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A REVIEW OF COURTYARD HOUSE: HISTORY EVOLUTION FORMS, AND FUNCTIONS

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ABSTRACT

The courtyard is one of the traditional architectural forms that contributed in determining climatic environment, physical and psychological in the courtyard house. This paper focus on the history of courtyard and it is privacy measure in variant civilizations. Variants courtyard studies were investigated, beside the courtyard history, evolution, form and elements were recorded in terms of it is physical features and benefits. The result revealed that the courtyard around the world has a similar form, but the attributes are varied depending on the region climatic characteristic. The paper concludes with an outline of means to optimize a courtyard microclimate performance.

Keywords: evolution, courtyard form, functions.

INTRODUCTION

The courtyard is a form of construction that have a presence since the humans started to build their houses. (Bridson, 2012). Generally, this design familiar in the arid climate of the Middle East, gradually courtyards transformed as more and more of its area covered, so that activities that once took place outdoors begin to take place indoors.

Courtyards are enclosed outdoor spaces but are normally open to the elements at their top; another definition of the courtyard is "An unroofed area that is completely or partially enclosed by walls or buildings, typically one forming part of a castle or large house."(Lea & Runcie, 2002).

A courtyard is a common design feature, which has been applied for thousands of years in many parts of the world particularly in houses. Courtyard used in basic as a gathering place for house users', and for daily particular purposes in another area it is used as encode (Edwards, 2006). Edward (2006) reveals in his book The Past, Present and Future of the courtyard, that the courtyards do not belong to one specific period of history; it seems that it had always been around. The idea of courtyards as a plan configuration goes back thousands of years to Neolithic settlements.

To deep understanding of court in all guises, it is useful to introduce the fundamental topological difference, between courtyard house (interior) and terraced house (exterior). The courtyard house a sign of urban pattern through the time, especially in hot region Middle East and North of African as an example, which offer an exclusive private function of the household. A terraced or (row) house always lies in road faces in it and is directly accessible to it from the outside (Petruccioli, 2006).

Guy Petherbridge offers an overall explanation for the dispersal of the courtyard house types by distinguishing two varieties: "The interior courtyard house, where the house encloses a courtyard characteristic of urban areas, and the exterior courtyard house where the courtyard borders the house providing protected area, contiguous with the dwelling units but not enclosed by them" (Petherbridge, 1978). Andre Bazzana, states the different various to the economic status by each type the interior court used by sedentary farmer and the second type exterior used by Sami-Nomand (Petruccioli, 2006).
There is need for more investigate on the courtyard microclimate performance such as passive strategies for maintaining thermal comfort and energy efficiency on building, and consider at the primary design stage or at building refurnished stage as low cost element that enhance the significant impact of courtyard in buildings.

HISTORY EVALUATION OF COURTYARD FORM

Introduction of the History of Courtyard House

Courtyard housing known as the oldest form of residence. The historical evolution of courtyard form a cross the world showed in ancient civilization from excavated at Kahun in Egypt, which back to 5000 years old to the Chaldean City of Ur before 2000 B.C. (Oliver, 2003). The characteristics of courtyard housing depend on the environment and culture of a group of the specific region; for example, courtyards may use as an inner garden, or there may function as the focal point in the house. Through thousands of years different courtyard housing, planning demonstrated, Sumer and Pharaonic Egypt recorded as the oldest culture of the Middle East, which hold the oldest example of the courtyard (Ayhan & Neslihan, 2011). Later on, this type of building was seen in western cultures such as Greek and Rome (Abdulac, 1982).

In Italy at 700 B.C , a new courtyard design which refer as atrium house, developed from the old form, the purpose of this type is to provide private outdoor space, atrium house met up with the Greek pre-style which has a different design, the design showed small courtyard enclosed by columns (Blaser, 1985). In the Middle East courtyard houses an architecture tool, hat are common in hot and dry climatic and endure in many ancient cities and attempts to generate private area for introversion (Al-Azzawi, 1994).

