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An Evaluation of Spatial Design of House Layout to the Traditional Houses in Shibam Hadhramout, Yemen

ANWAR AHMED BAEISSA*

Abstract

Shibami house design has a significant value of its interior spaces, which for generations has drawn as primary attention by the Hadhrami master builders when they build the houses. The aim of this paper is to evaluate on how good house design is able to give residential satisfaction levels and could contribute towards habitability in Shibam. The house design is a subject dealing with house layout of its efficient space-function design which preserves the cultural needs of the community. These houses in Shibam are related to an identity of the traditional style, family structure and social customs. These houses are considered to be one of the earliest high-rise house type built in the world. Today, these buildings in Shibam are recognized as one of the heritage sites under UNESCO's World Heritage Lists. The literature study of house design is conducted to understand the definitions of the title, which is important to identify the measurable factors for the research analysis. The study finds that *diwan*, dining area, bedrooms, bathrooms, corridor and storage, courtyard and balcony, and the composition of the rooms' layout are important measurable factors under the category of this space planning and function. There are two types of the research analyses which are qualitative and quantitative analyses. In that light, within the ambit of this study, the house design in Shibam can and does serve as a reference.

Keywords: House design, spatial design and function, Shibami houses

* Department of Architecture Environment Planning , Faculty of Engineering Petroleum, Hadhrmout University ,Yemen.

تقييم التصميم المكاني للتخطيط السكني

للبيوت التقليدية في شبام حضرموت–اليمن

أنور أحمد باعيسى*

الملخص:

تميز تصميم البيت الشبامي بقيمة كبيرة لمساحاته الداخلية، والتي لفتت على مدى أجيال الاهتمام الأساسي من قبل البنَّائيين الحضارم الأوائل عند قيامهم ببناء المساكن. الهدف من هذه الورقة البحثية هو تقييم مدى قدرة تصميم المسكن الجيد على إعطاء مستويات الرضا السكنية الذي يمكن أن يساهم نحو مسكن صالح للسكن في مدينة شبام. تصميم البيت هو موضوع يتعامل مع تخطيط المسكن لتصميمه الفعال لوظيفة الفضاء والذي يحافظ على الاحتياجات الثقافية للمجتمع. ترتبط هذه البيوت في مدينة شبام بهوية النمط التقليدي وهيكل قوام الأسرة والعادات الاجتماعية. تعتبر هذه البيوت واحدة من أقدم أنواع المساكن الشاهقة التي تم بناؤها في العالم. اليوم، تم التعرف على هذه المباني في مدينة شبام كأحد المواقع التراثية المدرجة ضمن قوائم التراث العالمي لليونسكو. يتم إجراء الدراسة الأدبية لتصميم المسكن لفهم تعريفات العنوان، والذي يحدد العوامل القابلة للقياس لتحليل الورقة البحثية. توصلت الدراسة إلى أن فضاء الديوان، ومنطقة تناول الطعام، وغرف النوم، والحمامات، والممر والخزن، والفناء والشرفة، وتكوين تصميم الغرف هي عوامل مهمة قابلة للقياس ضمن فئة الفضاء التخطيطي ووظيفته. هناك نوعان من التحليلات البحثية وهما التحليلات النوعية والكمية. في ضوء ذلك، ضمن نطاق هذه الدراسة، يمكن أن يكون تصميم المسكن في مدينة شبام بمثابة مرجع تصميمي.

الكلمات الرئيسية: تصميم المسكن، التصميم والوظيفة المكانية، البيت الشبامي.

*قسم الهندسة المعمارية والتخطيط البيئي ، كلية الهندسة والبترول – جامعة حضرموت – اليمن.

1. Introduction

This paper discusses spatial design and function of the traditional house design in the city of Shibam at Hadhramout region, Yemen. The study will look how the Shibami house design can serve as model of habitability. The city of Shibam is named after its King *Shibam* bin *Al-Harith* bin Hadhramout bin *Saba Al-Asghar*. This area is about 600-700 meters from the sea level. It had played a crucial role as a capital of Wadi Hadhramout in the fourth B.C. **(9)**. This city is built on a small mound or on a podium. The present city of Shibam is situated in the core of Wadi Hadhramout above the ruin of the ancient city of Shibam. The city of Shibam today (Figures 1 and 2) is one of the cities in the world that is recognized as World Heritage site and placed under the UNESCO World Heritage lists since 1982 for its uniqueness of its house form and design **(12).** The houses are mid-and high-rise mud brick house types. The house units for generations are dwelled by households with extended family system with their parent's, son's, daughter's family units. This tradition has been widely practiced in Shibam, Hadhramout especially among the low and middle income families **(14)** where it has shaped organization of space planning and function in the house layout. This sustenance has been seen to permit the development of the local culture, the religious values and the promotion of regional identity of the traditional architecture. Considering these, a study on the traditional house design of the mid and high-rise (from 3 storeys to maximum of 9 storeys) houses in Shibam (Figures 2) is deemed important as well. The result of this study will be able to serve as a reference to the present and future development of house design

