

## Concurrence of Thermal Comfort of Courtyard Housing and Privacy in the Traditional Arab House in Middle East

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**Abstract:** This review paper qualitatively identifies the physical features of the traditional Arab houses in Tripoli and Libya in terms of their privacy and their physical response to the environment. It measures elements of courtyard housing style and consequently how they adapt to the environment's culture and climate. The physical features of a traditional house and user behavioral preferences of gender segregation are evaluated for matching. This paper contributes in establishing environmental analogy of man and his habitat. Social, physical and psychological dimensions of housing regionalism are symbiotic. In order to enhance housing sustainability several interrelated sectors like planners, designers and developers need to carefully harness these potentials considering their economical viability.

**Key words:** *Privacy, courtyard, thermal comfort, traditional Arab house, and Libya*

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### INTRODUCTION

These modern buildings with their new and extrinsic design principles have generated social problems because buildings rarely follow inhabitants' customary life style. Many of the social habits and ways of life that provided the society its identity has become extremely difficult for the people to practice. Initially the traditional house accommodated an extended family comprising several generations (grandparents, parents and children). The spatial characteristics of the house offered each generation the possibility of adhering to its own way of life while at the same time maintaining a mutual relationship between generations. This pattern of living, which gave society continuity and social integration, has begun to disappear.

The current trend of modernization and urbanization seem to sacrifice building adaptation to nature for other considerations. However, the twenty first century green building movement or zero carbon emissions reechoes the global awareness for environmentally sensitive building. Traditional buildings are a product of an age long tested and trusted reaction to environmental realities. This set of structures deserves conservation in their energy efficiency, low-tech solutions and popular acceptability among users. In developing countries like Libya, Oman and Bahrain formal housings provide access to a significant section of the citizenry. However, many of such schemes failed to meet the cultural values of the inhabitants. Particularly Bedouins were forced to settle in these projects. Similarly, some of the residential designs could adapt well to the arid Mediterranean climate. Socially, polygamous men (married to more than one-woman) were inadequately provided with dwelling spaces. Apparently the Bedouin resettlement population doubled or even tripled in many of these dwelling units. Users employed informal additions to their dwellings to satisfy the needs which evolve continuously with time. Unfortunately, some of these adjustments raised structural challenges Mahgoub, (1999).

By the end of the eighteenth and nineteenth century, Muslim cities were sentenced to death through the introduction of alien morphology, socio cultural transformation with time and change in contemporary economic activities because many people, especially those influenced by western propaganda, considered the seclusion of males from females in Islamic settings as barbaric and infringing on the rights of the women folk. They consider the Muslim women as one that was restricted from social activities hence giving the Men the scope of enjoying themselves. This study focuses on the functions of the courtyard as a means to provide the Muslim woman with a lot of freedom within her own private world. This paper answers the question of how the courtyard in traditional Arab house privately secludes women by guaranteeing them unlimited freedom to engage in their outdoor activities, within thermally comfortable setting and thereby enabling the dwelling environment to serve its core religious and social functions of privacy happily.

We have tried to divide the paper into four sections. Following the introduction, is the problem statement,

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which outlines the link between the need for outdoor spaces secluded for the family, away from the preying eyes of male visitors, which is also thermally comfortable to human physiology. The second part deals with the traditional domestic architecture of the Arab World which spells out the characters of the courtyard housing in the research area and factors influencing the design of courtyard house, e.g. climate, building materials, socio-cultural dynamics; neighborliness, modesty of life and the level of thermal comfort. The third section analyzes some typical core (old) Tripoli houses' for privacy and thermal comfort. Section four concludes the paper, and makes appropriate recommendations.

***Problem statement:***

Man has always been struggling to mold his residential environment in the way that fits his needs and well adapted to physical environmental changes. To this end, he makes some modification within his means (technically and materially) in response to those needs and circumstances. Nevertheless, his natural environment is a crucial factor that determines his choices. Ultimately man could hardly escape from adapting himself, his lodging and his life style within the environment, the container for him, his dwelling and the rest of the community that he belongs. Accordingly, his lodgings in its all-different types had expressed human life and the availability of resources within his operational base, the environment. Therefore, man made his house to be conducive to the surrounding environment by applying appropriate available building materials to articulate humane space for social interaction fellow men.