Ancient Civilizations

A troglodyte village in Matmatas of Southern Tunisia the most primeval and homogeneous society to build courtyard houses, according to Schoenauer and Seeman "Each dwelling-unit is built around a carter open to the sky with slope wall and flat bottom" (Schoenauer & Seeman, 1962). Douars in North Africa, encampment of nomadic tribes in West Africa, the Kraals of Bechunaland in South of Africa and the first rectangular dwellings in Morocco introduced the first prototype of courtyard (Das, 2006). Figure-1 shows different types of courtyard plans in Africa.

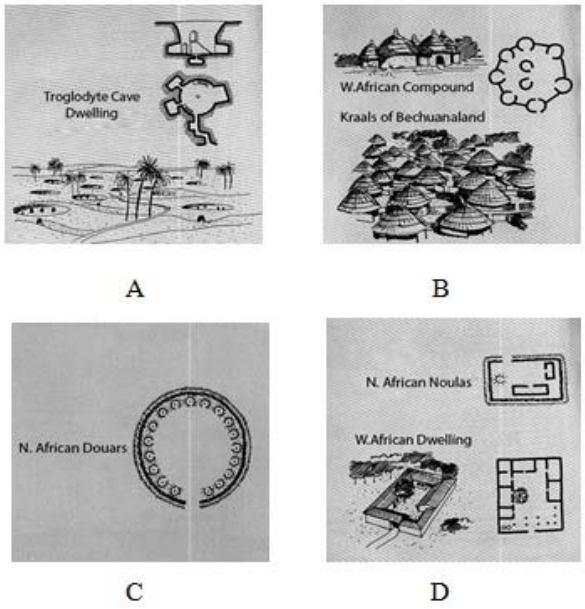

Figure-1. (A-D) Different types of courtyard form in Africa (Schoenauer, 1962).

Another example that reveals in archeological survey found at Ur on the Euphrates River in Mesopotamia in 2000 B.C Figure-2. The plan showed a square courtyard that surrounded by rooms in Ground floor, and the second floor of the house open to courtyard, the building material in that era mainly from fired brick (Blaser, 1985). In China, primary houses have significant influenced by religion and the philosophy of Yin and Yan (Schoenauer & Seeman, 1962), the purpose was different the courtyard used for privacy and meditation. Even the form has another attribute from the first example at Ur. Instead of surrounded by rooms, the Chinese courtyard surrounded by individual houses, which belong to different people. Garden and water features were two signs for the courtyard, thus it used as a cooling tool in warm climate in Southern area Figure-3 illustrates typical layout of Chinese dwelling and courtyard houses. While, Figure-4 presents typical layout of Japanese traditional house.

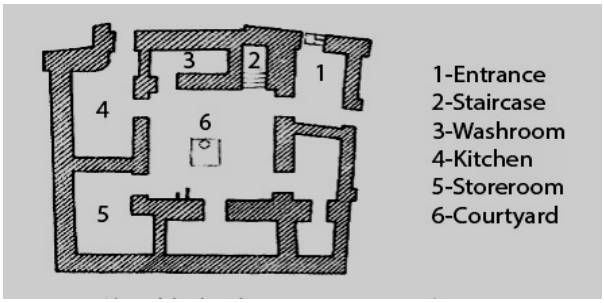

Figure-2. Plan of House at Ur, Mesopotamia (Al-Dawoud, 2006).

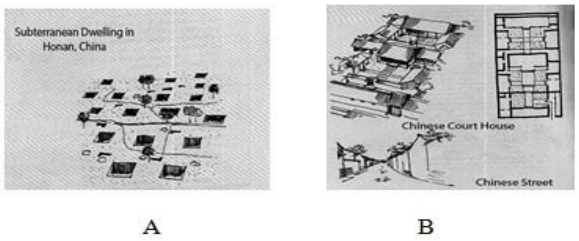

Figure-3. (A-B)Typical layout of Chinese dwelling and courtyard houses (Schoenauer, 1962).