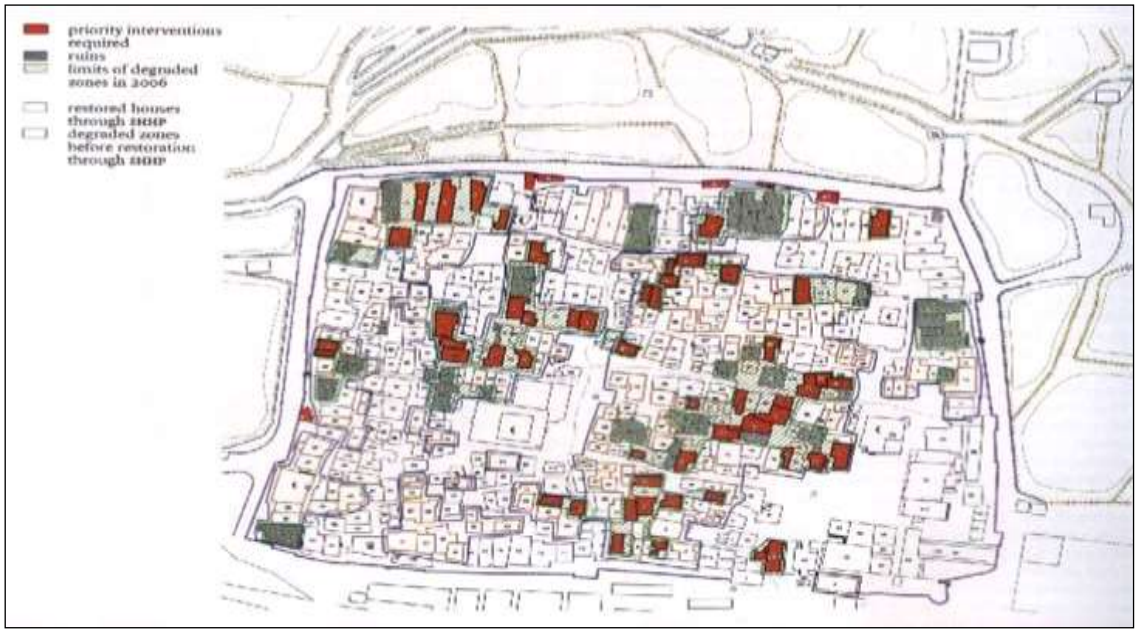

Figure 1: Old City of Shibam Source: Aga Khan Award for Architecture

Figure 2: Shibami houses (mid and high-rise buildings)

Source: Mukallatoday (2007)

2. Space Planning and Function

According to **(8)**, a space is a room which consists mainly of several spaces. Some rooms are interlocking and some are distinguishable. That is, some spaces are restricted with no openings and no space for movement. A static space may be created by closing up the bedroom at night, drawing the drapes, and shutting the doors. Citing **(13), (15)** holds that architecture is the "art of space" without defining the nature of the space itself. Here, the concept of space is immaturely realistic as is the case with the researchers in this field who look at it as a uniform extension of 'material' that can be 'modelled' in several ways. Awareness of *Shariah* (Islamic Law) principles and references by the architects while designing the house design integrated with social aspects is lacking. *Shariah* law provides an essential body of legislation to enhance the social life of people, including the built environment: it encourages people to live peacefully and to share responsibilities to enhance their social and urban life **(3; 10; and 9)**. Many studies have been done which suggest the importance of spatial layout in house design. Here are some of them: As quoted by **(1)** in one of the *Hadiths* that Prophet Mohammad (peace be upon him) said

