

**Towards Contemporary Traditional Housing Architecture:
Investigating the Relationship between Culture and Traditional
Housing Architecture in Aburouf, Sudan**

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Abstract

Architecture and culture are two fine and subtle concepts that represent the identification of the society. The magnificence of architecture can define any civilization and introduce itself as an iconic and cultural concept for recognizing the cultural values of the society. Unfortunately, nowadays, in Sudan as well as in many Arab countries, focusing just on technology and modernity point of view produces unfamiliar buildings that are known as architecture but these buildings can damage the cultural identification of the society and cannot establish a proper base for forming the architecture related to social and cultural values of the society.

Although traditional Architecture in Sudan is accumulated experience of successive generations, unfortunately, it is rarely considered by academics and decision makers in Sudan. The building standards and rules issued by the authorities are giving attention only to spatial features not common in the Sudanese cultures and ignored the traditional spaces have direct integration with the socio-cultural norms.

This thesis has explored traditional Sudanese houses, focusing on those in the Aburouf, one of the oldest traditional neighborhoods in Omdurman the national capital of Sudan.

In order to gain a better understanding of the houses in the selected area and their inhabitants, the study undertakes a field survey based on an ethnographical study consists of observations, informal interviews, constructed questionnaire, daily notes by the inhabitants about space-time occupation as well as an architectural study for the houses spatial layout.

The best contribution to this study is to search for architectural deep knowledge to encourage the architects and decision makers to think about the house architectural design as product of socio-cultural norms and interaction between home and users rather than “unique” concept and form and modern construction techniques.

Keywords

Architecture
Aburouf
Contemporary
Culture
Design
Domain
Gender
Family
Khartoum
House Layout
Life Style
Omdurman
Socio-cultural Factors
Space Syntax
Spatial Analysis
Traditions
Traditional House

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List of Contents

Abstract	2
Keywords	3
Acknowledgment	4
List of Contents	5
List of Figures and Photos	9
Chapter One:	
Towards a Contemporary Traditional Architecture: Problem Formulation	12
1.1 Background	12
1.2 Traditional Housing: Complexity of the Problem	13
1.3 The Research Problem	14
1.4 Aims and Objectives	15
1.5 Hypothesis	17
1.6 Scope of the Research	17
1.7 Methodology	18
1.8 Organization of the Research	19
1.9 Provisional Findings	20
Chapter Two:	
Literature Review: Approaches of Relevant Concepts	23
2.1 Traditional Architecture: Definition	23
2.2 Traditional House and Social Norms: Literature Reviews	24
2.3 Traditional Housing: Sudanese Research	31
2.4 Provisional Findings	33
Chapter Three:	
Conceptualization of Traditional Architecture: Conceptual Framework	35
3.1 Culture	35
- Definition	35
- Characteristics	37
- Components	37
- Culture and Built Environment	38
- Social Behavioral System	39
- Culture and Human Needs	39
- The Built Environment and the Behavioral Setting	41

3.2 House	41
- Definition	41
- House Form and Socio-Cultural Influences	42
- Low-cost housing	43
- Dwelling	43
- Traditional “Vernacular” House	43
3.3 Family	43
- Definition	43
- Family and type of Marriage	44
- Family and Household	44
- Family and Family Cycle	45
3.4 Socio-Cultural Forces on Vernacular Dwelling	46
- Religion “Islamic” Beliefs	46
- Privacy	46
- Privacy and Space	47
- Privacy and Dwellings	48
- Privacy and Islam	48
3.5 Provisional Findings	49
Chapter Four:	
Khartoum-Omdurman Traditional House: The Current Situation	52
4.1 Sudan: Country Profile	52
- The Physical Setting	52
- Drainage and Soil	54
- Climate	54
- Population	55
4.2 Greater Khartoum: Khartoum, Khartoum North, Omdurman	56
4.3 Omdurman: The National Capital	58
4.4 Greater Khartoum: Housing Classifications	60
- The Traditional House	61
- The Modern House	63
4.5 Selection of Field Study Area: Abu-Rouf Neighborhood	64
- Location	64
- Historical Background	65
4.6 Provisional Findings	66
Chapter Five:	
Implementation of the Field Study: Abu-Rouf Neighbourhood	68
5.1 Aburouf Neighborhood	68
5.2 The Selection of Cases	71
- Selected Cases and Building Materials	71

5.3 Set up of the Field Study	72
5.4 Aims and Methodology of the Field Study	72
5.5 Data Collection	73
5.6 Definition of Terms	74
5.7 Provisional Findings	75
Chapter Six:	
Presentation of the Selected Case Studies	77
6.1 The Selection of Cases	77
6.2 Presentation of the Cases	78
6.3 The Case Studies	79
- Case 1	79
- Case 2	80
- Case 3	81
- Case 4	82
- Case 5	83
- Case 6	84
- Case 7	85
- Case 8	86
- Case 9	87
- Case 10	88
- Case 11	89
- Case 12	90
- Case 13	91
- Case 14	92
- Case 15	93
- Case 16	94
6.4 Provisional Findings	95
Chapter Seven:	
Space Syntax Approach: Morphological Analysis of the Case Studies	97
7.1 Space Syntax: Definition	97
7.2 The Method of Special Syntax Analysis	98
- The Convex Map	98
- The Justified Graph	99
7.3 Morphological analysis of houses layout	100
- Case 1	100
- Case 2	101
- Case 3	102
- Case 4	103
- Case 5	104

- Case 6	105
- Case 7	106
- Case 8	107
- Case 9	108
- Case 10	109
- Case 11	110
- Case 12	111
- Case 13	112
- Case 14	113
- Case 15	114
- Case 16	115
7.4 Provisional Findings	116
Chapter Eight:	
Spatial Configuration of the Traditional House in Omdurman Sudan:	
Syntactic Findings	118
8.1 Family Structure, Gender and Spatial Configuration	118
- Culture, Religion and Space Division:	119
- Socio-Cultures and Zoning:	120
- Guests Routes and Spatial Zoning:	120
8.2 Spatial Layout and Usage of Spaces	121
- The Exterior	122
- The Carriers	122
- The Male Domain	122
- The Family Domain	123
- The Family Gathering Zone	123
- The Private Zone	124
8.3 Space Functional Classification	124
- The Male Courtyard	125
- The Female/Family Courtyard	125
- The Male Hall/Diwan	125
- The Kitchen	125
- Family Living Room/Veranda	126
8.4 Summary of Findings	126
Chapter Nine:	
Towards Contemporary Traditional Housing Architecture:	
Conclusions and Contribution	129
Bibliography	133

List of Figures and Photos

Chapter One:

Towards a Contemporary Traditional Architecture: Problem Formulation

Figures:

- Fig. 1.1 Map of Sudan
- Fig. 1.2 Objectives of the Study
- Fig. 1.3 Levels of investigation
- Fig. 1.4 Analytical view, Traditional Architecture
- Fig. 1.5: Organization of the Study

Chapter Two:

Literature Review: Approaches of Relevant Concepts

Figures:

- Fig. 2.1: Traditional architecture study perspectives

Photos:

- Photo 2.1: House shaped tomb
- Photo 2.2: Clay houses
- Photo 2.3: The ruins of the medieval Thetford Priory in England
- Photo 2.4: Courtyard Housing traditional urban fabric
- Photo 2.5: Traditional house, Makkah
- Photo 2.6: Traditional architecture in Jumairah City in Dubai
- Photo 2.7: Traditional ways of building and craftsmanship in Omdurman

Chapter Three:

Conceptualization of Traditional Architecture: Conceptual Framework

Figures:

- Fig. 3.1: Conceptualizing the built environment

Chapter Four:

Khartoum-Omdurman Traditional House: The Current Situation

Figures:

- Fig. 4.1: Map of Sudan
- Fig. 4.2: Satellite Image of Sudan

- Fig: 4.3: Climatic Zones of Sudan
Fig: 4.5: Khartoum Capital (Khartoum, Khartoum North & Omdurman)
Fig: 4.6: Khartoum during British General Charles Gordon
Fig: 4.7: Omdurman Map during the Mahdiya Period
Fig. 4.8: Organic Pattern of Omdurman
Fig. 4.9: Old Map of Omdurman-Aburouf
Fig. 4.10: Aerial View of Aburouf

Photos:

- Photo 4.1: Khartoum, Khartoum-North & Omdurman
Photo 4.2: Traditional House in Omdurman
Photo 4.3: Courtyard in a traditional house in Khartoum,
Photo 4.4: Modern Villa in Khartoum,

Chapter Five:

Implementation of the Field Study: Abu-Rouf Neighbourhood

Figures:

- Fig. 5.1: Aburouf Neighbourhood in Omdurman
Fig. 5.2: Urban Morphology of Aburouf
Fig 5.3: Methodology of the Field Study

Chapter Six:

Presentation of the Selected Case Studies

- Fig. 6.1: Data Representations for the Cases
Fig. 6.2: Case 1
Fig. 6.3: Case 2
Fig. 6.4: Case 3
Fig. 6.5: Case 4
Fig. 6.6: Case 5
Fig. 6.7: Case 6
Fig. 6.8: Case 7
Fig. 6.9: Case 8
Fig. 6.10: Case 9
Fig. 6.11: Case 10
Fig. 6.12: Case 11
Fig. 6.13: Case 12
Fig. 6.14: Case 13
Fig. 6.15: Case 14
Fig. 6.16: Case 15
Fig. 6.17: Case 16

Chapter Seven:

Space Syntax Approach: Morphological Analysis of the Case Studies

Fig. 7.1: Example of space syntax representation of housing floor plans

Fig. 7.2: Case 1

Fig. 7.3: Case 2

Fig. 7.4: Case 3

Fig. 7.5: Case 4

Fig. 7.6: Case 5

Fig. 7.7: Case 6

Fig. 7.8: Case 7

Fig. 7.9: Case 8

Fig. 7.10: Case 9

Fig. 7.11: Case 10

Fig. 7.12: Case 11

Fig. 7.13: Case 12

Fig. 7.14: Case 13

Fig. 7.15: Case 14

Fig. 7.16: Case 15

Fig. 7.17: Case 16

Chapter One:

Towards a Contemporary Traditional Architecture: Problem Formulation

Vernacular “traditional” architecture is the outcome of a tradition that has evolved over generations fulfilling specific needs and expressing the aspirations of its users; it is shaped by environmental, social, economic and historic factors.

(Rudofsky 1965)

This chapter provides a brief background to the problems and provides details on how the research will address these problems. Also, it defines the concepts needed to understand and resolve the research problem.

1.1 Background

I lived with my family in a small traditional house in the old city of Omdurman, where the early beginning of this research idea had begun some years ago during one evening when my professional thinking took new and different dimensions.

During that evening, I had a short discussion with my Father regarding his intention make use of the backyard in our house to build extra two rooms with a small kitchen and a bathroom for my newly wedded brother to live in using the same “traditional” materials as used in the house.

When our discussion came to; where and how to place those rooms within our backyard, without hesitation I confidently said to him:

“Dear Father, Did you forget that I am an architect...don’t worry, I will take care of the layout, and make a plan for that ...”

He suddenly interrupted me by saying:

“wait, wait dear Son... this type of houses does not represent any part of your architectural world; you are a modern architect who has been trained to design “modern houses”, but, this traditional type of architectural thinking is not of your concern....”

I was very shocked at the beginning when I heard his say, but, after taking a moment of thinking I found that, disappointedly, he was, somehow, correct. During my five years of architecture study at the university, mainly I was educated to become a “modern” designer who knows how to produce wonderful and good looking pieces of buildings and how to use the modern construction techniques. I encountered traditional building only once, in a four-week project of the second year’s syllabus. While for the rest of the five years, I studied the design and construction of higher level buildings.

However, that was the day, when my thinking started to take different dimensions. I was thinking why old houses were built, how they were built and used in certain ways, and why they changed in form, style and technique through time. I wanted to figure the aspects may be “read” through the form of old houses and use them to make a house design that reflects the people’s social preferences.

From the day of that conversation with my father, my inquisitiveness about traditional architecture and its significance has grown increasingly and become more precisely oriented, and, that was the very beginning of this study idea.

1.2 Traditional Housing: Complexity of the Problem

In most Arab countries including Sudan, the architectural education and professional practice rarely consider the house as a product of social and cultural norms. Likewise, most of the Architectural theory and history records have been concerned with the study of memorials and the works of genius architects more than the building activity at any given period.

Architects in the developing world, particularly in Sudan, are largely more concerned about aesthetics, economy and construction of modern houses than the usage and users. They often look at building technologies, material systems, and aesthetic concepts rather than

the socio-cultural identities of their project. Traditional Sudanese Architecture had always been deserted in both architecture educational and professional life although traditional houses were, and are, major part of our Sudanese life.

Moreover, Sudanese traditional architecture and how the layout of house is affected by cultural and social factors has seldom adequately been studied or absorbed in the current architectural practice, education and research. Furthermore, in the practices of the present day architecture negligence of the traditional houses and the traditional ways of living goes hand in hand with the motivation of acquiring modern houses and living modern life style. Consequently, many cultural, social, environmental and economic problems have arisen. Sudan, like in many other developing countries, policy makers believed that economic criteria were fundamental and all that low-income families needed was only shelter. These housing emergencies created a mass-produced housing which, very often ignored the cultural values of the indigenous society. Hence, such buildings often don't satisfy the inhabitants' ways of living and lifestyle. While, the traditional house, which is a product of many centuries of local experience, people tend to live more in harmony with the local environment and other cultural variables.