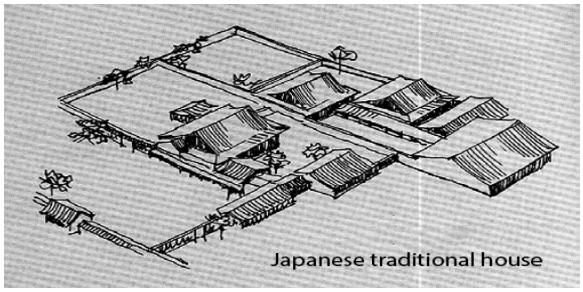

Figure-4. Typical layout of Japanese traditional house (Schoenauer, 1962).

Classical Civilizations

The developer of courtyard takes another kind of design at 700 B.C; in Italy. The atrium house design has had a small courtyard surrounded by rooms, with a container in the center of the courtyard to gathering the rainwater to drink. The main purpose of this design, which is an open to the sky is to provide a private outdoor space. Around 275 B.C., Roman architecture became mix features inherited from the Etruscans and the Greek, after occupied of Southern Italy by Romans (Al-Dawoud, 2006).

The atrium house met up with Greek pre-style (court enclosed to columns), when people started to build a big house contained two styles (atrium pre-style), any one of these styles has had their location in design, atrium near to street and pre-style in the back of the house (Blaser, 1985) Figure-5 shows both classical era of courtyard and atrium.

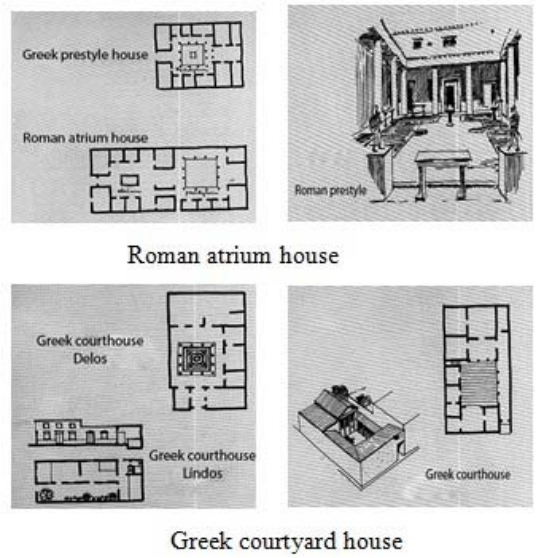

Figure-5. Typical courtyard dwellings prevalent during Classical Civilization (Schoenauer, 1962).

Middle Ages and Renaissance Civilization

After the fall of Roman Empire by A.D. 476, the courtyard type dwelling suffered relapses, and found in Italian Cortile and monastic cloisters. During Christian architecture era, the atrium became common in early Christian churches as the main entrance; it was used as a meeting place in the center of the colonnaded open court there was a fountain or well used by worshiper to wash their hand before entering the church (Blaser, 1985)

In some Islamic countries North Africa and Middle East, the courtyard in the Dar follows the philosophy "privacy and seclusion with a minimal display of the occupant's social status to the outside world"(Schoenauer & Seeman, 1962). Private courtyard offers isolated space for women to relax with sheltered courtyard tress, a pool and outdoor furniture. Another element in the design of the courtyard (serdab) appeared in Mesopotamian region, this room used as a re-treat cool air to the house Figure-6 shows courtyard house design in Morocco at that era (Das, 2006). According to Das, there are two Courtyards in northern area around the Mediterranean Sea, particularly in Spain that influenced by the Roman atrium, the courtyard design in the north of Spain more solid than the Southern, which used the court for more outdoor activities that help in evolution of the courtyard dwellingtype. Lately, patio design method entered to Latin America by Spanish colonists Figure-7 presents dwelling house in Spain and the entered one in Mexico.