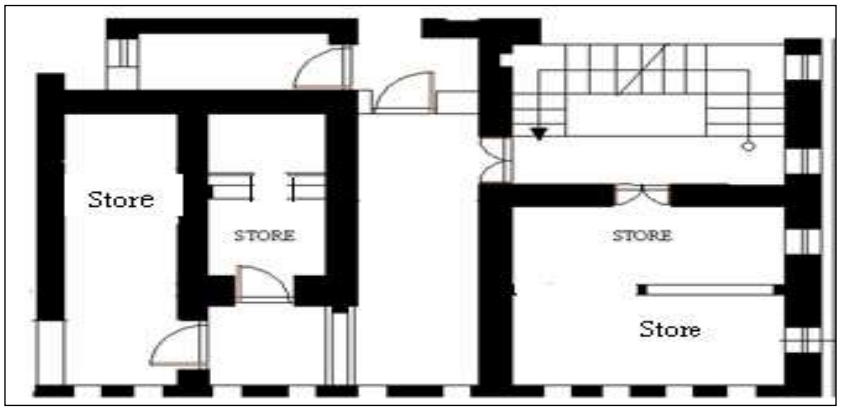

Figure 3: The ground floor plan

3. Factors of House Design in Space Planning and Function in Shibam

This section will identify the factors by space planning and function of house design of the traditional houses in Shibam. These factors comprise five important topics as follows:

3.1 Space Planning and Function

According to **(4)**, the layout of interior space and function becomes an important factor by the local master builders when building the traditional Shibami houses. Nagib argued this spatial design has preserved the local culture over the years. He also noticed that the design is relevant towards the sustainable development. In Shibami house design, the space planning and function consists of five important factors which are as follows:

a. *Diwan*, dining area, bedrooms
b. Bathrooms
c. Corridor and storage
d. Courtyard and balcony
e. Compositions of the rooms' layout

3.1.1 *'Diwan',* dining area, bedrooms

In Shibami house design, *diwan*, dining area and bedrooms are closely related to each other. These three factors cannot be described into separate entities as they cover interrelated social activities. The *diwan* consists of the following spaces: (a) living room, (b) visitor room, and (c) furniture setting. The dining area consists of the following spaces: (a) dining room, (b) kitchen, and (c) top floor room/terrace. The bedrooms comprises following features: (a) master bedroom, (b) bedroom for the males, and (c) bedroom for the females. **(7)** argued that the main reception room or *(Majlis* or *Diwan*) (Figure 3 & 4) is accessible through a door located at the entrance of the shorter side. According to her, until the last century, these doors

were not higher than 1.2 meters. The frames are carved deeply and the surfaces are decorated with long iron nails with huge heads (5cm) varnished with lead. He also noted that on both sides of the door, wooden chests are placed that are used to place sleeping mats and pillows during daytime. In addition, these chests are studded with brass or tinned iron ornaments that are considered as the only furniture in the room