Generally the form of traditional houses is influenced by physical, social and psychological factors. Human choices within the physical realm relate to local climate and geology. Two overriding factors - climate and the availability of building materials have limited the traditional Arab architectural forms up to some extent. However, a look beyond the predominant sand/mud color of many of the buildings shows the wealth of the complex edifices of varied details.

The traditional Arabian architecture and planning seem to erode due to economic boom especially in Middle East. The oil wealth of the late twentieth century seems to reorient the value system of the citizens of this region. This manifests in the application of modern building materials and techniques with minimum regard to environmental setting. Most of the prestigious institutional buildings are inclined to artificial or mechanical ventilation. Consequently, such habitat proves to be climatically, environmentally and culturally unsuccessful. Traditionally, Arab houses are characterized by courtyards as physical and cultural symbolism; inward directed openings; hierarchy of spaces to uphold of Islamic social order on gender as well as appropriate application of materials local materials.

In the twenty-first century, there appears an efficient usage of courtyard as environmental bioclimatic thermal controller at domestic and institutional levels of the built environment. Air from courtyard can only affect internal space if it circulates through them effectively. Moreover, these courtyards physically protect the structure against strong wind. Culturally, the same space is dedicated to the private outdoor relaxation of women and children. Social and cultural changes in Libya are affected by all aspects of life. People depend on cars and other means of transportation which causes the cities to expand rapidly. This uncontrolled expansion transforms major cities into metropolitan areas, thus changing the traditional life style into a modern one. Figure 1 illustrates privacy imagery of the Arab/Muslim society.



**Fig. 1:** An Aisle linking houses: A Typical Façade of an Arab House (min. ext openings) Source: Author's field work.

***Traditional Architecture in Arab World:***

Traditional architecture is used to represent the structures built by people whose design decisions are influenced by traditions in their culture. It varies widely with the world's vast spectrum of climate, terrain and culture. It contains inherent and unwritten information regarding how to optimize the energy performance of buildings at low cost using local materials. Over the course of time these dwellings have evolved to respond to challenges of climate, building materials and cultural expectations of a particular place.

The concept of family privacy and the role of women in the family and the society are reflected in the use of public, semi-private and private spaces. Environments dedicated to women only or to the entire inner family are the private spaces in the house. They also utilized several outer courts dedicated to various levels of social interaction among men. In the twenty-first century, there appears an efficient usage of courtyard as environmental bioclimatic thermal controller at domestic and institutional levels of the built environment. Air from courtyard can only affect the internal space if it circulates through them effectively. Courtyard provides comfortable area during hot season. Opening and closing of doors are employed to influence the courtyard's microclimate. Moreover, these courtyards physically protect the structures against strong wind during storm and bad weather. Culturally, the same space is dedicated to the private outdoor relaxation of women and children. Courtyards are particularly effective in climates where extreme diurnal temperature is quite likely. They act like cups holding cool air (cooled at night) to be used during the day time. It should also be noted that courtyards also provide outdoor areas that are well protected from distractions or dangers outside the home. The study evaluates the coincidence present in the ability of the courtyard to provide thermal comfort as well as providing privacy as demanded by Islamic laws (Ealiwa and Taki, 2001).