In Asia, particularly in Malaysia, the traditional Malay house serves citizen in rural area of Peninsular. The house design provided Malay needs, culture and environment. Many attributes appear in the old Malay house design, such as fully shaded vegetation as buffer zone. The history of the beginning of the use of the plants in landscape design in South Asia return to 14th century (Majapahit kingdom) (Zakaria *et al.* 2014). In addition, courtyard in Malaysia goes back to the era of indigenous design of traditional Malay house, the influence of traditional Chinese house, with inner courtyard integrated to Malay house, the courtyard design at that period similar to the Chinese traditional. While Figures-9 shows the concept of the Malay community gardens in different zones.

However, whatever the geographical distribution zone in Peninsular there is a similarity in the use of plant species in Malay community, there are variant types of plant normally found in Malay house such as Cananga, Coconut, Kesidang, Jasmine, Areca nut, Lemongrass, Galangal, Ginger, Henna and Turmeric (Ahmadi, 2004). The arrangement of Malay courtyard plants depends on the area compound, the old Malay house divided into three areas, which are front compound, side compound, and rear compound (Hussain & Byrd, 2012) Figure-8 revealed the landscape typologies and characteristics of traditional Malay kampong in Malaysia.

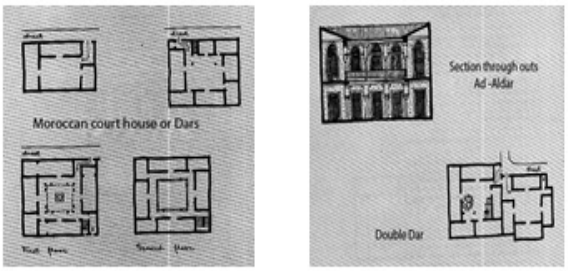

Figure-6. Courtyard houses in Morocco, typical during middle ages (Schoenauer, 1962).

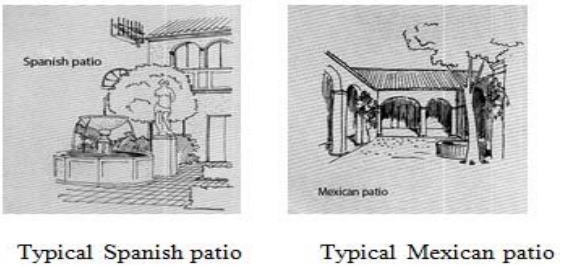

Figure-7. Comparison between Spanish and Mexican courtyard (Schoenauer, 1962).

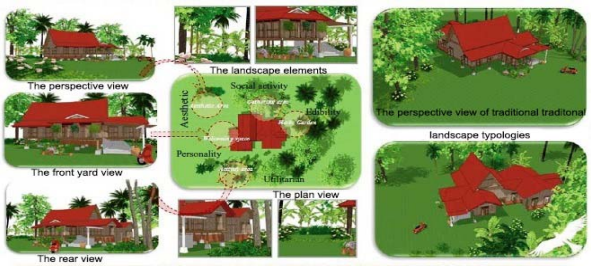

Figure-8. The landscape typologies and characteristics of traditional Malay kampong in Malaysia (Hussain, 2012).

(a)

(b)

(c)

Figure-9. (A-C) the concept of the Malay community gardens in different zones (Zakaria, 2014).

Modern Civilization

In the modern era, the courtyard first entered to the West Coast of North America, and revealed in the Southern California due to the influence of Spanish colonial. Whereas another opinion mentioned that, the reason of the different building's style of Los Angles influence by the movie set and film industry. Stefanos *et al.* (1996), observed the regained of tourists to settle down in California between 1880 and 1930 created need to high accommodation that, changed the form of courtyard houses in that region (Stefanos *et al.* 1996)

Lately, the courtyard type transferred across the United State to the East Coast when the idea of use courtyard to separate between the sleeping area from living area spread by Marcel Breuer (Das, 2006), Duncan, 1973, cited that in 1956 the binuclear patio had converted to the long, narrow terrace house in the country. Figure-10 shows a sample of terrace house in Los Angles designed in 1956 by the architect Richard.J.Neutra.