1.3 The Research Problem

This study seeks to relate house design to man's social and cultural needs in Third Class areas in Khartoum. It identifies and explains those cultural and social variables that can be used to examine the house design system. It illustrates how these variables are operative in the use of the residential environment, and shows that it is essential to account for these variables when formulating design codes and policies.

However, by stressing the socio-cultural factors, this study does not deny the importance of any other factors. On the contrary, it is believable that the main objective for design activities should be to provide a residential unit that facilitates and maintains a functional balance between human needs, environmental factors and financial constraints.

Generally, this study is a contribution to the Sudanese research on traditional domestic architecture by highlighting the morphological relationship between house and people's lifestyle by investigating the house, its spatial use and configuration in a certain traditional environment.



Sudan, in northeast Africa, its neighbours are Chad and the Central African Republic on the west, Egypt and Libya on the north, Ethiopia and Eritrea on the east, and South Sudan, Kenya, Uganda, and Democratic Republic of the Congo on the south. The Red Sea washes about 500 mi of the eastern coast. It is traversed from north to south by the Nile, all of whose great tributaries are partly or entirely within its borders.

Fig. 1.1: Map of Sudan

1.4 Aims and Objectives

At its first objective, this study aims to gain comprehensive understanding for the spatial configuration of domestic built environment, rather than statistical knowledge, and how this configuration is affected by socio-cultural factors. The study also attempts to offer an understanding for the social factors and their requirement on the house design and demonstrates how these factors are affecting the daily life of the inhabitants and, subsequently, the use of the space and the house morphological form.

Findings concerning this relation between house form and social norms ought to be considered by architects and other educated professional builders in their housing layout design, as well as by policy makers and authorities when setting the design codes and regulations for houses.

Another objective of this thesis is to explore and evaluate the architectural design elements that can be adopted from the traditional architecture in third class residential areas in Khartoum the capital of Sudan. The study attempts to seek solutions from traditional architecture, in order to come up with functional, cheaper and better-ways of providing good standard contemporary house design and spaces for the low income residents in Khartoum.

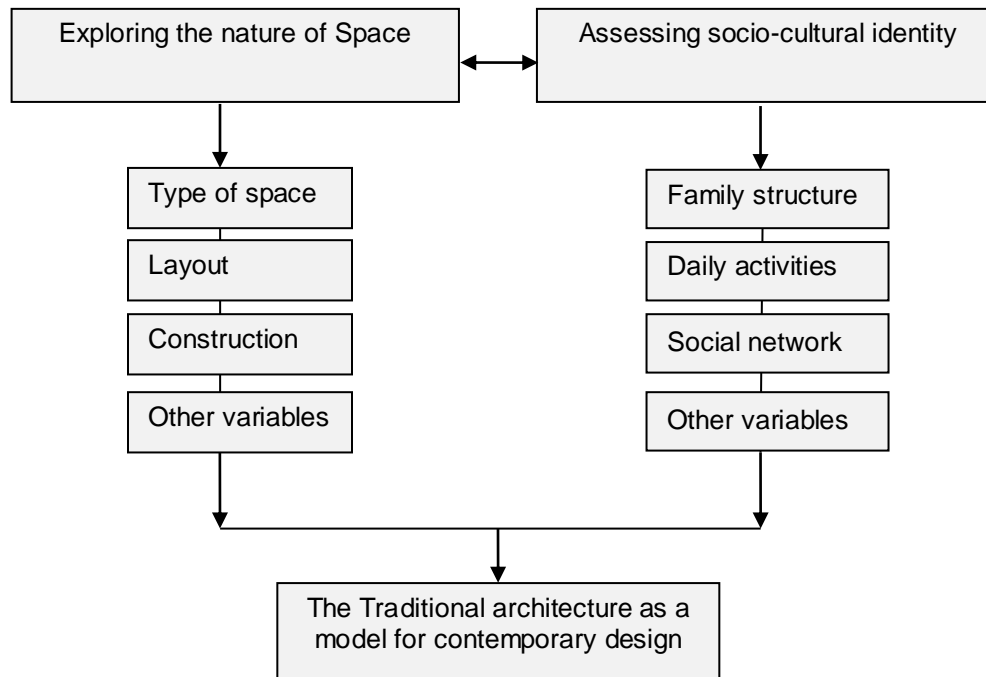


Fig.1.2: Objectives of the Study

It is expected that; the study will add substantive value to the provision of a domestic spaces that takes into consideration the inhabitants' local culture and ways of living. This new approach can even be extended to other areas, cultures and times in order to learn more about Sudanese architecture through traditional architecture.

It is probable that the study will suggest possible alternatives and new solutions more related to space organisation and constructive systems learned by traditions and using it as a basis for concepts of design of low-income housing in Khartoum.

For the purpose of this study, case studies of self "*non-architect*" designed traditional houses in selected third class neighbourhoods in the capital Greater Khartoum are conducted.

1.5 Hypothesis

A set of leading hypotheses focused the research and guided the enquiry.

Hypothesis 1: *House form is not simply the result of Physical forces but also the outcome of a complex set of socio-cultural factors.*

The relationship between man and his built environment is certainly complex. Man builds his home according to variety of parameters, including materials, space and economic and socio-cultural values. Then, eventually “the house” by its spaces would influence and control the daily pattern of man’s life.

Hypothesis 2: *The current Sudanese housing policies and codes in Greater Khartoum are not giving ample attention to the lifestyle and socio-cultural needs of the Sudanese society.*

The housing design policies hardly supporting the common desired activities did not fulfill the required level of privacy and did not facilitate social interaction; hence, it disturbed the overall wellbeing of its inhabitants.

Hypothesis 3: *A lot can be learnt about traditional architecture*

Lessons can be learned to increase the awareness of the locals on how to build modern buildings using traditional materials.

1.6 Scope of the Research

This research will include three levels of investigation.

The first level focuses on the historical background which aims to define both the constant and changing socio-cultural factors and their influence on housing traditional architecture in the aspects of socio-economic, environmental and culture in Sudan with special emphasis to Khartoum as the main City.

The second level investigates the current situation of the traditional domestic architecture in Khartoum through a comparative analysis of existing old houses in a traditional neighborhood. The main city of Omdurman in the capital Khartoum will be used as case studies.

The third level investigates the future prospects and the need to develop approaches and suggestions for addressing the traditional domestic architecture in Sudan and explore how we can build contemporary, traditional houses, which is an emerging challenge on a substantial revolution of building design philosophies and strategies.

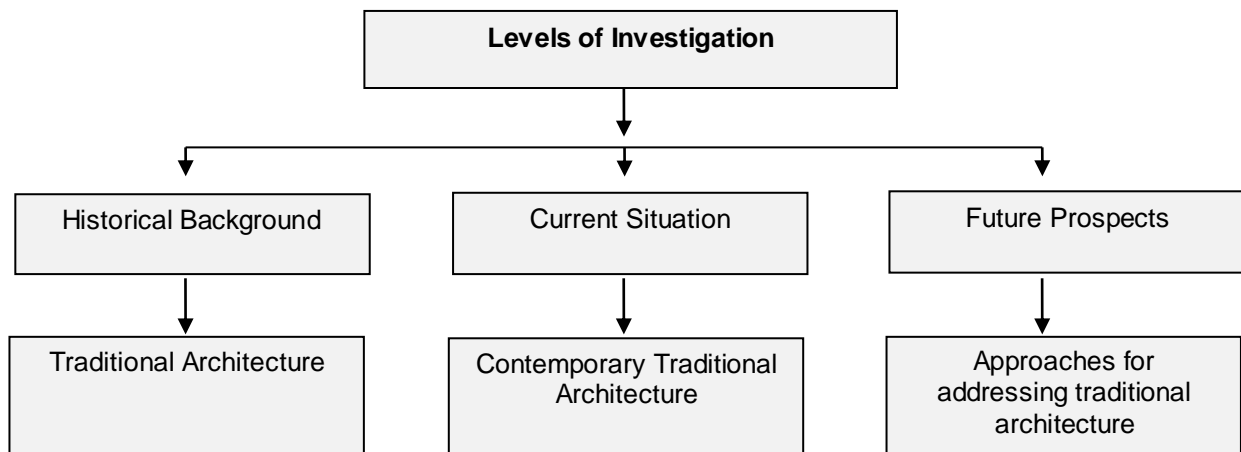


Fig. 1.3: Levels of investigation

1.7 Methodology

The long term aim behind this research is to facilitate the integration between the socio-culture responsive environments and house design. Since that the main purpose guides this thesis is how to integrate people and house design in the research approach and how to interpret the interaction between them, the research method combines evidence from documentary sources and field studies in attempt to identify the gap in knowledge in the field of the Built Environment.

The study method started by reviewing the written literature in this field inclusive of studies of Human characteristics and behaviors influencing the spatial morphology of the dwelling. The literature reviews will be followed by detailed analysis of the role of the different social and cultural forces in helping to influence the evolving spatial form and the use of the house in a traditional setting.

One useful way of understanding the relationship between socio-cultural forces and the built environment could be achieved by a comparative analysis of existing dwellings through field investigation studies. The attempt of the field studies is not to conduct a statistical survey in order to gain statistical records. The objective is to conduct a field study that reveals different aspects and variables on how the houses form are impacted by the social life of the residents. Thus, the field studies conducted by personal interviews and direct contacts with residents who trustfully agreed to share the complex relationship between their routine daily domestic life and the uses of their house spaces.

The next step after the field study is to combine the architectural spatial data and the findings of the socio-cultural norms and habits of the people and their specific characteristics of the life style and to identify how the effect on the house form.

Finally, the study will use the findings of the morphological analysis for the case studies to suggest possible solutions more related to spacial organization and constructive systems learned from traditions and using it as a basis for contemporary concepts of design of low-income housing in Sudan.

The basic theory for the study, is that house form is not simply the result of physical forces or any single causal factor, but is the consequence of a whole range of socio-cultural factors.

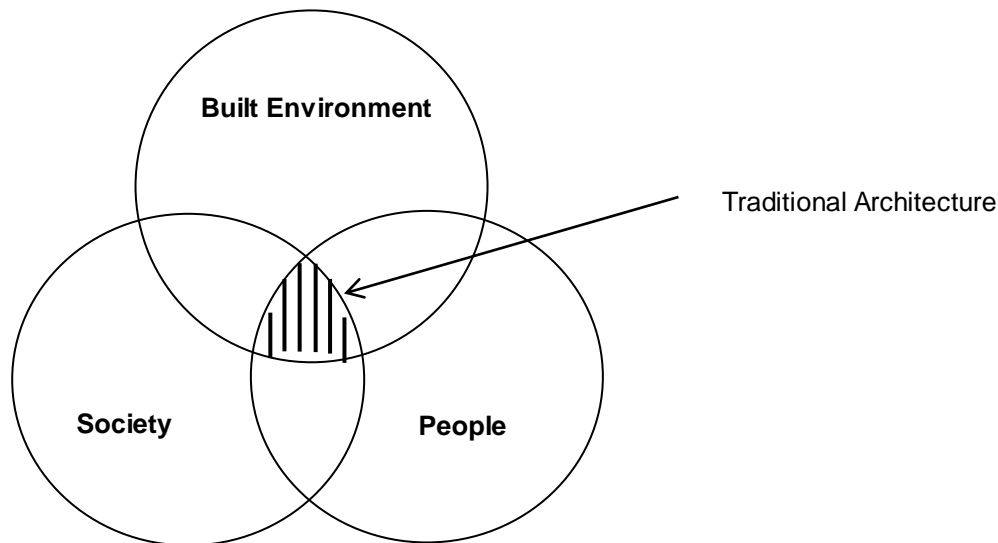


Fig. 1.4: Analytical view, Traditional Architecture

1.8 Organization of the Research

The research is divided into four parts. The first part aims to build the theoretical background for the traditional house review. This part consists of two chapters discussing the formulation of the research problem and the relevant literature reviews and the factors influencing the house design in the developing world.

The definition of the most important concepts in vernacular house and the context of the study concerning the situation in Sudan will be discussed in the second part of the

research. The third part will include the criteria for selection of the case studies, the presentation of the selected case studies and the method used in data collection. Through discussion and analysis, the final findings and the research contribution are formulated in the fourth part of the study.