***Characteristics of Courtyard Housing in Islamic (Arab) Society:***

The Arab World has adopted the courtyard house as the basic type of dwelling house because of its ability to satisfy the practice and living habits prescribed in the Qur'an and the Hadith. The characteristics of traditional courtyard houses can be summarize as follows (Edwards *et al.*, 2006):

- i. Privacy of the occupants, especially women in relation to the outsiders and male visitors
- ii. The treatment of guests
- iii. Responsibility to the neighbor and
- iv. Modesty in life

The typical characters of the courtyard include (Edwards *et al.*, 2006):

- i. There is an enclosed space open to the sky surrounded by rooms accommodating the various activities of the dwelling house.
- ii. With hardly any openings in the external walls, the houses are inward looking towards the courtyard on which it has total dependence for light and air circulation.
- iii. The façade of the external wall is plain devoid of any decoration with the elevations expressing a play of rectangles, squares and straight lines.
- iv. Before subsequent expansion, the houses are usually built as one storey structure with raised parapets in the roof which is accessed by a stair from the courtyard enabling the roof space to be for various purposes.
- v. The courtyard may have trees, water pools, wells, awnings etc to soften the effects of heat and glare.
- vii. There is covered logins (*iwans*) surrounding one or more of the courtyard which provide further protection from the sun.
- viii. The number of courtyard varies from one to five.
- ix. The main door is usually decorated as opposed to the austere treatment of the façade and exterior walls. The entrance is usually at the end of the passage which maintains the privacy of the house.

***Islamic Determinants of Housing Design:***

When the Arabs settled in the desert, they used to close their houses to the outside and turned them into courtyard which often embodied most of the missing aspects of the desert such as water, plants, shade, reference point and a sense of enclosure Noor, (1991). For the people of the desert the courtyard seems to offer the ideal conditions they desire in an abode. Eventually this turned to be an idealized world for them, around which the family life evolved. The factors which influence the design of courtyard are listed below.

***Climatic:***

The courtyard in the Arab house is an effective way of building a dwelling place as well as to create an agreeable internal environment which counteracts the climatic conditions of the humid region. It acts as a modifier in hot and dry regions and allows occupants to carry on outdoor activities with protection from the sun, dust and wind.

***Building Materials:***

Lack of suitable building materials, like burnt brick and timber, leads to vertical and horizontal restrictions of sizes of the building. This makes a number of rooms that are compatible to each other to be grouped together around a central space within easy reach of one another. These constraints have given the courtyard house a sense of uniformity in their widths and heights.

***Socio-cultural Dynamics of Privacy:***

A verse in the Quran states 'when you ask of them (prophets wives) anything, ask I of them from behind a curtain' (33; 52). Although the passage relates to wives of prophet (AS) all Muslim are to follow the example. Sahih Al Bukhri (R A) reported that if any one of you asks for permission three times to enter a house and permission is not given, and then he should not enter inside the room.

*'If anyone removes a curtain and looks into the house before receiving permission, and sees anything which should not be seen, he has committed a sin. But if a man passes a door which has no curtain, and is not shut and looks in, he has committed no sin, for the sin pertains to the people inside'* Mishkat Al Masabih (3526).

The emergence of the following Islamic guidelines has impact on the design of a Muslim house in both direct and indirect manner:

- i. Privacy of women should be respected in all circumstances at every level.
- ii. The entrance of a house should have a curtain, a door or some kind of screening so that passersby or any sort of strangers may not peep.
- iii. A visitor should wait for permission before entering a house. If he is not permitted he is not allowed to get inside the house.

All these requirements mentioned above are satisfied by the design of courtyard house. The importance of privacy is one of the major concerns while designing a Muslim house. Yet according to the interpretation of other guidelines the male guest visiting the house, from which privacy is intended, is to be accorded as much hospitality as possible and treated like a member of the family. In the Quran, Muslim is asked to treat each other as brothers. 'The believers are both a single brotherhood (Al Quran, 1919).

Intelligent and precise planning makes it possible for the visitor to enter the *diwaniya* without disturbing the female members of the family. In multi courtyard houses, the second courtyard is likely to be the family courtyard which may always be used by the women where complete privacy is ensured.

***Privacy Function of the Courtyard:***

The traditional Arabic house is one that has been adapted, physically and symbolically with a view to serving two inseparable functions: first, serving as a shelter *ma-awa*, providing the inhabitants with adequate protection against unfavorable outside conditions (climate). Second, as a habitat *maskan*, one in which the inhabitants could comfortably satisfy their physical and emotional needs (culture). Consequently, the courtyard seems to be the appropriate outdoor space for these functions.