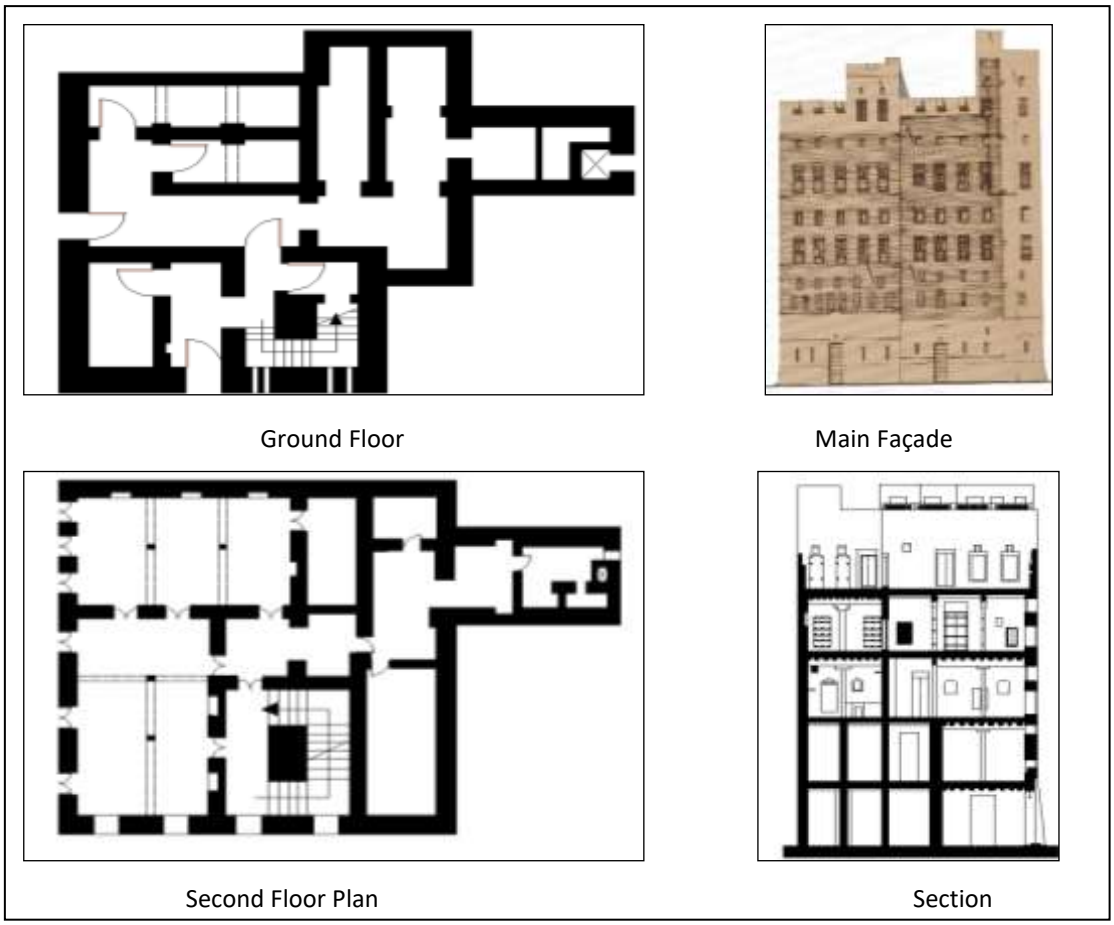

Figure 4: Interior space (*diwan*) of Shibami house

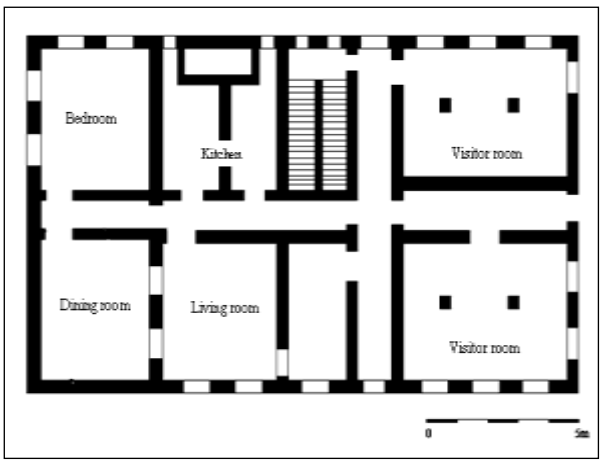

Figure 5: The first floor plan

Figure 6: Interior Space (*Diwan*) of Shibami House

(7) noted that in the first floor there are several *mahadir* (the singular is *al mahdarah* which are the house main living and reception rooms. The '*mahdarah*' is a large room split by four columns or (*ashum*) (plural of *saham* meaning arrow). There is a smaller room or (*mahdarah*) which is adjacent to the larger one reserved for reception or sleeping place during the winter time. In addition to *mahadir*, there is a house stairway to the second floor **(7). (7)** noted that the second floor consists of the living rooms reserved for woman and for carrying out ceremonies such as weddings. These living rooms are divided in the same or similar way as the *mahadir*. A large reception room divided by four poles or columns opens onto small, windowless, locked room known as *al maghlulah* which contains more than one niche and used for several purposes such as sitting room in winter or to store utensils and clothes. He add that a kitchen and a toilet (*taharah*) are located on the third floor. This is a common house layout design among the traditional houses in Shibam. The toilets and the kitchens are built on top of each other next to the service well that contains the disposal openings and the canals. The third floor is called *al marawih* or *tarawih* (Figure 7). There are rooms where business, social activities, and reception of male strangers are carried out. Other private rooms are reserved for daytime activities for women and children. On this floor there is a series of roof terraces. The fourth floor is reserved for women activities. It consists of a large *mirwah* with a small *marawih* on top of them that open out towards the roof or the sky called *raym* (plural is *ruyum*). They are similar to terraces but more like patios in design and function and are used for living and sleeping during the summer season **(7).**