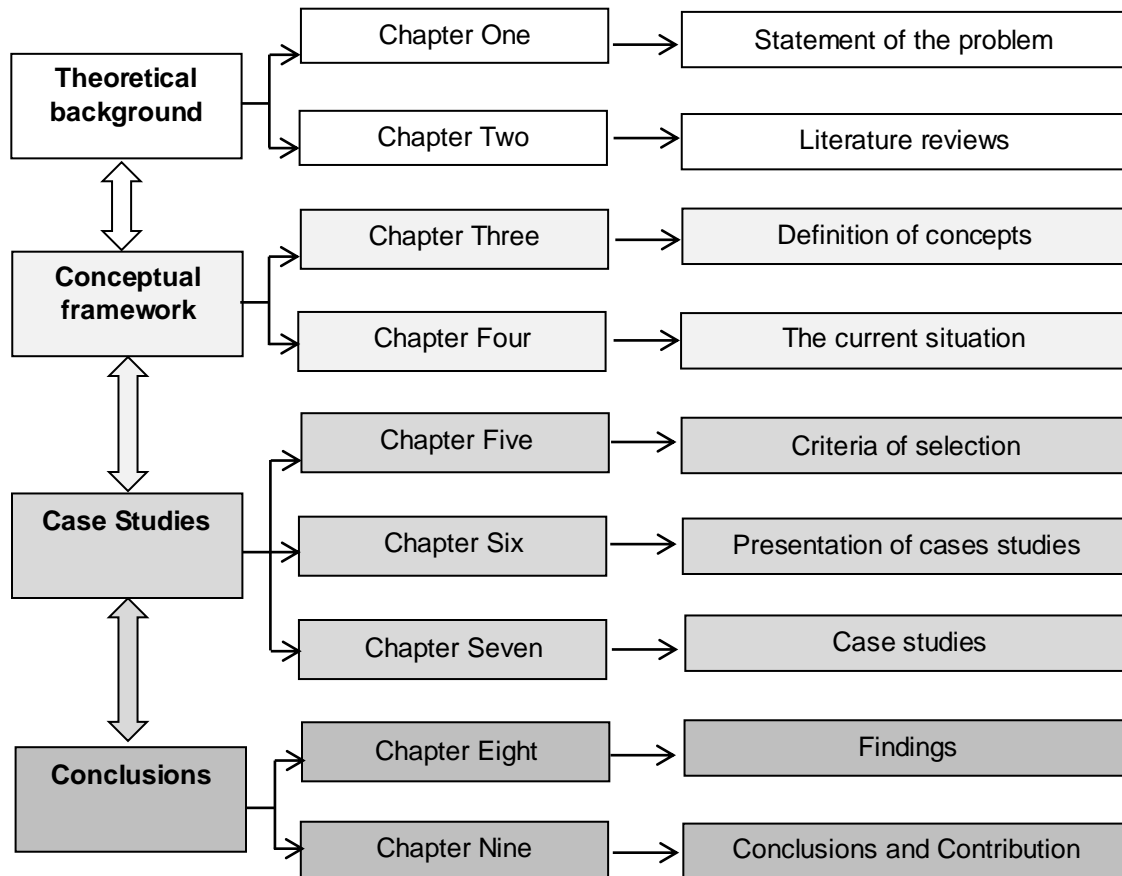


Fig. 1.5: Organization of the Study

1.9 Provisional Findings

In Sudan, architects and policy makers rarely consider the house form as an outcome of traditions that has evolved over generations to satisfy specific needs of its users. Also, the traditional housing architecture as an outcome of specific environmental, social, economic and historic factors has not given attention in both the professional and academic fields of architecture.

The challenge of this study is to gain a deep understanding for the interaction between the form non-architect designed houses and the cultural environment and how the spatial organization of the house is influenced by the social structures.

This Study investigates the relationship between social, cultural, and religious traditions and the architecture of traditional housing in Khartoum, Sudan. It also represents a search for answers regarding how traditional local culture, beliefs, values, and rituals influences housing architecture.

The study challenges is to understand the traditional house form within certain socio-cultural variables through the analysis of ethnographical data in order to enable the architects and policy makers to understand and consider some of its principles in the contemporary house design and codes.

Chapter Two:

Literature Review: Approaches of Relevant Concepts



What a strange building!.. It seems basically like a house on a post. On the other hand it shows a wonderful dynamism in traditional decoration. There is a bird on top and for the rest we see leaf-like projections in many directions mainly above the roof.

Source: Waterson 1990

This chapter will investigate the literature concerning the traditional architecture of built environment which forms the old sections of many contemporary cities, in order to identify and develop the general concepts in its world view and specifically one in relation to the housing and the Sudanese context. The purpose of such a review is to discover ideas which will be helpful in addressing the research questions leading to the structure of the methodology, and to build a platform for the second theme of the study; the case study analysis. It means that its findings will direct the research to analyse the case study by referring to the concepts emerging from this chapter.

2.1 Traditional Architecture: Definition

Many scholars now use the term "traditional architecture" to refer to structures made by empirical builders, without the intervention of professional architects and without the use of industrial components. It is still the most widespread method of building homes across the globe according to Rapoport 1969. All forms of traditional architecture are built to meet specific human needs, accommodating the values, economies and ways of life of the cultures that produce them.



Photo 2.1: House shaped tomb (joro) at Lumban Silambi
Source:(Waterson 1990)

Here, the rooftop is projecting. And like in the first photo, birds on top. Do they indicate a relation with the sky, heavens, or space? However, probably there is another way to understand this, more related to architecture

From the different definitions for traditional architecture, one concludes that it is a term from academic architecture to categorize structures built outside of academic tradition considering the function of the building as the dominant factor, aesthetic considerations being quite minimal and local materials would be used in the construction.

2.2 Traditional House and Social Norms: Literature Reviews

The traditional built form has been studied from different points of view, and by a variety of disciplines. This study selected certain literatures which are more relevant to the objectives of this research and highlighted their relevance and irrelevance to this research.

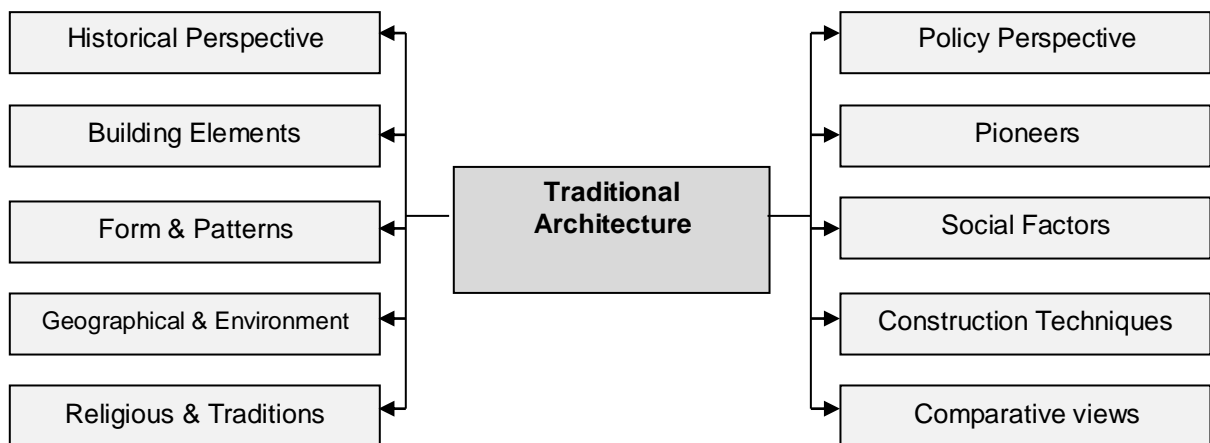


Fig. 2.1: Traditional architecture study perspectives

Social influences on the traditional house design, is a vast conceptual term, combined with multiple aspects of our lives. This conceptual term was explored by many researchers trying to identify it and understand the factors that shape and affect its meaning.

Amos Rapoport was one of the first who in new ways studied traditional house forms worldwide with a specifically developed method and attempts to formulate a theory on the socio-cultural forces influencing house form. In his book "*House Form and Culture 1969*" He discusses the principle explanation for the house form. In contrast to the physical determinist view, Rapoport argues that building form manifests the complex interaction of many factors, such as; climate, site, religion, defence, economics, material, construction, and technology. Rapoport also suggests that house form retains its validity and usability long after the culture or way of life that created them has changed. He argues that the European medieval town is more liveable and satisfies many perceptual needs better those present-day towns.

Again, in 1990 Rapoport introduces a new definition of traditional architecture, whereby He develops a new method using many characteristics to define the built environment "*The Meaning of the Built Environment, 1990*", He suggests a multiple scale, and stresses the importance of comparisons of different built environments within a given cultural context. He divides the attributes of the built environment into process characteristics and product characteristics. These characteristics are then used to describe and differentiate the built environments.

Manzoor in his Book "*Tradition and Development, an approach to vernacular architectural patterns in Iran, manzoor-1989*" discusses the problem of introducing Western concepts of planning, and neighbourhood and house design to the Third World with reference to Iran. The main objective of his study is the evaluation of physical planning in the past for the purpose of developing architectural and planning work in Iran. He studies the general planning patterns, and the house design and its components explaining its physical and social advantages.

Schwerdtfeger studies the traditional houses in three African cities; Zaria, Ibadan, Marakech "*Traditional Housing in African Cities ,1982*". In his study the household composition within each compound was analyzed in an attempt to relate history of the

extended family to the history of the compound. He investigates the use and distribution of living space within the dwelling is supported by detailed description of the technology, raw material, finance, and organization of local construction industry in each of the three studied cities. Schwerdtfeger, writes about the influence of Islam on the house form. He concludes that Islam had influenced the traditional houses and their inhabitants in the three African cities differently. His justification for that is the variations in ethnic core, history of the town, how society had been introduced to Islam, and the duration and style of Islam in the specific society.



Photo 2.2: Clay houses decorated with low-relief ornament and vibrant designs exhibiting contemporary vernacular architecture in Zaria, Nigeria.

Source: Schwerdtfeger, 1982

The study of traditional architecture explores the characteristics of domestic buildings in particular regions or localities, and the many social and cultural factors that have contributed to their evolution. In his book *“Built to Meet Needs: Cultural Issues in Vernacular Housing, 2006”*, vernacular traditional architecture specialist Paul Oliver consider aspects of traditional architecture which, in some instances, may be contentious. These aspects do not attempt to classify or describe in detail the types and forms of building traditions across the globe.

However, the main purpose of this collection is to consider the cultural factors that bear upon the subject. Specifically, these relate to the study and understanding of vernacular traditions, and to aspects which reflect the motivations, means and methods of those who undertake research in the field, who may be responsible for the care of some of its buildings, or who may design in vernacular contexts. These aspects include subject definition, cultural character, transmission of skills and values, vulnerability to hazards,

building conservation, popular housing, architectural education and future applications of the vernacular.

In 2009, Kingston explores the bridge between vernacular architecture theory and contemporary regional design. He considers *Regionalism* as an attitude toward design that endeavours to bring about positive change through the introduction of appropriate technologies. In his book "*Vernacular Architecture and Regional Design Cultural Process and Environmental Response*", he puts forth an argument to broaden the scope of regional issues addressed in architectural education, and it offers a theoretical exploration into the nature of vernacular forms as expressions of evolving regional patterns.

Kingston supports the notion that traditional architecture is a dynamic process of development over time by the collective actions of individuals. In the end, it is people who individually address the challenges and opportunities of a locale and act on the basis of local knowledge that is collectively shared; together, they develop an identifiable regional architecture.

Allen Nobel in this study "*Traditional Buildings: A Global Survey of Structural Forms and Cultural Functions, 2007*" examines traditional buildings at close range and to make comparisons over a wide spectrum of examples in many parts of the world. He has arranged the text material around certain themes, concepts or characteristics; Terminology and Disciplines, He used differed approaches to understand various processes, developments, and the rationale for traditional building like Function and Form, Plan and Elevation, Location and Orientation, Building Materials and Construction Methods, Above-Ground and Excavated Structures, Coverings and Climate, Threats: Man-Made and Natural Hazards, Openings: Doors and Windows, Heating and Cooling and Change versus Constancy.



Photo 2.3: The ruins of the medieval Thetford Priory in England show flint cobbles and mortar through the whole depth of the wall

Source: Allen Nobel, 2007

In their book "*Courtyard Housing: Past, Present and Future, 2006*" Magda Sibley, Brian Edwards, Mohamad Hakmi, Peter Land assumes that Courtyard housing is widely considered to be a responsive typology to low-rise high-density urban housing and is an appropriate form of housing within contemporary mixed use sustainable urban developments. The intention of this study is to revive the courtyard house as a model and bring it up to date in terms of current legislation so that it can assume greater importance in the rebuilding and expansion of cities throughout the world.

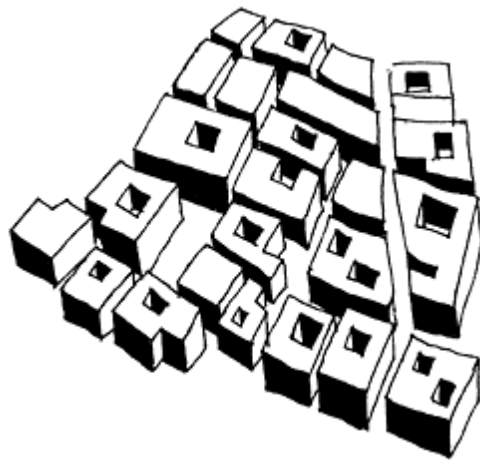


Photo 2.4: Courtyard Housing traditional urban fabric
Source: Magda Sibley 2006

In his piece of writing "*The Vernacular architecture as a model for Sustainable design in Africa*" Bonginkosi G. Mabaleka makes particular reference to traditional vernacular architecture in Africa in the countries and how it has developed and what determines the vernacular architecture in these selected countries. Mabaleka examines how vernacular architecture has developed over the years and how modern sustainable design has adopted elements of vernacular architecture. Mabaleka discusses the factors influencing traditional architecture in Africa. He assumed that African architecture works on a traditional village scale, rather than following global architectural styles. African architecture is a direct evocation of its physical environment, culture, stylish depending on tradition, climate and the availability of building materials which varies from mud to stone and to thatch.

Mabaleka concludes that traditional architecture was once pride and heritage to the different tribes and cultures in Africa, but as a result of imperialism it became perceived as low status housing by those who could afford modern building materials.