According to Mahgoub *et al.* (1999), privacy was an important factor in the arrangement of the houses. The male reception area was separated from other family private areas. It had direct access from outside without going through the house. The courtyard was restricted to family activities. It was used by women to move between house parts. The courtyard was an important feature of the house. It occupied half of the traditional house area. It provided privacy for women to conduct their social activities, eating, and sleeping during the hot summer season.

Mahmoud, (2007) stated that in traditional Arab house, one can understand the interior disposition of the dwelling, based on a number of major cellular units grouped around a central distribution space that is the courtyard the space organization of such a dwelling reflects the user need, the spatial requirements and the incremental developments with mutual understanding among neighbors. The courtyard house was indeed the

favoured typology of most Arab-Islamic cities and their enclosed and introverted domestic space responded ideally to the requirements of the Arabs social order.

The courtyard is the controlled source of light, providing shade as the sun moves across the sky, and allows a portion of the light to be used for all indoor living purpose. Thus the courtyard becomes the inner living space. The fundamental characteristics of the courtyard house are in line with the family's tradition of isolating itself from the public and its need for a private family life (Abarkan and Salama, 2000).

Old houses are formed with a courtyard (square, rectangle, and trapezoid plan type) surrounded by buildings oriented on the main directions such as east–west and north–south. Blocks surrounding courtyards are usually perpendicular to each other irrespective of the plot geometry Gedik, (2004). Reynolds, (2002) explains the social functions of courtyard as that of allowing almost any activity to be carried on at least in a temporary basis. He explains that the most common usages of courtyards and arcades are as an extension of living, dining and kitchen activities. The things most frequently done in the courtyard tend to be those done in groups. Another function of the courtyard as elaborated by Reynolds, (2002), is “social delight” of being in a safe playground with great variety. It offers the children enough contact with nature to be entertaining, yet rarely so much as to be threatening.

#### ***Neighbor Relations:***

The absence of windows on the external walls avoids the viewing out of the room as well as looking in by outsiders. The provision of raised parapets in the roof which is used by occupants as living space is as much for the privacy of the neighbor as it is for the dwellers own protection as advised by Prophet (SAW), ‘if anyone spends the night on the roof of a house with no stone palisade, Allah’s responsibility to guard him no longer applies’ (Abu Dawud; (5023). Hadith 1992)..

*“He who believes in Allah and the last day should not harm his neighbor and honor his guest” [11].*

#### ***Modesty of Life Style:***

The practice of modesty in life affects the design of Muslims’ houses. The Quran has forbidden the Muslims to spend money in vanity or in showing off their ‘wealth’.

*‘Allah loveth not, those who spend their sustenance to be seen of men (Al Quran, 1991)*

The stark, plain external facades of Muslim buildings devoid of any decoration or embellishment seem to reflect the implementation of these guidelines. The Prophet (SAW) seems to have associated the height of a building with an expression of vanity and extravagance by the owner. The Prophet (SAW) said ‘the hour of doom will not be established till the people compete with one another on constructing high buildings’, (Al-Bukhari, Hadith, 1990).

#### ***Thermal Comfort Functions of the Courtyard:***

The courtyard was developed mainly in response to climatic requirements. For many centuries and to the present day the courtyard has been one of the most characteristic forms of residential architecture in warm climates Muhaisen, (2004). The residents of such climate utilized the courtyard to serve as a collector of cool air at night and a source of shade in the daytime (Safarzadeh and Bahadori, 2005). Courtyards are usually the heart of the dwelling spatially, socially, and environmentally. Thermal comfort is affected by several factors like building orientation, ventilation, and shadowing. Courtyards are developed taking those factors into consideration.