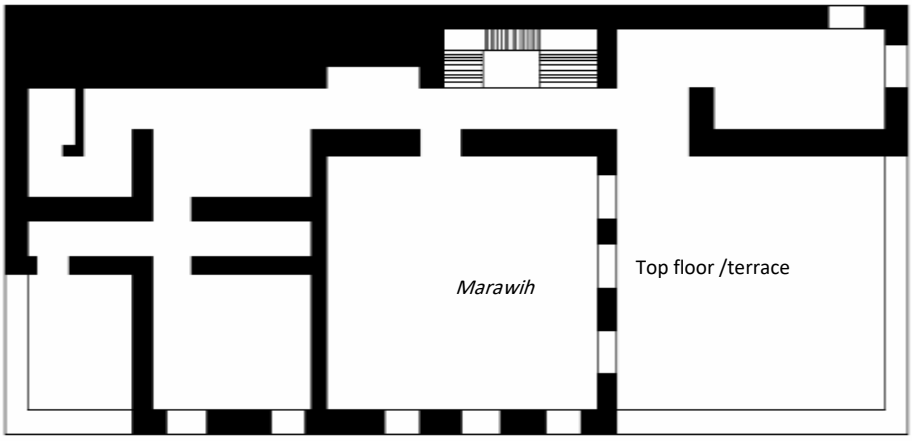

Figure 7: The third floor plan

3.1.2. Bathrooms

There are two types of bathrooms: (a) bathrooms for male, and (b) bathrooms for female. According to **(7)**, the main part of the toilet generally is an open canal leading to an opening in the wall; and it extents to an elevated platform on each side to stand on. Sometimes it is accompanied with a system of earthenware pipes, or cylinders completed of burnt clay and known as *qasb*, which are fitted after being painted with lime (*Nurah*) on the inside. Generally, the conventional arrangements for disposing of waste water depend on a network of openings in the back or side walls, open canals flowing along these walls and the ground at the back of the constructions and on pits (*habisah*) combined by a number of adjoining and connected thin constructions **(7)**

3.1.3 Corridor and Storage

This factor consists of the following spaces: (a) corridor space, (b) stairs space, and (c) storage and basement floor. **(11)** observed that there is only a single door which leads to the staircase from the entrance. A massive mud is created to leap around the staircase which runs throughout the height of the houses. For security reasons, there is no window built on the walls of the ground floors, except for a few openings on the ceilings for ventilation purposes. The ground floor (Figure 3) is usually reserved for storage purposes. In a ground floor, there are a number of *mayasim* (storages) that are used to store grains, dates and other crops. In addition they are also a place to store daily work tools. There are terraces areas to keep cattle at night. The height of the ground floor ranges from 4 to 5 meters (13-16 feet). Leslie added that there is a passage that leads to a staircase to the upper levels. **(11)** further noticed that as they are not used for living spaces, and for ventilation purpose, there are either small narrow longitudinal or circular holes known as *al-Ukrah* in the upper parts of the facade walls constructed higher than the door's level.

Furthermore, **(7)** noted that the ground floor consists of a vertical tunnel opened towards the sky called *manwar* or *shammash* built next to the stairwell, which stretch throughout the house floors, from the ground floor to the roof level. These tunnels allow the sunlight penetrates into the house through openings in the common wall, and they are also for air ventilation. He further noted that the stairwell is located centrally around *arus*, a vertical column near the entrance forming the main support carrying the building loads. **(7)**

argued that sometimes (due to the nature of the terrain during the actual construction) there is one and sometimes two additional basement, known as *khann*. This space is to tackle the ground level's variation between the main street level and the level of the city's raised site. The construction of *khann* accommodates this gradient

(between the lower ground point of the slope and Shibam's higher flat site); and the slope is leveled with a fortified base and additional foundation for the normal five or six storey above. The master builders do not count the basement floor (*khann*) as an additional floor, or as a separate storey, even if it consists of two floor levels.

In addition, the ground and first floors consist of the house main entrance that leads to a narrow corridor *(dacha)* or (*dayqah).* These two terms are derived from the Arabic language meaning "tightness or narrowness". Damaluji also noticed that this *dakhlah* leads to rooms called *al mayasim* (singular of *maysamah*) used for storing grain and *dhura* 'corn stalk'. He adds that in general, the ground floor is considered as the house main storage area or *diyaq* (plural of *dayqah*) which is used also as a shop. Most houses have their entrance off enclosed courtyards surrounded by fences whose walls have prickles on the top, (Figures 8). There is only one main entrance that opens into a central passage with windowless walls, leading to animal barn (for example, goats and sheep were often kept in the upper floor) **(7).**

