and urbanism since 1970s. The country's opening up for international business and tourism has attracted population. Huge amount of buildings were constructed in UAE's cities especially since 1990s. Newly developing industrialized materials and structural systems have been imported to the country. Several high-tech high rise and long span structures have emerged in the expanding cities. For a long time, especially Dubai and Abu Dhabi, has been home to placeless architecture, and to buildings designed in Western-based styles. However, as it has been seen in this thesis, there has also been an attempt to create buildings using traditional and historical elements in the volumetric expressions. Analysis of the table 5.11, which has been presented in Chapter 5 of the present thesis, reveals how the use of *Barajeel* and *Mashrabiya* has gained momentum in architectural expressions in the UAE, especially since the dawn of the 21st century. Majority of the examples, surveyed for the present study, indicates the popularity of *Barajeel* in its original form. Most of the case studies and other examples, which have been observed for the present study, are with *Barajeels*, designed in neo-historicist approach. On the other hand, *Mashrabiya* has gained popularity as an abstracted and modernized element on the volumetric expressions of the buildings constructed in the recent past.

As it has been seen in the UAE example, understanding and utilizing traditional elements in contemporary designs is important, because it helps in erecting buildings in the cities that reflect the culture and identity of local communities. Utilization of traditional elements for this purpose can be done either both functional and aesthetical, or only aesthetical. However, in any case, it is important to understand the traditional use and design of such elements before integrating them into new designs. This way, instead of repeating the same geometric and formal compositions, various new typologies can be created based on the existing models.

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