In this study *“The Development of the Domestic Interior in Makkah, Saudi Arabia: From the Traditional to the Modern Way of Living , 2006”* the Al-Wafi attempts to identify the main features characterizing the Arab and *Makkah* traditional houses. He notes that the design of Makkah traditional houses reflected the Islamic faith, the traditional way of life in Makkah, the social value, social cohesion, climate and geography of *Makkah* area. He assumed that there were differences found in the form of Makkah traditional houses from those of other Arab or Islamic traditional houses such as Baghdad in Iraq and Cairo in Egypt, in which the concept of central courtyard was the main element in the houses, which was the heart for all life activities, connections and movement.



Photo 2.5: Traditional house, Makkah
Source: *Al-Wafi, 2006*

In his conclusion Al-Wafi argued that if it is accepted that the Makkah traditional architecture provided the base-live for decent living do that necessarily mean that the modern architecture is inappropriate? He has noted that modern Saudi architecture was introduced from the West. This foreign import must however be made to fit with the different circumstances of Saudi families in Makkah. Therefore the designer should understand the origin of western architecture, as well as the characteristic of Makkah traditional architecture, social-cultural value and needs of Saudi families in Makkah in order to create a new satisfactory domestic environment.

In her PhD thesis titled “The Sustainability Potential of Traditional Architecture in the Arab world- With Reference to Domestic Buildings in the UAE” in 2007, Maha Al-Zubaidi advocated to investigate sustainability potential in traditional architecture in the Arab World through developing Sustainability Assessment Method appropriate to the natural

environment and social values in the region. Al-Zubaidi discusses traditional architecture, as well as contemporary, through systematic framework to identify sustainability in architecture with reference to role of Islam in creating environmental awareness and forming social values that were reflected in traditional architecture, especially houses.

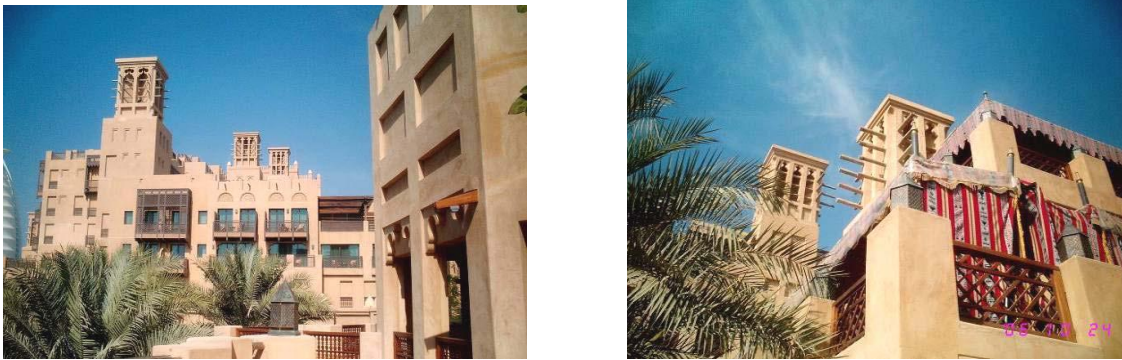


Photo 2.7: Inspiration from traditional architecture in Jumairah City in Dubai,
Source: Al-Zubaidi 2007

Al-Zubaidi concludes that in order to ensure successful implementation of the scheme, guidelines for sustainable building, design should be developed to provide practical assistance to building designers and encourage wider acceptance of assessment methods.

In his book “Towards a Socio-cultural approach for the design of the house/settlement system- A case study in Ghardaia, Algeria, 1988” Chabbi demonstrates the relation between design and man's social and cultural needs. He demonstrates the relationship between cultural and social variables that influence house form and settlement patterns.

Chabbi's main assumption was that traditional houses and settlements were culturally more responsive than their modern equivalents. Chabbi assumed that through studying human-environmental behavior and using multiple-methods strategies, it is possible to bridge the gap between design and social research.

Finally, His study suggests that designing for potential adaptability a characteristic of traditional design, reflects culture, and would not only accommodate change, but would also involve active participation by people and therefore raise the level of responsibility and satisfaction.

2.3 Traditional Housing: Sudanese Research



Photo 2.7: Traditional ways of building and craftsmanship in Omdurman using local materials that are about to vanish

As in the case of most Arab countries, there exists many research works dealing with housing in Sudan. Most of the research works carried out addresses current problems concerning the policy economic and technical aspects of housing. There are other few researches which dealt with the social aspects affecting the domestic built environment. However, these studies were mainly approach the subject from policy, planning and theoretical perspectives. The researches which are of interest for this study are mostly post graduate thesis researches.

As early as 1954, a survey collecting socio-economic data on house hold was carried out by the Ministry of Social Affairs. As part of the socio-economic survey, a social investigation about the living conditions in two Sudanese low-cost domestic quarters was carried out. The survey dealt with the social needs and domestic design of low-cost housing. (Fawzi 1954).

El-Bedri (1970) continued in the field of low-cost housing by studying the change in family structure, patterns of living and economical ability of the inhabitants in relation to housing taking into consideration the climatic conditions, socio-economic and functional conditions.

Madibo (1989) in his PhD thesis addresses the impact of the socio-cultural aspects on the built environment with special reference to Sudan". His research main objective is to

explore the relationship between the culture and the existing built environment in Sudan. He discusses the cultural institutions which are directly or indirectly related to the built environment, namely; *Religion & Islamic laws kinship, family, marriage, privacy and territoriality*. He relates the social aspects to planning issues and recommends some planning guidelines.

In her PhD thesis Othman (1993) attempts to identify socio-cultural forces of importance to environmental design issues. The approach of the study towards the issue of culture was through the analysis of domestic activity setting and special pattern. The thesis attempted to study the domestic buildings in the urban Sudanese context. Othman identified four house categories that are found in Omdurman town: modern, institutional, traditional and scattered. The thesis dealt with the house form in traditional areas, while raising the question of the interaction between cultural aspects and spatial organization of the house. Although the study failed to present the pattern of daily life and use of space, is concluded that the traditional modern buildings are most recommended by the inhabitants. Consequently, she called for a study of a larger sample of both categories.

Daifalla (1998) investigated the social factors that influence the house design through the application of Rapoport's theory of constancy and change. Her effort has made to understand the social needs of the residents and how the needs have been satisfied. The thesis founded that Rapoport's theory is applicable and the methodological approach is transferrable and, hence, concluded that extended way of life is one of the influencing social factors in the studied houses.

In a recent PhD thesis Farah (2000) continued the research on traditional domestic architecture by highlighting and social life and domestic design in traditional neighbourhoods. She was the first to alert the Sudanese architects to the need to consider the socio-cultural roots in the built environment. Her research recommended a research approach which could be re-used and adopted on a larger scale.

2.4 Provisional Findings

Radically, the small number of studies concerning the relation between house form and social norms ought to be considered by architects in their housing design, makes research in this area especially important. Vernacular, Traditional and Local house architecture is in danger and about to disappear in Sudan as well as in many countries of the Arab World. It has almost disappeared in the Oil-Arab capitals where what we call native, traditional and handmade has begun to disappear gradually and then the true meaning of vernacular vanishes. Global ambitions and socio-economic development are some of the factors behind inhabitants deserting their vernacular houses, leaving them to deteriorate or demolishing them to build new houses using industrialized materials. This is, unfortunately, almost true for Sudan.

Generally, this study is a contribution to the Sudanese research on traditional domestic architecture by highlighting the morphological relationship between house and people's lifestyle by investigating the house, its spatial use and configuration.

Chapter Three:

Conceptualization of Traditional Architecture: Conceptual Framework



"Most of the people are still very happy to live in these traditional structures or belong to places which offer the material and moral comfort of traditional vernacular architecture,"

(Oliver 1987: 8)

The purpose of this chapter is to explore relevant theoretical definitions, conceptions, ideas and arguments that can help to develop a clear framework to understand the concept of domestic traditional forms and socio-cultural models.

3.1 Culture

Definition:

The discussion of traditional architecture leads to the consideration of the cultural contexts. Researchers like Low and Chambers (1987) consider "Culture" as a fact of history and a basis for the historical process. It describes both the materialistic and the spiritual basis of human activities. The elements of the materialistic culture are technology, communication, productivity, etc. Also, built environment is 'indeed' related to images of

self-value and symbols that must be intimately linked with culture. Low and Chambers (1987: 2) conceptually summarize 'culture' as follows:

"It is a way of life typical of a group, it is a system of schemata transmitted symbolically, and it is a way of coping with the ecological setting."

Culture can be defined in many ways. In 1952, Kroeber and Kluckhohn produced a sizeable book reviewing definitions of culture and since then the flow of definitions and conceptualizations of culture has increased. Culture, according to the dictionary of modern sociology is:

"...the total generally organized way of life, including values, norms, institutions and artifacts, that is unique to given people and that is passed on from generations to generations by learning alone..."

A classical anthropological definition of culture is that it refers to and indicates the whole range of the conventional understandings that are shared by the members of a group of a certain society. Taylor (1958) reflects this classical definition stating that:

"Culture... is that complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society".

Hall in 1977 offers a simple definition of culture as 'man's medium'. He explains this further by:

"There is not one aspect of human life that is not touched and altered by culture. This means personality (how people express themselves including shows of emotion), the way they think, how they move, how problems are solved, how their cities are planned and laid-out, how transportation systems function and are organised, as well as how economic and government systems are put together and function".

Culture is a dynamic body of value systems that is altered by social Change. Thus, it is conceived as a coherent body of beliefs and practices which are dynamic and changing within particular historical periods (Moalosi - 2007).

Rapoport is none of the first to attempt to relate culture to the built environment. He defined culture as being about

"a group of people who have a set of values and beliefs which are learned and transmitted, which create a system of rules and habits, and leads to a lifestyle"

The term culture is difficult to be defined precisely, but through these definitions an understanding of its characteristics and components may be reached. However, for the purpose of this study, culture is seen as being made up of the activities of a group of

people who share certain values, beliefs and ideals components; these different components are transmitted from generation to generation through various artifacts, including the built environment.

Characteristics:

Salamati 2001 has summarised the characteristics of the concept of culture into four categories:

- First, it is a system composed of shared categories and plans manifested as norms rules, and codes. These categories and plans do not exist in isolation, but serve as organizational links between people and things. People use this system to interpret and evaluate their behaviour and the behaviour of others to know whether they are using the system correctly or not.
- Second, culture does not exist separately from people. Culture is set in the mind of people and carried by individuals while invented and sustained by a group.
- Third, culture is not innate. It is grasped, applied, and transmitted by social learning.
- Fourth, culture is not finite. It develops in an evolutionary modification process.

Components:

Culture is the outcome of several factors combined. These factors are the mental activities of people, intellectual orientation, and the social behavioural processes of a certain society. Each factor consists of many inseparable issues and sub-issues involve certain classes of activities, beliefs, attitudes, intentions and actions, (Altman and Chemers, 1984).

According to Altman, (1980) culture has several components:

- **First:** "it refers to beliefs and perception, values and norms, customs and behaviours of a group or society". Therefore culture includes what people believe to be true of their lives and environment.
- **Second:** "the term culture is used to indicate that cognition, feelings, and behaviour are shared among a group of people in consensus". This means that for culture to exist, they share a common way of viewing living and the environment.
- **Third,** "culture implies that there are shared believes, values, and styles of behaviour are passed on to others, especially children, and that the socialization and education of new members of the culture help preserve consensus from one generation to the

next". Thus children learn their behaviour, moods, beliefs and values appropriate and congruent to the family and to the larger society. "

- **Fourth**, "in addition the three discussed components of culture that reflect society's values, beliefs and practice (mental and behavioral process) culture can appear in objects and physical environment". Altman (1980) confirms, Home design, community, layouts, and public buildings often explicitly reflect the values and beliefs of a culture.

Culture and Built Environment:

There is a strong relationship between culture and housing type and layout, or in other words, between family and housing, which can be discussed either in terms of a process or by looking at housing as a product or by looking at both.

Culture is a theoretical construct. Some of the expressions of culture are mostly lifestyles, activity systems, values and images, which characterize families and will be used as indicators for future ways of living and, hence, house space layout. Thus, studying the traditions' acts as:

"A mechanism, which has no authority but it forms the most important service of our knowledge and serves as the basis of our thought and action ",
(Rapoport, 1969: 6).

In this study an orientation to the relation of components within the built environment, culture and people who created the traditional system interplay to form a social system, which means that all these components are in unity.

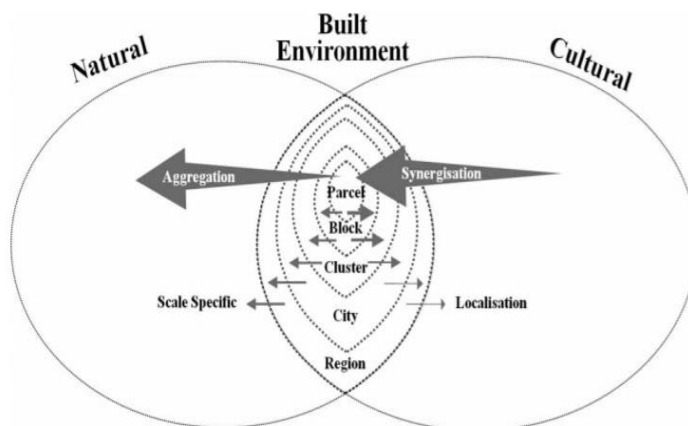


Fig. 3.1: Conceptualizing the built environment as a social-ecological system.

Source: Sebastian Moffatt & Niklaus Kohler, 2008.