Although, the size of the land, to some extent, is influential, the average sizes of the courtyards are generally determined according to the latitude. They are narrow enough to maintain a shaded area during the heat of the day in summer but wide enough to receive solar radiation in winter. A courtyard can provide security, privacy, and a comfortable place within the house. The courtyard is usually planted with trees, flowers and shrubs, not only to provide comfortable condition and beautiful setting, but also to shade spaces adjoining, and increase the relative humidity of the courtyard. Even without modern, mechanical heating or cooling systems the courtyard house provides a comfortable living environment through seasonal usage of sections of the structure. The mass of the walls and floor of the courtyard is cooled by outgoing long wave radiation, and therefore, the surface of the courtyard floor and walls will remain cool by the following morning. In this way, the mass of the walls and floor of the courtyard (and not the air deposited in the courtyard) serves as a reservoir

of coolness if it is not too large and well shaded.

Khan, (2003) justified the functions of the courtyard as more than privacy. The courtyard has an environmental advantage as well as social. They also serve as temperature regulators. Surrounding the courtyard there are colonnades and the rooms were arranged with open into balconies overlooking the courtyard this arrangement allows cool air to flow through the building into every room in the house. In the day time when inside windows are closed, the coolness was maintained inside the rooms by heavy thick walls that absorbed the built-up heat.

**a) Orientation:**

According to climatic conditions for each district, specifically for the prevailing winds movement of sun in the direction and area of window directed inwards or outwards were taken into consideration at that time:

- To ensure natural lighting for interior spaces in the house in desired times but without control.
- To be suitable to humidity by ensuring ventilation.

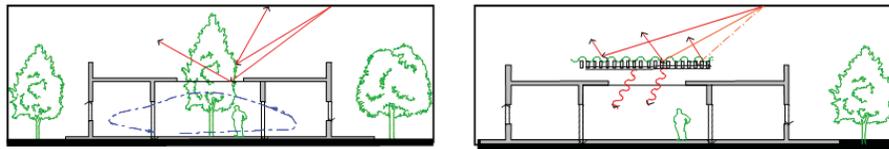
Studies on this issue show that most windows opens outwards. Especially on the higher floors these windows were directed to the northern/south orientation in order to enable the penetration of ventilation air to the interior spaces and to reduce undesirable sun rays (Gedik, 2004).

**b) Ventilation:**

Natural Ventilation is the process by which spaces exchange indoor air with outdoor air without the use of any mechanical system. This can be induced by wind effects by which air is driven through or out of the space via windows or other openings like louvers, holes etc. Air movement can also be induced by buoyancy resulting from the difference between the density (due to temperature differences) of the air of the indoor and outdoor space. The lesser the density of the air the higher it will rise. For ventilation openings are not used to increase the reduction of humidity in the interior spaces of the ground floor of the traditional interior courtyard houses because there are no openings outside that ensure the movement of the air ((Gedik, 2004).

**c) Shadowing:**

Traditional houses are usually surrounded by a wall and an interior courtyard. During the day, interior and exterior spaces pass through different shadow periods. Interior courtyard represents a source of natural lighting for the surrounding spaces. This area is not exposed to the sun's rays even in every hot times due to the available trees in interior courtyard, which creates equilibrium in internal environment of house. This courtyard permits the removal of hot air and maintenance of cool air inside the courtyard; and relatively keeps the coolness of surrounding spaces (Gedik, 2004). Figure 2 below shows thermal value of courtyards in enhancing cross ventilation through shadow casting.



**Fig. 2:** Types of natural elements for shadow. Source: Author's field work.

**Analysis of Selected Models of Houses in Tripoli Core City:**

Two sample houses were analyzed for their privacy (seclusion of women) and thermal comfort. Privacy could be evaluated in terms of (Zakaria, 2001; Mohammad Oumar, 1999);