3.1.4 Courtyard and Balcony

In Shibami houses, courtyard is a spacious area which gives shades and protection from direct sun rays, wind and sand **(2)**. This factor consists of the following spaces: (a) the courtyard space; and (b) the balcony space. **(7)** mentioned that the houses in *Shibam* have been built with practical expansion in mind in that the house designs are vertically; hence the houses have been built very close to each other. In the house design of the top floors (*ruyum*, and *tayarim*), there are potential expansions at different locations and at varied dimensions. For example, to compensate for the traditional courtyard, the builders instead provide the required alternative spaces that are exposed to the sky. This feature preserves the privacy factor of the interior as it is contained in an enclosure within the exterior walls of the house design. There is no balcony constructed in this traditional house.

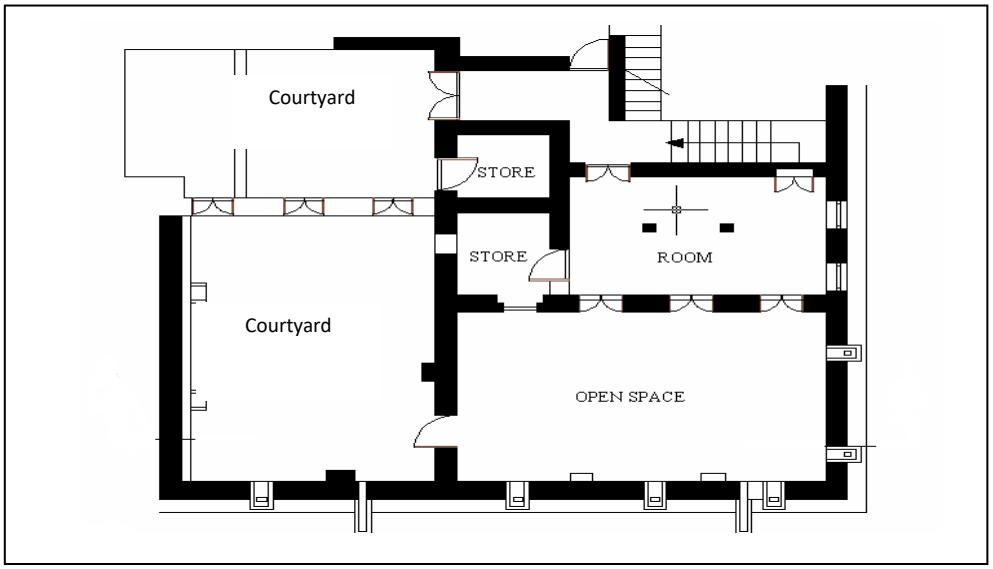

Figure 8: Plans of a Traditional House in Shibam

3.1.5 Compositions of the Rooms Layout

The arrangement of the interior space layout in this Shibami house is organized based on the space-function design **(5).** There is only a single entrance door which leads to a staircase. This door is always situated against the external walls, (Figure 8). A massive mud wall leaps around the staircase which runs throughout the height of the houses. The ground and the first floors are usually reserved for storage purposes. There are opened rooms at the central landing on each floor. There are also family rooms; and this area also can be used for eating, sleeping or to conduct business at different periods. On the upper floor there is a large hall called *diwan,* (Figure 9) which is not always used by the family. It is a place reserved for the guests, entertainment and special occasions. This room has small washing area at one corner and it is separated from the rest of the other spaces. It is also an area used for praying and dining, and a small part of the area is for ablution **(5).**