Social Behavioural System:

Social behavioural processes involve mediation between the environment and people's behaviour at the social level. This includes any socialisation process which people use to manage and regulate their relation to both the social and physical built environments such as privacy and territoriality. Through this they achieve an optimal environment that fulfils their range of goals and needs. The needs for privacy, personal space, territory and social interaction are universal and contribute to the meeting of human needs. However, these needs are manifested differently in different societies and by different groups of people, *Salamati 2001*.

Society and space are clearly related. Many researchers like Rapoport (1969), Carmona (2003) have identified that an understanding of the relationship between people and their built environment is essential in urban and rural design.

Many claims of the relationships between people and their built environment can be determined:

- The built environment has a determining influence on human behavior.
- People are not passive. They influence and change the built environment. So they are a determining factor in built environment change.
- Both people and built environment freely affect each other. They can both influence and change each other.

Hence, we can argue that people and their built environment are a two-way process. Carmona 2003 argued that whenever the individuals know and adapt to their built environment they can live mutually with them. Thus, the situation of individuals in each environment is of significance. The person's goals and values, available resources, past experiences, etc., develop this situation. This individual and its family form the structure of a society that establishes an order on their living spaces and reflects their character on these spaces. The family contains the socio-economical structure of society in itself. Even though it is a small element, it forms the core, which makes up the future of society. The family needs a certain space, namely the dwelling, to achieve this function.

Culture and Human Needs:

Human needs differ from society to society and place to another. The choices people make in any given settlement are influenced by society and culture involving beliefs and values, which are passed from generation to generation, *Carmona 2003*.

Maslow 1968 in his “hierarchies of human needs” pointed out that human beings have a set of basic needs that are organised into a hierarchy of relative prepotency. If the most basic needs are relatively well gratified, they become unimportant in the current dynamics of the individual and the needs shift to less basic ones (Maslow, 1954). His hierarchical order from the most to the least basic needs are as follows:

- 'Physiological needs' are the needs for food, water, comfort and whatever helps to maintain a constant and normal blood flow. This type of need can be gratified through certain activities such as eating, drinking, sleeping, etc.
- 'Safety needs' are the needs for security, protection from physical harm and freedom from psychological fear. This type of need can be gratified by means such as building shelter, controlling territory, and forming a legible environment as well as looking for a healthy environment with minimal pollution and ecological disruption.
- 'Belongingness and love needs' are the needs for affectionate relations with people such as those within a group or family. Such needs can be addressed by socialisation processes and by being given the right to own property. The idea of ownership serves to create a sense of belonging and leads to personal pride.
- 'The self-esteem needs' denote being taken into consideration by oneself and by others. Such needs include a feeling of self-confidence, strength and usefulness in the world as well as the desire for prestige, reputation and dignity.
- 'The needs for self-actualization' are the needs for freedom of choice and of action. Self-determination is one example of the needs for self-actualization, since self-determination is based on the representation of interest.
- 'The desire to know and understand' can be addressed through opportunities for learning, exploration and self-testing.
- Finally, 'aesthetic needs' or the desire for environmental beauty come from sensory, formal, and symbolic aesthetics, which serve to please the eye and inspire the spirit. In fact, space can favor conviviality or solitude depending on the way of handling and organizing its elements as well as its geometrical form and proportion.

This hierarchy of needs appears to span the physiological, socio-cultural, and personal bases of motivation.

The Built Environment and the Behavioral Setting:

The *built environment* is the outcome of people's actions and behavior. It includes buildings, neighborhoods, cities, transportation and other systems of a man-made environment, which are usually constructed to meet the perceived needs of 'Activity Systems'.

Chapin and Kaiser, 1979 state that, the location, layout and pattern of environmental features can have behavioral and psychological effects on people's activities. Activity systems embody a hierarchy of 'Behavior Settings' linked to complement any behaviors.

In the light of this statement a “*house*” can be seen as a place for sustaining activities, socialization activities, recreational activities, social interaction activities, human development activities, etc. Baker, 1968 defines 'Behavior Settings' as an ecological theory that focuses on the everyday environment of people. It deals with social and built environmental issues together. A 'Behavior setting', as discussed by Baker, is a unit combining activity and place.

According to Salamati 2001, Baker's above definition of 'Behavior Settings' is a standing pattern of behavior at any given moment along with the environmental features that surround that behavior. Hence, 'Behavior Settings' consist of a standing pattern of behavior to satisfy certain needs such as eating, sleeping, etc.

A standing pattern of behavior exists within a spatial environment with, at least, minimal level to afford the standing pattern of behavior and a time period. The advantages of the 'Behavior Settings' idea are that it adds considerable clarity to discussions of physical design and its functions since it looks at activity location. The combination of 'Behavior Settings' and the linkages between them in certain locations reflect people's motivations and attitudes, limited by their incomes, competence, and culture, (Lang, 1987).

3.2 House**Definition:**

“*House*” in the Arabic language is synonymous to “*Manzel*” and “*Bayt*”. *Manzel* refers to a house as a constructed shelter, housing one or a number of families. *Bayt* has an additional meaning to shelter, and refers to the family living in it; for example, one can say “he belong to rich or famous Bayt” means that his family is rich and known. This indicates the strong bonding between the *House* and its inhabitants in the Arabic Society. Moreover, the word *Bayt* is also used in *Quraan* instead of the word *family*. For the ancient English

word “*house*” means both physical structure and a line of people related to each other, (Laslett 1972).

House Form and Socio-Cultural Influences:

Today, there is sufficient evidence to support the hypothesis that “*House form and settlement patterns are not simply the result of physical forces, but also the outcome of a complex set of social and cultural factors*”; for example, Rapoport in his book 'house, form and culture' (1969) challenged those studies that emphasized climate, construction materials, and/or economic factors as determinants of house form, and demonstrated the primacy of cultural systems in helping to determine the design and form of houses and later of urban forms.

Rapoport's pioneering work has since been followed by many other studies that related cultural and social factors to the design and use of houses. For example, Banham in his “The Architecture of the well-tempered Environment 1973” illustrated the association between possible forms of human shelters and the influenced cultural habits of a people'. Also, King (1980) edited a number of contributions on buildings and society and successfully demonstrated the relationship between social forms and built forms.

In a more recent contribution, Lawrence presented a comparative study of certain cultural, social and architectural factors related to the design and use of houses, and concluded that: “*houses are the material expression of a matrix of cultural and social variables*”

However, while these factors can facilitate and make possible or impossible certain decisions, they cannot decide or impose form. As Rapoport (1969) writes:

“Given a certain climate, the availability of certain materials and the constraints and capabilities of a given level of technology, what finally decides the form of a dwelling and moulds the spaces and the relationships, is the vision that people have of the ideal life”

Indeed, the large variety of forms by itself shows that, it is not just climate, site or materials that decide the shape of our habitat. Social and cultural forces, including religious beliefs, social organization and interaction play an important role in the choice among varied existing possibilities, and affect greatly the shaping of man's built environment. The more severe climatic, economical, material and/or technological constraints become, the less are the non-material aspects open to freedom of choice. In no case, however, are they completely without influence.

In this study, cultural and social variables are used to account the house form and settlement patterns. It seeks to show how strong cultural beliefs, attitudes towards control and other values, in addition to some physical aspects such as climatic conditions, led to the urban characteristic of the low-income settlements.

Low-cost housing:

Low-income housing is aimed at individuals without enough income to provide adequate housing for themselves and their families. These families are usually unable to purchase a home because they fail to qualify for finance.

Dwelling:

Dwelling can be defined as either containing a single household space or several household spaces sharing some facilities.

In this context, “dwelling unit” is used for the traditional house which is occupied by a simple family household or an extended family household.

Traditional House

The main aspects characterize the traditional house (or the modern) are; the type of building materials, building technologies used and the layout and use of spaces.

In this study, traditional house is defined using two variables:

- The physical structure of the house: the house is built by local people, without the interference of a professional architect, using local building materials and techniques.
- Inhabitant's way of life: house layout is affected by the sex, age, position in the family and the interrelation to other extended family members.

3.3 Family**Definition:**

Family is a basic unit of social structure, the exact definition of which can vary greatly from time to time and from culture to culture. As per the English dictionary, family” is defined as; a fundamental social group in society typically consisting of one or two parents and their children. Also, “family” refers to two or more people who share goals and values, have long-term commitments to one another, and reside usually in the same dwelling place.

Family is the most common social institution in the world with some variations in its organization i.e. ties of kinship and marriage. Rosin 1997 remarks that such variations occurs across cultures and strata, within a single society and even in the same family as its life cycle is transformed by marriages, births and deaths. However, any change in the family structure leads to alteration in the spatial pattern of the dwelling particularly when the dwelling is inherited from one to another (*El tayeb 2002*).

Family and type of Marriage:

Marriage is a socially sanctioned union that reproduces the family. In all societies the choice of partners is generally guided by rules of exogamy.

According to type of marriage “family” can be classified into (*El tayeb 2002*) (*Ibid*):

- Polygamous family: the family consists of a husband with two or more co-wives and their children. The dwelling is divided into separate living spaces for each of the wives. The sequence and layout of space in the dwelling depend basically on the ranking of wives and children.
- Polyandrous family: a wife with two or more husbands. There is no separate living area for each husband.
- Monogamous family: a husband and a wife with or without children. The built space has no replication of function. Separate sleeping places are allocated for adolescent of both sexes. In modern societies unmarried children have their own rooms and bathrooms.

In the Sudanese urban context, due to Islamic religious believes the majority of populations are monogamous family with some polygamous family examples. The majority of the polygamous families are living together sharing the same house.

Family and Household:

Schwerdtfeger 1982 has defined “household” as:

“a separate unit of domestic economy consisting of all persons who eat together from the same pot, dwell together in one part of the compound, and who contribute most of the time in kind, labor, service, and/or money to the household budget”

As per the English Business Dictionary “household” is defined as: *“All persons living under one roof or occupying a separate housing unit, having either direct access to the outside*

(or to a public area) or a separate cooking facility. Where the members of a household are related by blood or law, they constitute a family”.

In the Sudanese context, “household” concept is associated to many variables; economy, cooking, eating together, etc. Daifalla 1998 defined “household” as:

“ a unit consisting of a group of related individuals who share living quarters and eat or not eat together”

Households can be classified in different types. Laslet 1974 classified households in three types; simple, extended and multiple families.

- Simple family household: this is related to “nuclear” or “elementary” family. It consists of a married couple or a married couple with their children, or a widowed person with offspring.
- Extended family household: consists of a simple family with the addition of one or more relatives other than offspring like parents of husband, married daughter.
- Multiple family household: comprises all forms of domestic groups which include two or more simple family units connected by kinship or by marriage.

In the Sudanese context, the simple and the extended household are the prevailing forms in both the urban and rural societies.

Family and Family Cycle:

Family structure is changing with time due to many factors occurred in the family cycle; births, deaths, marriages, divorces, etc. any change in the structure of the family and its social organization immediately reflects on the spatial layout of the dwelling. For growing families by new added siblings in the family, dwelling forms is generally changing to accommodate different stage of family cycle by increasing number of rooms or internal divisions, (El tayeb 2002).

Keeble 1996 has classified households according to family cycle into:

- Growing household: a house hold which may expect a child or more based upon the age of the housewife and the duration of the marriage.
- Stationary household: a household which has reached its maximum size and without any possibility for further increase for some time, and includes:

- Married couples without children under twenty, five but with marriage duration of over ten years or with housewives over 45 years or with marriage duration which is of such length that no further children can be expected.
 - Single or widowed person of less than 45 years with children.
 - Single or widowed person of less than 55 years without children under 25 but with other adults.
 - One-person household with single or widowed persons under 55 years.
- Declining household: a household which is likely to decrease in size and includes:
- All households that are estimated to contain sons and daughters over school age.
 - One-person household, which consists of adults over 25 years.

3.4 Socio-Cultural Forces on Vernacular Dwelling

Religion “Islamic” Beliefs:

Religion is an essential element in most cultures, especially the Third World Muslim Countries. On urban settlement level, Islamic culture seems to have stamped cities and towns of the Islamic world with some characteristics which made them unique and virtually distinguished them from other cities and towns, Gabbi 1988.

These urban settlements were mainly characterized by their introversion, their very dense informal cluster arrangement, the tri-fold division of space into private, semi-private, public, and by a clear segregation into male and female spheres. The most common model followed by these cities used the main mosque and the '*souq*' (market) as the focal points of the town. Surrounding this centre were the '*Hai*' or quarters which were autonomous units and contained local mosques and convenience shops.

On the Dwelling level, religion plays a major role in the layout of the dwelling spaces. Also the organization of the Muslim family required that the house should provide maximum levels of privacy. In addition to hospitality, the close relation between the family and the strong relations between families together the family traditional dwelling has to be planned in such a way as to encourage social contacts and to insure privacy.

Privacy:

The term "Privacy" has very broad meanings, which are covered and used by a large number of scientific disciplines. Every human activity requires a certain level of privacy.

The notion of that level of privacy differs from culture to culture, Hall, 1966. Altman provides a broad definition of privacy as:

"... a selective control of access to the self or one's group"

Privacy has been defined on different bases. Some define the desired levels of privacy based on the concepts of withdrawal and control of the flow of information to/from the surrounding environment. Other definitions are based on personal and social spaces.

In the study of privacy and man-environment studies we find that different disciplines have different concerns. The social psychologist is largely concerned with studying the process of withdrawal from interaction or of control of interaction and involvement with others. The environmental psychologist is interested in the relationship between privacy-oriented behavior and the physical environment, for privacy can be controlled by manipulating either the environment or one's position in the environment.