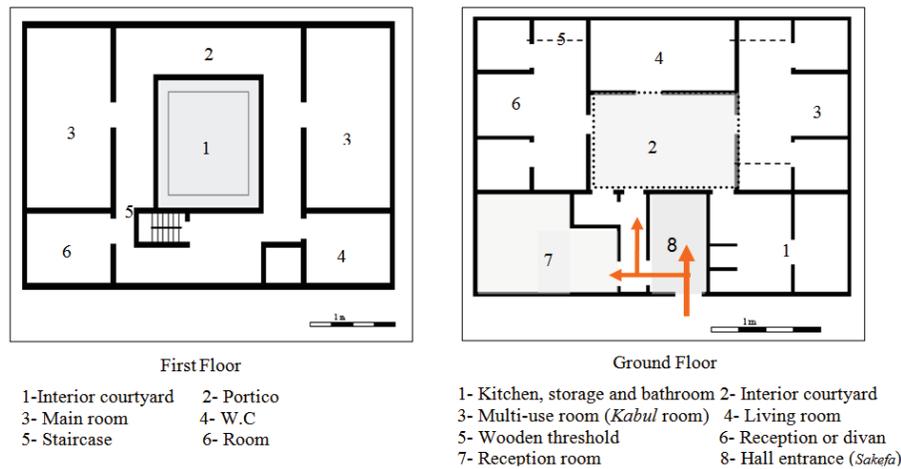
- i. Inaccessibility of male visitors or passers-by to the interior of the house (women's domain);
- ii. Adequacy of indoor and outdoor spaces for the women's private activities;
- iii. Hierarchy of spaces;
- iv. Opacity (Lot coverage)
- v. Circulation Complexity

Thermal comfort could be evaluated as follows:

- i. Cross Ventilation (openings and their locations, size of courtyard, and orientation);

- ii. Temperature, Humidity, and Air velocity
- iii. Aspect Ratio
- iv. Availability of shade
- v. Size of courtyard
- vi. Building geometry

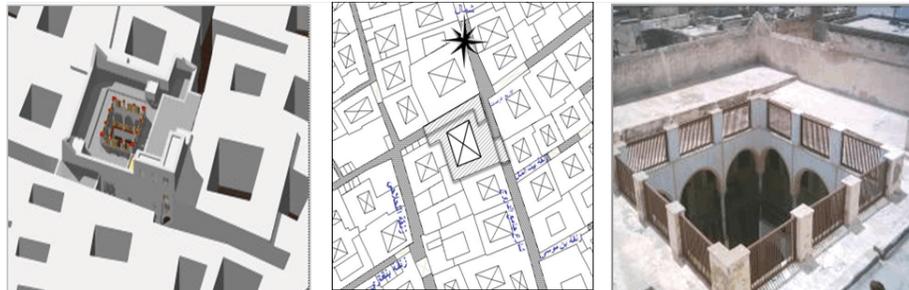
Functional relationships for traditional interior courtyard houses are connected with socio-culture relationships for residents. Accordingly, interior spaces were prevailing connected with courtyard, which worked as an architectural element of connection among these functions. This courtyard represents an element of movement among house spaces in addition to being a living space in traditional house in traditional city of Tripoli. Projection clears functions of traditional interior courtyard house and its connections to each other as shown in figure 3.



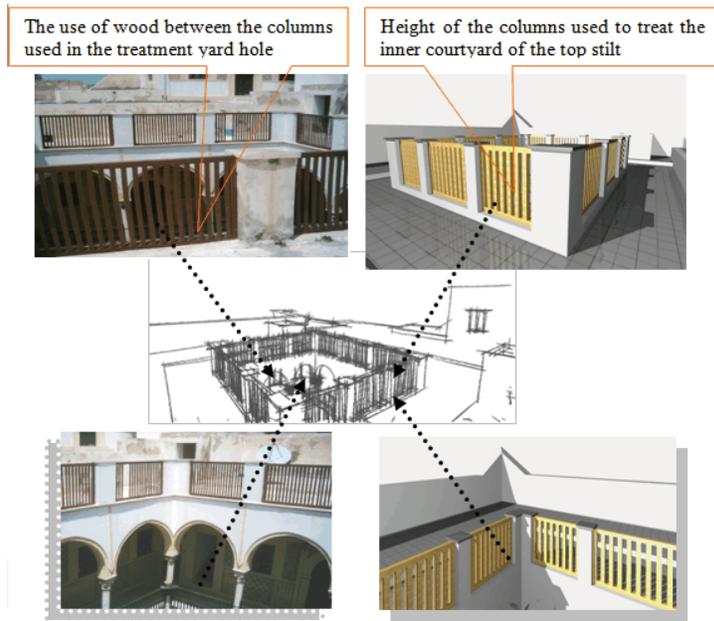
**Fig. 3:** Traditional Arab interior courtyard housing in Tripoli (Amora, 1993).