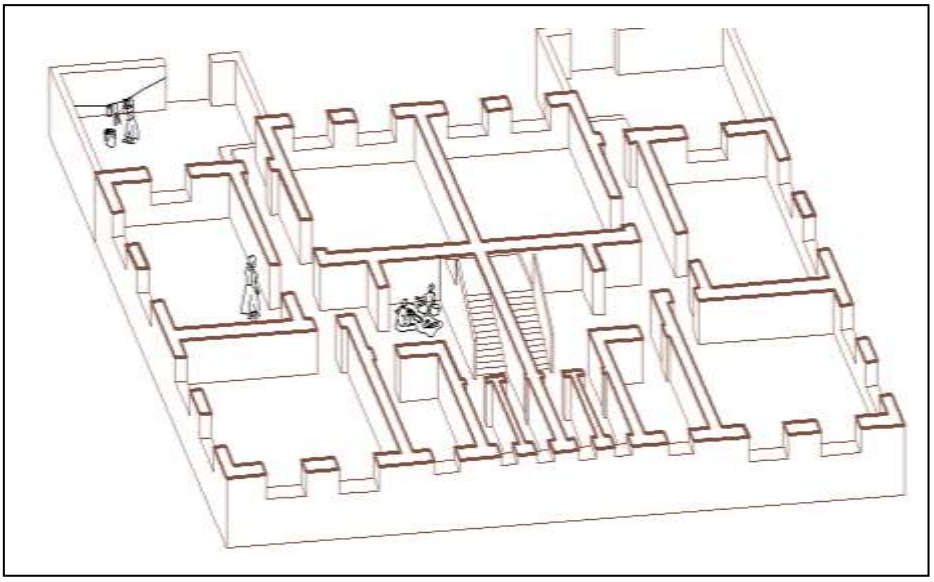

Figure 9: Circulation the interior space of Shibami house

Table 1:An-example's Physical Survey of House Block

A… BLOCK	Block/type	Stories	Courtyard	Main door	Wall	Total floor area	Narrow corridor	Fence
No. Units								
Size								
Area								
Height								
Type								
Material								
Colour								

B. OPENNINGS

	Gate	Windows
.No Units		
Size		
Area		
Height		
Type		
Material		
Colour		

B. STRUCTURE

Foundation	roof	walls	stair wall	stairs	beam	Material

D.LIGHTING

Light well	Artificial Light

Table 2:An-example's Survey of checklist factors of house design in space planning and function vistors's room *(Diwan)* (*Mahdarah*)

	Window					Door		Skylight	Light	Space			Column	Beam
No.Units	W1	W2	W3	W4	W5	D1	D2			wall	Ceiling	Floor		
Size														
Area														
Height														
Type														
Material														
Colour														

Table 3: Summary of the results in the analysis from the Checklist Factors on the relative weights of the two methods (qualitative & quantitative survey) on Shibam house

Factor	Space Planning and Function	Qualitative Survey		Quantitative Survey
		Yes	No	
a	Diwan			**88%**
	(a) living room	X		87%
	(b) visitor room	X		88%
	(c) furniture setting	x		89%
b	Dining Area			**96%**
	(a) Dining room	X		94%
	(b) Kitchen	X		96%
	(c) Top floor room/terrace	X		97%
c	Bedrooms			**92%**
	(a) master bedroom	X		91%
	(b) Bedroom for male	X		93%
	(c) Bedroom for female	X		92%
d	Bathroom			**94%**
	(a) Bathroom for male	x		95%
	(b) Bathroom for female	x		92%
e	Corridor and Storage			**96%**
	(a) Corridor Space	X		98%
	(b) Stairs Space	X		95%
	(c) Storage and basement floor	X		94%
f	Courtyard and Balcony			**78%**
	(a) Courtyard	X		79%
	(b) Balcony		NULL	77%
g	Composition of the rooms' layout	X		**83%**
N=17	**Total**	**16**	**1**	**627**
Total number of positive answers over the total number of items		16/17	1/17	627/7
Overall average answers in percentages		94%	6%	90%

4.Qualitative and Quantitative Analysis

This paper methodology consists of qualitative and quantitative survey. In qualitative survey, the criteria for evaluation are on qualitative analysis from checklist factors as discussed in the literature review based on the researcher's observation on the house design during the site's visit. The answer "Yes" represents as satisfactory and "No" as unsatisfactory. For example, if the visitor's room is satisfactory, the answer "Yes" will be marked as 'x', but when it is unsatisfactory, the answer is "No" will be marked as 'x'. On the other hand, the

quantitative survey is the answers from the respondents. There are respondents who reside in Shibam involved in this survey. One respondent is selected for one building block. (mid or high-rise building). The selection is based on from the level of the house unit. For example; the first respondent is from a house unit at the ground level of the first building block; the second respondent is from a house unit at the second level of the second building block; and so on. The answers are based on their satisfaction level from survey related to the same checklist factors. The objective of the quantitative survey in this study is to identify the factors of the level of satisfaction as perceived by the residents. The results of the qualitative and the quantitative analysis of the data are presented in subsection of space planning and function as follows (Table 3):

4.1 Discussions: Results of the Qualitative Analysis

The study finds that all results of the qualitative analysis are positive (except answers of balcony), which means that space planning and functions of the house design are relevant as a good model for a house type in Shibam. With respect to the category in space planning and function of *diwan*, dining area, bedrooms, bathrooms, corridor and storage, and courtyard and balcony, the only negative response in this analysis is in the balcony. The study finds that there is no balcony as a part of the house design in Shibami houses compared to other house types in Yemen. The study suggests consideration for a need to integrate balcony as one of the factors in the house design in the present and future development.