For our planning & design context, questions of privacy are involved in decisions about visual and auditory separation between the different sections and elements within the home, between the home and the street, and between dwelling units.

Privacy and Space:

In their book *Culture and Environment* Altman and Chemers (1980) define privacy as:

"Selective control of access to the self. Selective control means that people (individuals or groups) attempt to regulate their interaction and exchange with others or with aspects of the environment. That is, people try to control their openness or closeness to others, to be sometimes open and available to others and sometimes dosed and unavailable"

AlHemaidi 1996 states that this definition raised an important aspect of privacy that is the boundaries of a person's privacy, both physically and psychologically. These boundaries were not static, neither a complete darkness nor light, rather they were a kind of mixture of darkness and light, openness and closeness.

Altman and Chemers added that this definition departed from some traditional ways of thinking by emphasizing that privacy meant changing boundary control, not merely "keeping out" others or shutting off stimulation. Privacy was a dynamic process whereby people vary in the degree to which they are accessible to others. Altman and Chemers' use of the term, therefore, covers the whole range from extreme openness to extreme closeness in space. The degree of this openness and closeness was, however, dependent on the variables that control privacy, such as age, sex, place, activity, culture, etc.

Privacy and Dwellings:

One more definition of privacy was presented by Rapoport (1977), where he explained that if privacy was defined very broadly as "the control of unwanted interaction", then:

"unwanted" "interaction" and "control" are all variable and matters of definitions, so that there are differences in the tolerance and, indeed, preference of various interaction levels. With whom one interacts, when and under what conditions; what constitutes withdrawal, where both interaction and withdrawal occur all vary. The nature, placement and permeability of barriers also vary accordingly, as does the cycle of withdrawal and interaction which form a system; neither is comprehensible by itself."

In Rapoport's view, unwanted interaction could be controlled through "rules" (manners, avoidance, hierarchies, etc.), "psychological means" (internal withdrawal, dreaming, drugs, depersonalization etc.), "behavioral cues", structuring activities in "time" (so that particular individuals and groups do not meet), "spatial separation", and "physical devices" (walls, courts, doors, curtains, locks- architectural mechanisms which selectively control to different information). In most cases, of course, multiple mechanisms are used but particular ones are stressed and they are combined in different ways.

This definition was particularly applicable to the socio-cultural principles and values of the Islamic and the contemporary Sudanese cultures. Within the context of this study, the only possible shortcoming of Rapoport's definition of privacy lies in the differing degrees of privacy, with each degree being allocated its own degrees of importance. In Arab-Islamic culture, the degree of privacy differed according to the relationship between the observer and the person that was being observed.

Privacy and Islam:

As Al-Kodmany 2000 states, "*Islam gave a particular preference to residential privacy as essential to a refined life of goodness and purity*". To some extent, it was recognised as a key factor in the organisation of space, and especially "the delineation between public and private spheres" across the city's quarters and even in the arrangement of space within the dwellings and its relationship with the space outside, (Abu-Lughod 1983; Madanipour 1998; Memarian and Brown 2003; Stewart 2001).

From the above points, privacy can be recognised as a fundamental formula controlling the physical organisation of the Islamic city and the layout of traditional dwellings.

Islam, as both religion and social system, has an enormous impact on the social and physical characteristics of house and city forms in the Muslim world. Large number of writers highlights this point, and discussed how Islam has affected and how privacy is defined and perceived by its followers, both in traditional and contemporary societies.

Another writer, Vaziritabar (1990), discussed the influence of Islam on the architecture and planning of Middle Eastern cities. In his study of franian housing, he identified Islam as a major contributing element to patterns of privacy and concealment which affected the form of the house and settlement in the region.

According to Bahammam, Islamic values defined three different spheres, where individual protection from visual and acoustic invasions of privacy is required. They were:

- Privacy of the house, between neighbours' dwellings as well as between the individual dwelling and the street.
- Privacy between sexes; and
- Privacy between individual family members of a dwelling

Therefore, the concluding point coming out of these definitions and their analysis is that privacy can be defined for the context of this study as *"the protection (controlling mechanism) of the dwelling and its residents (individual or group) from being violated by other's undesired visual observation (interaction)"*.

In this definition, all the possible variables are being covered. These are the space, the individual or group that is observing or being observed, the relationship between the observed and observer, the behaviour that is being observed, the time or occasion, and the agreement on the rules governing privacy.

3.5 Provisional Findings

Human relationships are often influenced and organized by the socio-cultural factors, which also influences the physical structures of life, especially architecture, including the design and spatial layout of houses. Several studies have demonstrated how cultural and religious beliefs influence the layout of micro spaces like houses.

The relationship between architecture and culture is one that has been studied in Sudan in for many years. But what's happening now is much more unfortunate. The contemporary

housing architecture focusing just on technology and formalistic points of views and produces unfamiliar buildings that are known as “modern” architecture. But, but it is important to know that these buildings can damage the cultural identification of the society and cannot establish a proper base for forming the architecture related to social and cultural values of each society based on these values.

This study investigates the relationship between social, cultural, and religious traditions and the architecture of vernacular housing in Sudan.

Chapter Four:

Khartoum-Omdurman Traditional House: The Current Situation



"Omdurman, the selected site, is one of the oldest traditional towns in Sudan. Photo: Courtyard at Khalifa House Museum, Omdurman, Sudan.

Source: National Corporation for Antiquities and Museums

The objective of this chapter is to provide a general view of the current situation of the evolving of traditional house in Sudan.

4.1 Sudan: Country Profile

The Physical Setting:

Sudan is an African-Arab country with unique geographical, cultural and economic characteristics. It is the third largest country in Africa with a total area of 1,882,000km² and 42.8 million inhabitants. The country is bounded on the north by Egypt, on the east by the Red Sea, Eritrea, and Ethiopia, on the south by South Sudan, on the west by the Central African Republic and Chad, and on the northwest by Libya.

The River Nile traverses the country from south to north providing a crucial water source, while the Red Sea washes close to 900km of the eastern coast, making Sudan a sea bridge between Africa and the Middle East.



Fig. 4.1: Map of Sudan

The national capital of the Sudan, embraces the three cities of Khartoum, Khartoum North “Bahri”, and Omdurman. The Three Towns Capital, as usually referred to by the locals, located at the confluence of the White Nile and Blue Nile. Sudan is both an African and Arab country, with Arabic being the most widely spoken language. Over 97% of the population are Sunni Muslims with a small Christian minority.

Sudan is mainly composed of vast plains and plateaus that are drained by the Nile River and its tributaries. This river system runs from south to the East-Central part of the country. The immense plain of which Sudan is composed is bounded on the west by the Nile-Congo watershed and the highlands of Darfur and on the east by the Ethiopian Plateau and the Red Sea Hills. This plain can be divided into a northern area of rock desert that is part of the Sahara; the western Qawz, an area of undulating sand dunes that merges northward into the rock desert; and central-southern clay plain.

In North-Eastern Sudan the Red Sea Hills region is an uplifted escarpment. The scarp slope facing the Red Sea forms rugged hills that are deeply incised by streams. The escarpment overlooks a narrow coastal plain that is 10 to 25 miles (16 to 40 km) wide and festooned with dunes and coral reefs. Farther south the eastern uplands constitute the foothills of the Ethiopian highland massif.



Fig: 4.2: Satellite Image of Sudan,

Drainage and soils:

The Nile River system is the dominant physical feature, and all streams and rivers of Sudan drain either into or toward the Nile. It enters the country as the White Nile in the southeast, about 60 miles (100 km) south of Kusti, and maintains an extremely low gradient until it is joined by the Blue Nile at Khartoum.

The Blue Nile, which rises in the Ethiopian Plateau, contributes much of the floodwaters of the White Nile. After the confluence of the White and Blue Niles at Khartoum, the river flows in a great northward-curving course and is known simply as the River Nile. Throughout much of the country, however, drainage does not reach the Nile; the rivers of the southwest infrequently reach the Baḥr Al-Ghazāl system, and to the north most hill groups initiate seasonal watercourses that are lost in the surrounding plains.

Climate:

Sudan has a composite climate between hot, cool and rainy seasons. The principal climatic elements which affect the building design and comfort are solar radiation, temperature, humidity, wind speed and direction and precipitation

Sudan is classified into three climatic zones (Zone I: warm desert climate, Zone II: warm semi-arid climate and Zone III: tropical savanna climate). In the Northern Part (zone I) warm desert climate zone summer temperatures exceed 43.3 degrees Celsius in the desert zones and rainfall is negligible except in the center, such as the capital Khartoum

and Gezira region where rainfall is common between June and September. Dongola, Port Sudan, Kassala, and Khartoum are examples of some cities in this zone.

The maximum mean temperature registered the highest values in Dongola and Khartoum cities, while the highest values of humidity are in Port Sudan city because of its coastal location close to the Red Sea. In the capital Khartoum, the average annual temperature is about 26.7 °C;

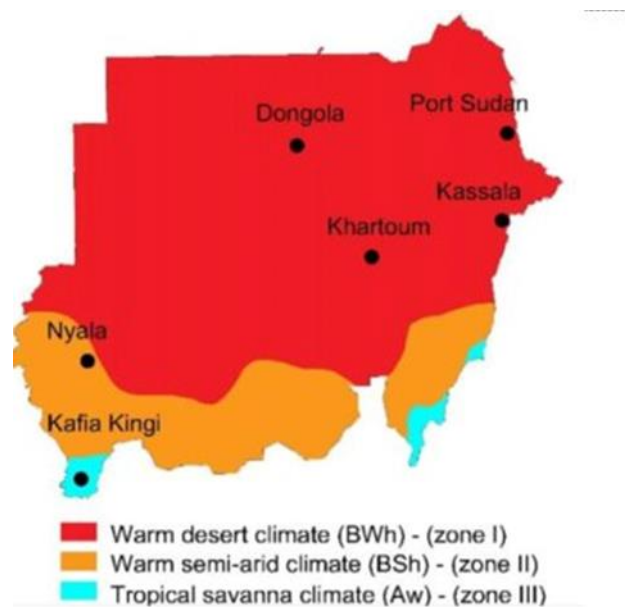


Fig: 4.3: Climatic Zones of Sudan,

Sudan enjoys abundant rainfall in the South but the exported rain declines gradually as you go north, where there is almost no rainfall. The northern part of Sudan is an arid desert land except the Nile course where human settlements and agricultural activities are found. The central part is a savannah zone with low-density vegetation.

Population:

Sudan's population is over 43 million people. The majority of the population is Muslim, and the minority is Christian.' Arabic is the official language of the country. The urban population is estimated at about one-third (34.6%) of the total, which indicates that Sudan is still predominantly rural. Sudan's population pyramid is young and growing, so it belongs to the expansive type. In the population distribution, around 41% of the population is under 15 years, 56% is between 15 to 64 years and 3% of the population is more than 65 years old.

The population of Sudan is a mixture of various ethnicities and tribal origins; the Arabs occupy the central and part of the western Sudan, the Nubian tribes in the north, the Bija in the east while the south is occupied by the Nilotic and Africans. The official language is Arabic but most non-arab tribes have their local languages.

4.2 Greater Khartoum: Khartoum, Khartoum North, Omdurman

Sudan's capital, Khartoum (or Greater Khartoum), is called “The Three Towns”, because it consists of three towns in a triangle intersected by the White Nile, the Blue Nile and the River Nile. It is located roughly in the centre of the country, at the junction of the Blue Nile and White Nile rivers. It is part of the largest urban area in Sudan and is a centre of commerce as well as of government. The capital city, Greater Khartoum lies at the confluence of the Blue Nile and the White Nile (forming the River Nile) and is the capital of Sudan. It is known as the ‘tripolitan capital’ as it is formed of three towns – Khartoum, between the two tributaries; Omdurman to the west of the Nile; and Khartoum North, between the River Nile and the Blue Nile

The cities of Khartoum, Khartoum North and Omdurman are situated around the confluence of the Blue and White Niles at latitude 15 36° N. and longitude 32 31° E. on mostly flat terrain with an altitude of 380 metres above sea level. Khartoum is situated between the Blue and White Niles, Khartoum North on the eastern bank of the River and Blue Nile while Omdurman is situated on the western bank of the River Nile. And the White Nile



Fig: 4.5: Greater Khartoum (Khartoum, Khartoum North & Omdurman)

Each of these three towns displays its own character. Khartoum town, is the modern commercial and administrative centre. On the contrary, Omdurman, the largest of the three towns has a traditional theme and known as the “People’s Capital”. Khartoum North remains the industrial town and the smallest of the three.

Khartoum and Omdurman shared the political and cultural dominance since the nineteenth century. During the rule to Sudan between 1821-1885 Khartoum was the capital until Al-Khalifa Mohammed Ahmed Al-Mahdi and his followers, who flocked from different parts of Sudan to join him conquered Khartoum, ended the Turko-Egyptian rule and settled in Omdurman as their centre of rule and his new established Islamic state. During this era, Omdurman has given a spiritual status and destined to be an Islamic town.

The political and commercial importance of Omdurman was unchallenged until 1898 when the seat of power moved to Khartoum after the Anglo-Egyptian invasion referred to as the “Condominium Period”, was significant in the history of the settlement, particularly that of Khartoum.