In Europe, single storey courtyard houses became widespread, according to (Duncan, 1973), that type of courtyard is requested by low-income class. In addition, he cited that the first courtyard built in the South by Hugo Haring in 1928, his design modification later into L shape plan, which became popular in England and Germany during 1960s.

Figure-10. Terrace house in Los Angles designed in 1956 (Carolina, 2008).

Courtyard Form and Elements

Courtyard does not have a specific plan, the first design of courtyard housing is usually rectangular, square and circle. These forms have been converting to accomplish ecological aspects such as site limitation, topography, building orientation and function to produce new forms [U shape, L shape, T shape, V shape, H shape or Y shape] Figure-11 shows different possible forms for a single-family courtyard of one or two storeys. The scale and size of the courtyard can be adjusted from very close to expansive the space. Based on literature survey, it may say that the courtyard design can be fully or semi enclosed or surrendered by only two walls (Meir *et al.* 1995).

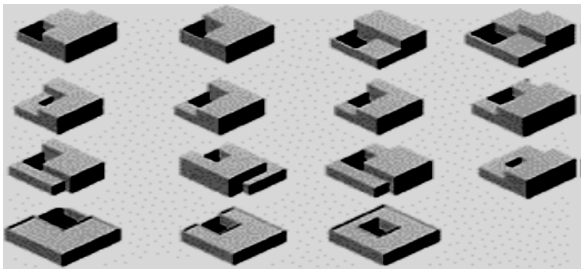

Figure-11. Different possible forms for a single family courtyard of one or two storeys (Edwards, 2006).

Different studies are carried out to examine critically the performance of courtyard forms and elements at both urban and architecture levels. This study helps to define the shortcoming, difficulties and the potential of future design development. Rectangular layout of courtyard studied by (Tablada *et al.* 2005); the study recommended this form to protect the building from solar radiation and dusty wind (Tablada *et al.* 2005). Three side courtyard created preferable climate condition, especially when the orientation and ventilation sought during the design process (Meir *et al.* 1995). (Muhaisen, 2006)

investigated rectangular form proposition to gain the extreme effect in summer and winter in four climates, while (Rajapaksha *et al.* 2003) developed ecological condition through natural ventilation in high-rise residential buildings by used internal courtyard.

Orientation, wall enclosure and natural elements of the courtyard were investigated as an essential architectural element, within each housing unit. The significant role-play by these elements proved their effectiveness with regard to climatic and social aspect that characterizes the building environment.

Orientation

Building layout plays an important part in the orientation of the courtyard, thus the sun location, shading performance, solar gain and wind direction. All these can effect of the microclimate condition (Bagneid, 2006). According to (Meir *et al.* 1995) the correct orientation of courtyard helps to develop thermal comfort, moreover solar angle and wind direction may cause thermal discomfort if the orientation not suitable.

Wall Enclosure

The design of a courtyard among regions has different forms, it depends on the details of the surrounding wall size and shape. Moreover, the varying impact of culture, economic, social and environmental condition, but in many cases the design of courtyard looks the same (Meir, 2000). The term wall enclosure refers to elements, which have significant roles of microclimate condition such as walls, windows and door these components define the form of a courtyard with the building. Furthermore, designers during the design stage can manipulate by these elements to provide positive impact of the courtyard.

Almhafdy *et al.* (2013) investigated different function of wall enclosure functions such as the impact of international courtyard ventilation on the thermal performance, the thermal performance, effectiveness of the courtyard building during variant design condition such glazing type and window to wall ratio conducted by (Aldawoud, 2008). Finally, color, materials, shading device and wall enclosure material studied as other option to development the environment condition (Almhafdy *et al.* 2013).

Courtyard Natural elements

The natural elements within courtyard found that increase the thermal comfort, and have potential to reproduction environment benefits, as an, example shrubs, trees and flower plant by shaded areas, which sit up by. Thus, used water body, water spray and tent was found that the internal courtyard and surrounding area be cooler especially during the sunny hours (Almhafdy *et al.* 2013)

Previous studies showed the significant effects of courtyard's elements to modify the surrounding environment through reducing solar radiation, lower the air temperature by landscaping shading and other function, which will provide thermal comfort for users'.