4.2 Discussions: Results of the Quantitative Analysis

The study finds that the quantitative analysis also has positive results as in the qualitative analysis. All results have cumulative answers by the respondents with more than 90% score except space planning and functions of *diwan*, courtyard and the house layout's composition. The survey also supports the result from qualitative survey that balcony is not part of the house design in Shibami houses. The analysis shows that there is a need to emphasis on *diwan*, courtyard and the house layout's composition as important design elements for the upgrades on the habitability. The summarized results of this quantitative analysis are as in (a) through (g) as follows:

a) Diwan

Eighty eight percent of the respondents from Shibam are satisfied with the *diwan* (the living, visitors' rooms and furniture setting). In another words, generally the residents of Shibam satisfy with the *diwan* in their houses.

b) Dining area

The analysis finds that 96% of the respondents perceive the dining area in their houses as satisfactory.

c) Bedrooms

With respect to the bedrooms, 92% of the respondents perceive their bedrooms as satisfactory.

d) Bathrooms

With a score of 94% on this factor, there is no doubt that the respondents of Shibam are satisfied with their bathrooms.

e) Corridor spaces and storage

On this factor, with a score of 96% the respondents give the answer as satisfactory.

f) Courtyard and balcony

Seventy eight percent of the respondents give satisfactory answers of the importance of courtyards in their house design.

g) Composition of the house layout

Eighty three percent of the respondents of Shibam have expressed satisfaction to the composition of the house layout.

5. Conclusion

The study concludes that the traditional houses in Shibam have a good house design with references to its space planning and functions. Both results of the qualitative and quantitative analysis support the research assumption that the traditional houses of Shibam can be considered as a model for the present and future development of house design in Hadhramout region, in parallel with Shibam's recognition as a traditional city under UNESCO's World Heritage Lists. undoubtedly have served as expressions of much level of satisfaction towards the house design and the nature of the amenities there. In that light, within the ambit of this study, the house design in Shibam can and does serve as a reference. The study has used the layout of the house design of the traditional houses of Shibam as the reference model. At the end of the study, it is suggested here that the study has made the contributions with respect to people's perception on the habitability of house design for the low income group in Hadhramout region in particular and some general ideas about habitability of house design in the field of architecture in general. It has provided the definitions of the terms 'house, designs and habitability' within the ambit of the perception of the residents in Shibam.

6. Recommendations

- Publicising the economic aspects of mud constructed building at all levels by conducting specialized studies to shedding lights on essential elements such as the principal construction cost or operational cost such as the cost of power, maintenance and compare them with their equivalents in buildings constructed with other materials.
- Set up a center for mud architecture that is to establish a primary plan to conduct studies and scientific and applied research. The proposed center is to have strong links with its counterparts in the world to exchange information and experiences.
- Carryout a survey to document mud architecture in Wadi Hadhramout, specifying regions and reservations that need to be conserved either collectively or individually through a well-prepared plans and specific goals. This may be achieved through co-operating with various local and international establishments.
- Rehabilitate high architectural values of mud-constructed buildings by using original construction materials and benefit from previous rehabilitation works to avoid mistakes that may have occurred in the past. Such precautions will preserve the independent architectural identify of each region.
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- Rehabilitate high architectural values of mud-constructed buildings by using original construction materials and benefit from previous rehabilitation works to avoid mistakes that may have occurred in the past. Such precautions will preserve the independent architectural identify of each region.
- Carryout specific trials to rehabilitate mud constructed buildings in accordance with developments witnessed in modern Yemen.
- Convening conferences and forums to exchange expertise and information in this field.
- Inserting mud construction in curriculum of Yemeni architecture colleges, institutes, and engineering faculties in order to provide students with technical information and features of this material, and the ability to upgrade it.
- Convening conferences and forums to exchange expertise and information in this field.

- Run public awareness campaign to exhibit mud's features, publish information, run exhibitions, lectures, seminars, forums, and other methods that introduce and encourage the public to use mud in construction.
- Run exhibitions in the first world countries to show the new architectural projects constructed with mud in order to change their concepts about mud.

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