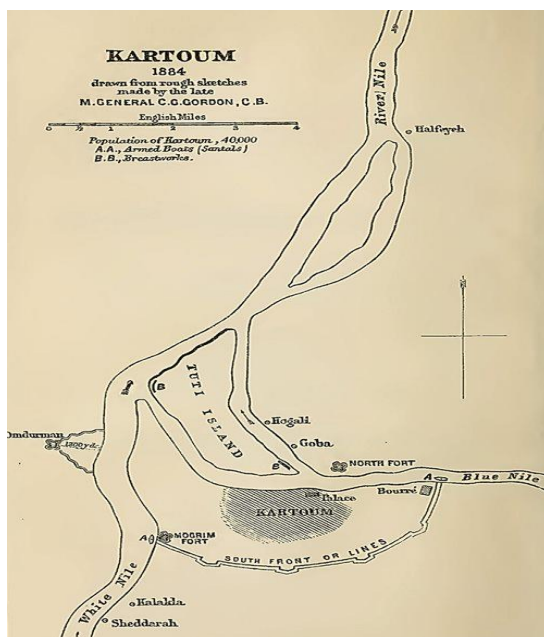


Fig: 4.6: Khartoum during British General Charles Gordon, Gordon lost his life in Omdurman in 1885 in a battle against Sudanese fighters, drew this map showing Khartoum and Omdurman with their defences in 1884, Source: Khartoum Atlas

However, by 1898 Khartoum town was rebuilt to be the new capital. The British governor made a plan on a system of diagonal streets, a system of union-jacks, believed to be for military purposes. The pattern can be traced even in the city of today. By 1904 Khartoum

began to assume its form and character, providing for administrative, commercial, and cultural functions. This era ended in 1956 with the attainment of Independence.

The Condominium rule gave Khartoum the priority in development and accordingly it emerged as the most important administrative, commercial, and educational centre in the country After Independence, as during the colonial rule, the concentration of commercial and industrial development has generated a continual flow of people into Khartoum Town. This leads to a considerable growth of the population and expansion in the residential complex.

Khartoum and Khartoum North are predominantly gridiron settlements while Omdurman developed in a random physical pattern in its early stages (which we can name as “the old Omdurman” , but the subsequent new extensions of the town followed the regular grid pattern as the other two towns.



Photo 4.1: Khartoum, Khartoum-North & Omdurman:

Khartoum is different in another way, too, because the meeting of two rivers spawned three cities, each on its own bank. To the southeast lies Khartoum proper; to the west Omdurman; and to the northeast Khartoum Bahri (“Khartoum Seaward”). Each has a distinct outward face, origin story and role in the history of the peoples of Sudan, as well as symbolic landmarks to tell its own tale.

4.3 Omdurman: The National Capital

The historical development has affected very much the location, form, and land use of the Three Towns, especially Khartoum and Omdurman. Khartoum had been chosen and developed by the colonisers as a strategic and defensive city guarded by the two Niles. On the other hand, Omdurman, with its collage tribal structure, was established by the Mahadists to the west of the Niles with its strategic and psychological attachment to where most of the supporters came.

The Mahadists period, has left many lasting impressions on Omdurman town which are of mostly traditional nature, among which are the existing main roads and squares. Other distinctly Islamic landmarks in the town including the zoning of the town along Islamic precepts are visible in the design, location and functions of the main marketplace, the mosques, the defensive walls and the fortresses. Part of these fortresses and their defensive walls still exist.

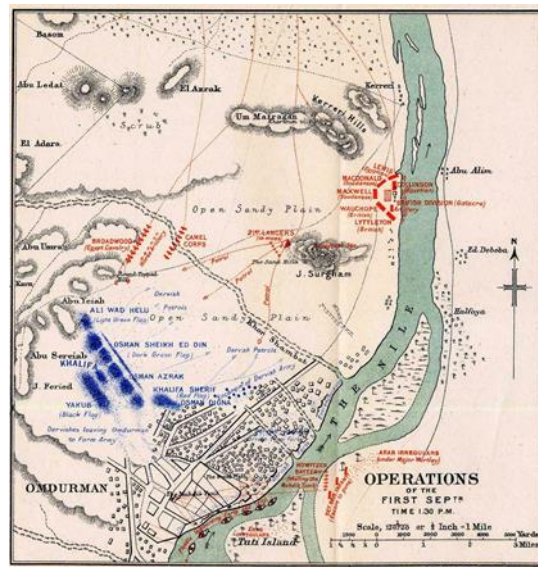


Fig: 4.7: Omdurman Map during the Mahdiya Period (Old Omdurman)

The traditional and ethnic based settlements are still one of the main features of Omdurman. These traditional settlements occupied by Arab Muslims as well as non-Muslims, were tied together by the wisdoms of Islam, which explicitly calls for community interaction and involvement, and that many of the present residents trace their descent and holdings to the Mahdist period. Consequently, Omdurman is famous with the stability of the social life of its inhabitants more than Khartoum, despite their varied ethnic and immigrant compositions. The tranquillity of this town played a major role in its unchanging character, as the physical movements of the inhabitants is minimal, and many families have lived in the same areas since the Mahdiya times.

Therefore, it can be concluded that despite the diversity of ethnic groups in Omdurman, still it can be described as a town with a remarkable stable social life. Thus most of the old neighbourhoods still retain most of their traditional features since the Mahadists times.



Fig. 4.8: Organic Pattern of Omdurman

4.4 Greater Khartoum: Housing Classifications

A house in the Sudanese context is a place for both the nuclear family and the extended family. It is a place for receiving guests visiting for short times or staying for long periods. Housing as per the “Khartoum Province 1992” document is defined at three levels:

At the First level, it is the dwelling which is occupied by a nuclear family or an extended family household. The dwelling is a secured place where this group of people practice a vital part of their daily activities e.g. relaxing, eating, bringing up their children etc.

At the Second level, it is the group of the neighbouring families which have some common aspects such as social, intellectual, cultural and economic. These similarities make the lives of the neighbouring families similar to that of the extended families which was the prevailing way of living in Sudan.

At the Third level, it is the village or city. As the household members and other members of the community have the same customs, traditions, and ways of life, and they also share the public services and facilities, the relation between the inhabitants is very strong.

Housing Tenure and Residential Building Materials:

Generally, housing in Sudan can be classified into four types according to tenure status; owned, rented, provided as part of work and free dwelling as part of the government housing schemes. Most of the houses are owned, while the least are the ones provided as

part of work and the ones given free by the government indicating that the government doesn't play a significant role in supporting affordable housing schemes.

The building materials used for houses in Sudan could generally be classified into two major categories according to the occupants income level; the higher income category usually uses modern materials like concrete, cement blocks with cement mortar while for the mid and lower income category dwellings are mainly using the traditional materials eg. red bricks combined with mud bricks for wall construction, mud construction for walls and roofing made from sticks, thatch and mud.

Most of the houses are at the medium and lower levels, "the third class housing". The top materials that have been used in houses in the old traditional neighborhoods of the Madists are mud and red "burned" bricks and wood. Concrete and cement blocks registered the lowest percentage in those traditional areas. The morphology of human settlements as well as the house forms of Sudan has been shaped by different historical, ethnic, geographical and socio-cultural variations of the country. Therefore, the houses architecture in Sudan has taken different shapes mainly fall under two major categories; the traditional and the modern houses.

The physical deterministic view, also, argues that building 'building materials' and "method of construction" determine the character of house whether "traditional" or "modern" house, especially in societies of limited 'technology'.

The Traditional House:

In general, it can be said that; this is the most prevailing category of the Sudanese houses forms as it includes houses or parts of houses built or rebuilt using traditional materials and with or without recent alterations or modifications. The top materials that have been used in houses of this category are mud and adobe for wall, straw and palm leaves for roof construction. In some occasions, the houses were built using more advanced building techniques or upgrading of the building materials for certain building components, but still maintaining the traditional character in their layout. Those cases still considered as traditional houses.

Usually these types of houses are found in the rural or third class areas which are mostly occupied by low-income residents. The land ownership is mostly freehold and the plots are usually large in area (varies between 500sqm to 2000sqm.) Traditionally, people used

to live in a household type composed of by multiple extended families occupying the same house or different parts of it, therefore the plots are usually of large areas.



Photo 4.2: Traditional House in Omdurman, *Traditional houses are famous with their high boundary wall and gate.*

Mostly, the traditional houses are characterized by a high (2,5m to 3,0m) boundary wall for both maintaining privacy and security purposes. They usually divided into two domains, one for males with main entrance to the street and the other females domain which located at the back of the house and in some cases has small secondary access to outside the house for limited uses of the family.

In most traditional houses the kitchen is located in one of the comers of the back yard in order to minimize fire risk and the disturbances of the smoke generated by the cooking with wood or charcoal, which was the common cooking methods followed. There are mainly two bathrooms and two toilets repeatedly located at the male and female sections, a set for each. They can all located at the separating line between the two domains but with opposite opening directions.

The traditional houses are inhabited mainly by multiple extended families. Families in such traditional house usually share facilities like male guest room (Diwan), kitchen, conveniences and sometimes meals. This pattern of living is encouraged by the strong family ties and shared loyalties between relatives. In general, this traditional category is generally characterized with a very high boundary wall to ensure privacy for the inhabitants. Also, the kitchen is usually located in one comer of the back yard so as to minimize fire risk might occur due to the use of wood and charcoal for cooking. There is a toilet located in the front courtyard and is usually divided into two parts with exits facing opposite directions.



Photo 4.3: Courtyard in a traditional house in Khartoum, The house is provided with a semi-closed veranda for sitting and sleeping outside.

Source: gg297, U.of Kent

The Modern House:

The second category embraces entire houses or parts of houses, which have been built or rebuilt using more durable building materials such as reinforced concrete, and concrete blocks which is mainly common in the first and second classes residential areas. This type of housing has emerged mainly during the 1970s to the 1980s with the trend shifted towards exposed structure and use of reinforced concrete. It was a shift in the housing patterns in Greater Khartoum that was brought about by the increasing numbers of Sudanese living abroad, specifically in the Gulf region. Having experienced higher living standards, the style of this era reflected the lavish lifestyle of the new upper-middle class. However, this transformation in the housing style resulted in a decline of the Khartoum housing traditional identity, but, fortunately, it is rather limited. Nevertheless, it can be concluded that the desire to live as extended families still exist in such areas, no matter what construction materials are used for the house.



Photo 4.3: Modern Villa in Khartoum,

Source: gg297, U.of Kent

4.5 Selection of Field Study Area: Abu-Rouf Neighbourhood

In accordance to the aims and objectives of this study, a preliminary fieldwork was conducted to identify the basis of selection of the area to be chosen for the case studies area. The investigations relied on site survey (including maps and personal interviews), conducted in most of the traditional quarters with especial emphasis on the areas occupied by the Mahdi. After visiting multiple houses, meeting with the inhabitants and personal observations of the houses, Abu-Rouf Neighbourhoods has been selected for the case studies area.

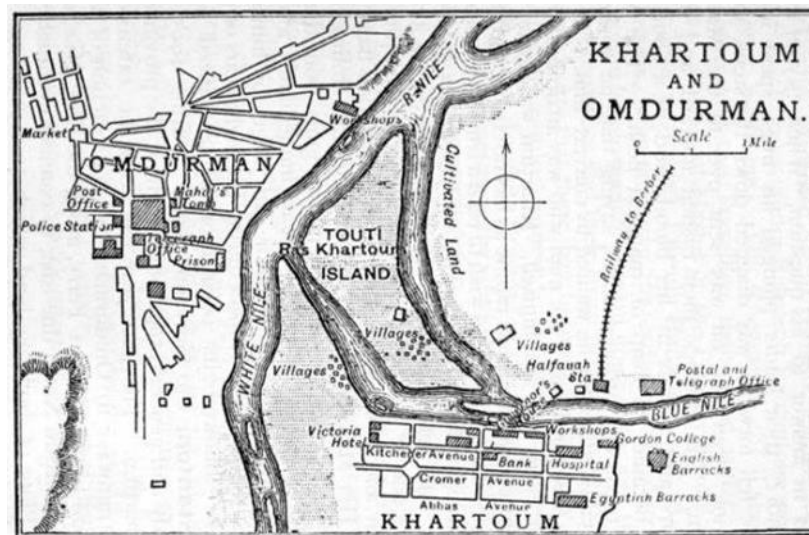


Fig. 4.9: Old Map of Omdurman-Aburouf, *Aburouf was the earliest neighbourhood in Omdurman*

Location:

The neighbourhood is facing the River Nile from the eastern side. The Nile Road, separated from the newly constructed Cornish Road, links the area with all parts of Khartoum State. The agricultural area, east of the Nile road, used to supply the old neighbourhoods with most of the inhabitant's daily needs. The neighbourhood is surrounded by other old neighbourhoods of the Mahdia; Beit Almal on the southern side, Hai Aldebaga, on the northern side. Elhigra Road, west of Aburouf represents the main transportation route that links Aburouf to other parts of Omdurman Town and separates Aburouf from the neighbourhood of Wad Nubawi, *Awad 2015*.

Historical Background:

After the fall of Khartoum in Mahdi's hand in 1885-Abu Salim(1979) reported that El Mahdi and his followers crossed the Nile seeking a simple, religious and humble life rejecting all influences of the Turko-Egyptian rule in Khartoum. A site called Al Bugaa north of the original camp of El Mahdi's troops was selected as the new capital, and was called Al Bugaa. The population of Omdurman increased considerably during the Khalifa reign. Rosingnoei, (1967) stated that the urban planning patterns evolved during that period were guided by teachings of Islam and were the result of the interaction between the socio-cultural and physical factors. The outcome was the indigenous organic planning pattern, compact building structures with low profile of mud houses, interrupted by mosques, and narrow meandering roads and alleys.