Courtyard Benefits

Courtyard plays a significant part in determining climatic environment, physical and psychological in the courtyard house, over the time, many profits of courtyard cited by scholars in order to define courtyard social and ecological functions. These benefits are psycho-social benefits, cultural benefits, religious benefits, economic benefits, climatic benefits and architectural benefits.

Psycho- Social Benefit

The basis of the profits of the courtyard is a finding of it is inner form, which offers a sense of confidentiality and enclosure to the form and residents of the house (Sthapak & Bandyopadhyay, 2014). However many theories' set the court acts as:

- Courtyard works as an extension of the kitchen during the morning and as living room during the evening to entertain the guests.
- A space for interaction for all family members, and encourage the family to act as a group.
- Visual privacy, when the court visually secluded, by screening or walled entrances.
- Sleeping area during the night when the climate is conducive to outdoor activity.
- Acoustical privacy, enclosure elements works as a noise barrier between the courthouse and outside area.

According to Rust (2010), courtyard can play a role in healing procedure, the architect could add courtyard features as a stamp of building design, Shade, water, trees and flowers an example of these features, also wind tower, pavement and colors all these could provide positive effects towards the five senses of the human body.

Study at Hong Kong university campus by (Lau & Yang, 2009), to produce healing impact into university campus showed that garden within a courtyard that located normally at the entrance and the meditation garden found near the campus library, has specific purposes and should has a differentiate pattern and landscape design. The meditation garden is better for study environment, while the garden with in courtyard support public social interaction. Toone (2008) evaluated in his study the effect of healing gardens in order to reduce stress in children medical center in Austin, the finding revealed that the stress level is lower when patient sitting at healing garden more than the indoor area.

Cultural Benefit

Use of more than one courtyard found in many cases. This is usually to segregate the public and private spaces within the house. The public is mainly for guest and generally used by male (especially in Islamic countries). The inner court is more restricted to the family used as an outdoor area for activity and used by female (Blaser, 1985).

Religious Benefit

The courtyard is both symbolically and religiously significant. This open-to-sky yet enclosed space within the surrounding walls of a house has been

considered the central focus of interest in the house (Blaser, 1985). The courtyard may symbolize many things: the central focus of interest in the house; a concentration of light, wind, sand and water; a private, safe and life-sustaining refuge.

Climatic Benefit

Courtyards have been generally referred to as a microclimate changer, due to their ability to mitigate high temperatures, channel breezes and adjust the degree of humidity (Saxon, 1986). Courtyards also were acting as a source of airflow thermal comfort to the residence. With right position to the house and suitable material, it can also help to reduce the heat gain and this will act efficiently with the properties of self-shading and thermal lag. Finally, courtyard acts like a cool air reservoir, especially in hot-arid climates (Sthapak & Bandyopadhyay, 2014).

Architecture Benefit

Courtyards generally function as a center in buildings and houses, connecting the different areas and functions. The significance of courtyard by it is the central position enclosed by various landscape and tree elements, which play an important role in our social and working life (Meir, 2000). Moreover, it fulfills visual and acoustic protection to the building as well as climatic, for this reason geometry of the courtyard and the properties of finishing materials should take priority during design the stage to afford a high level of thermal comfort (Meir, 2000).

CONCLUSIONS

This paper describes a research effort that contributes towards empathetic the history of courtyard in variant civilization. In addition, it demonstrates the element and form of courtyards to understand the impact of courtyard in building design.

The findings shown that the courtyards around the world have similar form and elements, only the attributes are varied from regions to other due to the climatic characteristic of different regions.

The research has provided a background to support further research and analysis on the history evolution of courtyards, and impact of courtyard elements of its performance. The paper is a first level of understand the effectiveness of courtyard on the building environments as climatic moderator and passive techniques that is help to reduce the energy conserve and provide thermal comfort to building occupants.

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