***Alqurmanli’s House:***

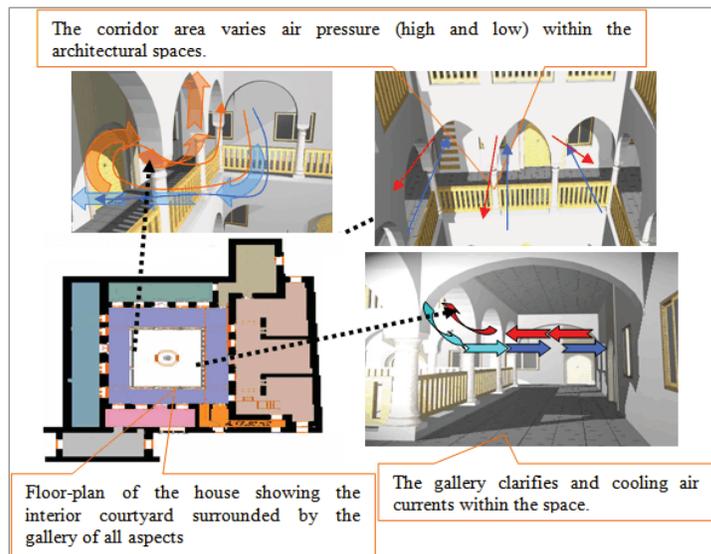
This house was built in the Covenant Alqurmanli by Governor Yusuf Pasha on 1795-1839. The house was built for his family after they have left the castle to the city, also called (Housh al-Harem) is located in a (Arba Arsat area). The building consists of two floors both of which were built following the Islamic patterns. It typifies the residential pattern of the ancient city of Tripoli. Figure 4 below is a sample of a private residence of the governor within the Tripoli city core. Figures 5 and 6 shows the competence of the courtyard and other building elements to enhance air movement within the house.



**Fig. 4:** (From left to right): 3D View; Ariel View; Interior courtyard of Alqurmanli’s House. Source: Author’s field work.



**Fig. 5:** Treatment of architectural elements (solid upper & Lower porous wall sections) Source: Author's field work.



**Fig. 6:** Air movement enhancing thermal comfort with colonnades as filter. Source: Author's field work.

**Conclusion:**

This review paper sought to establish a relationship between the Islamic concept of privacy, i.e. the isolation of women and the pertinence of the courtyard housing which is supposed to respond to primarily the thermal comfort needs of the occupants. It started with the characterization of the traditional Arab houses, the case study. Subsequently identifies the constructs that link housing privacy and thermal comfort of the case study. These include spatial inaccessibility of male visitors or strangers in the audio visual manner, indoor and outdoor spaces dedicated to women's private use; hierarchy of spaces; opacity (lot coverage); and circulation complexity. Thermal comfort could be evaluated in terms of cross ventilation (openings and their locations, size of courtyard and orientation); temperature, humidity, and air velocity; aspect ratio, availability of shade, size of courtyard

and building geometry. The fundamental research issues apparent from this review are to figure out the extent of courtyard housing required to promote the household privacy. In other words, to get an idea about whether the thermal comfort is sacrificed or enhanced in a typical traditional Arab house. Should the congruence be evaluated qualitatively or quantitatively? Which is more appropriate, inferential statistics or descriptive measures of disparity? Are limited interactive respondent views any better than empirical technical data such as spatial syntax? The two sample houses differ in layout, application of materials, size of courtyards, size and location of door and window openings. These would certainly determine the extent of agreement between privacy and thermal comfort. However, this raises a challenge of determining the standard measure of analogy.

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