Aburouf is one of the eldest traditional neighbourhoods of Omdurman Town. It was evolved during the Mahdia period where majority of the houses were built several decades back, during the era of the Mahdist movement, but are still well preserved. Moreover, Abu-Rouf continues to be spiritually relevant today, as the ancestral home of Al Mahdi, and the home of his descendants and close relatives.

Like all other towns evolved during the Mahdia era, Aburouf planning patterns was fully obeying the prevailing religious and socio-cultural forces at that time, resulting in organic morphological settlement layout pattern and traditional buildings characters. This traditionally oriented patterns made Aburouf a good choice for the field study area for this research in accordance to its aims and objectives, *Awad 2015*.

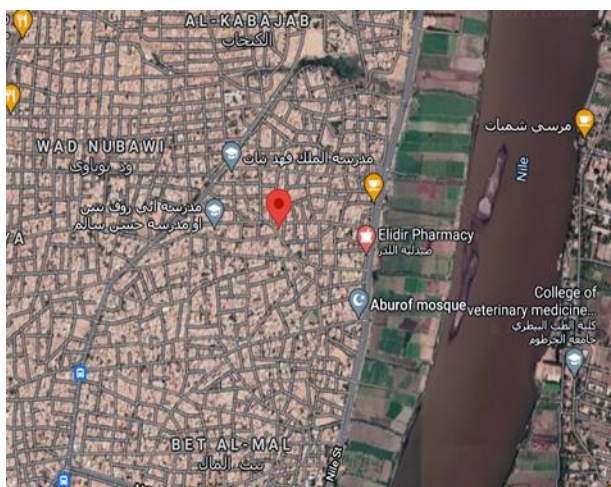


Fig. 4.10: Aerial View of Aburouf
The neighborhood enjoys an outstanding location facing the Nile with an organic planning pattern and a homogeneous society.

4.6 Provisional Findings

Throughout its history, traditional architecture has developed through a hierarchical process. This process suggests the idea that a continuum of basic design principles has existed, and has been transformed over time. Each generation learns from the preceding ones, taking some of its values and formal solutions and passing them on to the future. Thus, an evolutionary traditional pattern developed over many centuries which had its roots in the Greater Khartoum.

At present housing, especially within the old neighbourhoods of Omdurman which were under the Mahdists control, there is evidence that the evolutionary perspectives are valid and the classical basic design concepts are still at work in harmony with the inhabitant's basic needs of the present.

Chapter Five:

Implementation of the Field Study: Abu-Rouf Neighborhood



A house, being the most essential built structure to man, is a composition of different factors and variables, materials, styles, aesthetics and spatial arrangements.

Aburouf, the selected area for the field study is one of the oldest neighborhoods in Omdurman Town. It was evolved during the Mahdia, the neighborhood. The field study aims at observing the current domestic building, domestic life and the life style of the inhabitants. This chapter aims to present the background of the location and the site of the field study. The chapter also presents the methodology and procedures of the the field study and reveals the general findings of the survey.

5.1 Aburouf Neighbourhood

After the fall of Khartoum in Mahdi's hand in 1885-Abu Salim(1979) reported that El Mahdi and his followers crossed the Nile seeking a simple, religious and humble life rejecting all influences of the Turko-Egyptian rule in Khartoum. A site for the new capital was selected, north of the original camp of El Mahdi's troops at Abu Said, and was called Al Bugaa. The population of Omdurman increased considerably during the Khalifa reign.

Aburouf continued to expand in traditional organic settlement layout and housing forms unlike the new expansions of Omdurman town which are mostly laid out in a grid iron pattern.

Aburouf is facing the River Nile from the eastern side having gentle slope towards the Nile, in an approximate area of 1,000,000 sqm. The neighborhood is famous with much traditional manufacture of timber and timber products like fishing boats and home furniture. The Nile Road, separated from the newly constructed Cornish Road, links the area with all parts of Khartoum State, *Awad 2015*.



Fig. 5.1: Aburouf Neighbourhood in Omdurman
The neighbourhood is located in a west bank of the River Nile

The neighborhood is surrounded by other old neighborhoods. Aldebaga neighborhood, on the northern side is famous for the manufacture of commodities made from animals' skin such as shoes and bags, Beit-Almal on the southern side and Elhigra neighborhood at the west of Aburouf.

The neighborhood is mostly occupied by the low income families but recently there is a considerable portion of inhabitants of middle income occupying the area facing the Nile road this clear on the dominance of multi floors houses there. Most houses of the old neighborhood are built of basic traditional materials except those few fall in the zone facing the Nile Road built with modern or semi modern materials, *Awad 2015*.

The settlement pattern is an organic fabric with a compact building structure. The built area represents almost three quarters of the total area of the neighbourhood while the

remaining quarter is shared between the roads and open spaces. The settlement is famous with its high population density resulting in compacted house densities.

The neighborhood has big variation in its plot sizes. Large plots named as “*hoshe*” with areas varies between 1000 to 4000sqm mainly accommodating many extended families within the same plot. Smaller plots are mainly for independent families vary between 300 to 100sqm. This big variation in the plot sizes is mainly attributed to the fact that most plots were inhabited by extended families and with time they are divided into smaller portions to the family members according to their legal rights. In some cases, families tend to rent portion of their houses in order to raise their income. This portion is mostly separated by internal fence wall. Large plot sizes have numbers of courtyards inside so that social gatherings and ceremonies take place within the house premises, *Awad 2015*.

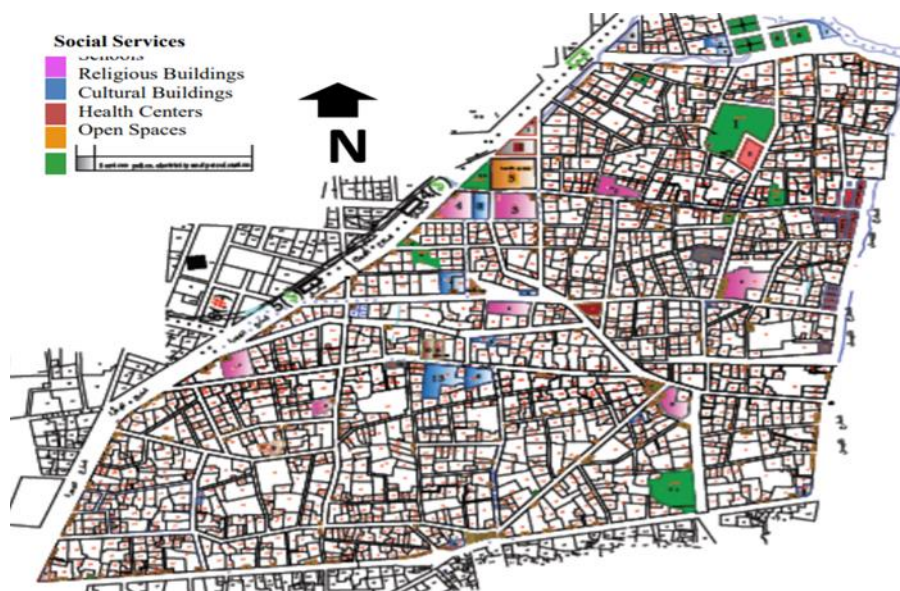


Fig. 5.2 : Urban Morphology of Aburouf
The urban pattern of the neighbourhood clearly shows organic tissue with considerable varieties in the plot sizes.

Aburouf has been selected as the location for a detailed study. The survey covered 50 households from different parts in the neighborhood. The approach of the field survey tried to introducing the complex, and interesting, interaction between home and users.

5.2 The Selection of Cases

The main intention for the field study is to collect qualitative information about building design and the socio-cultural lifestyle and the interaction between these factors. The fieldwork surveyed 50 households, to reveal basic information about building (materials and design) and user's categories (lifestyle), as well as investigating the relationship between residents and their residences and locality. The majority of the selected cases, selected from different areas within Aburouf neighborhood, are traditional houses while the modern cases are the minority.

In accordance to the spatial independence, the residences in Aburouf can be categorized into three main categories: the nuclear family residence, the extended family residence which consists of a number of dependent sections, and, semi-independent family residence who are living in semi-independent sections within the same *Hosh*.

Selected Cases and Building Materials:

Applying the argument that building 'building materials' and "method of construction" determine the character of house, most of the selected cases can be defined as traditional houses. Generally, most of the houses in the selected area were built as traditional houses built by trained skilled builders "*banna*" and supervised by a traditional contractor "*mogawil*" using traditional materials.

The materials used for the buildings were either Coh "*jalous*", Adohe (sun-dried mud bricks) or burned mud brick for the walls. The sand and gum mix is used for the internal wall rendering, while for the external rendering, many of the inhabitants have used a more advanced technique instead of the traditional materials that by using a thin layer of sand-cement mix. This technique endures the ravages of the elements better, thus reducing the need for frequent re-rendering for maintenance purposes. It is also more aesthetically appealing than the traditional material look.

For the roofing system, a traditional "*balad*" roof is used in most of the cases studied, using timber boarding. In some cases, it is found that the wooden system was replaced with steel I-section laid in 1-meter spacing and filled with burned brick laid in arch form and rendered internally with thin cement-sand layer in a system named as "*ageid*". For the roof thermal insulation and water proofing, they used a mixture of silt, cement and lime as a 5-7cm layer.

5.3 Set up of the Field Study

Preliminary discussions and investigations had been made with a group of academics from the Faculties of Engineering and Architecture at the University of Khartoum revolving the thesis aims and objectives. Those discussions had great role to define the geographical limits of the field study and the selection of Aburouf as the neighborhood to be studied.

The area of the studied traditional houses lies in the eastern side of old Omdurman. Intensive urbanization in this area began in the 1880's when Omdurman was made the capital of Mahdiya times. The development in the neighborhood progressed in a traditional manner with no definite plans and minimal restrictions on land acquisition. Plots areas ranged from 500-2000 sq. m, with single storey houses built using traditional materials. The inhabitants in each house were composed of one extended family. The households of this neighborhood mostly maintained their traditional ways of living and the house still maintained their traditional characters to big extent.

5.4 Aims and Methodology of the Field Study

The aim of the field research is to observe, interact and understand people while they are in their natural environment and to investigate the organization and use of domestic spaces in an old traditional Sudanese quarter and to explore the inhabitants' domestic life and their life style in order to understand the interaction with the their built environment.

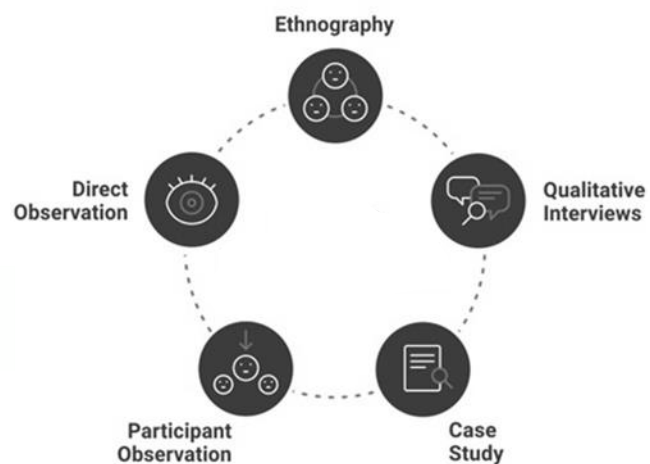


Fig 5.1: Methodology of the Field Study
Source: adapted from *Question Pro*

The field study will attempt to understand, from the inhabitants themselves, the relationship between them and their dwellings, and to identify their perception of the present problems they are facing and future expectations in this regard. The field work at the selected Abu-Rouf neighborhood is following a simple direct method including gathering of architectural and ethnographical data.

The adopted methodology for the field research of Abu-Rouf Neighborhood is typically conducted in 3 distinctive methods. They are

- **Observations:** In this method, the data is collected via field survey and observational method in a natural environment using aerial photographs, maps, site visits.
- **Qualitative Interviews:** The qualitative interviews include Interviews with the inhabitants of the selected houses, complemented by questionnaires. Furthermore, each person interviewed was asked to help in filling a Time-Space table of a one-day diary (i.e. how did he/she spend the previous day, when, where and with whom). A Time-space table was also filled in for the weekend and the "usual" pattern of his/her average week.
- **Surveying:** This method includes the measuring, preparation of drawing of plans for the selected houses and taking photos.

The field study conducted purely by using observational methods and in-depth interviews covering the whole of Aburouf in order to select visually different areas that satisfied the basic requirements for the field survey area selection.

5.5 Data collection

The field survey covered 50 houses, aimed to collect data which can be divided into four categories:

- **Drawings:** As there are no ready drawn plans of the houses, measurements of the plots and all the constructions within each plot were taken. The plans of the traditional dwelling units were sketched by the interview team. All pieces of furniture were noted and marked on the sketched plans. Architectural drawings have been made for all the houses surveyed. The buildings are of different sizes and are rather irregular in shapes. The drawing plans also included the arrangement of furniture in the various parts of the house.

- **Photographs:** Photos are taken during the daytime for the interior and exterior of the house. The photos are taken during the daytime, using the human scale as possible.
- **Questionnaires:** The interview form was in Arabic language as most of the households didn't know English language. The interview team was formulated with a team of Graduate students from the University of Khartoum who are living in or in the same vicinity of the neighbourhood and have either relative or friendship relationship with the respondents. This team set up break the barriers with the households and built trust channel. The interviews were conducted mainly during the evenings, so as to ensure that most of the family members were at home. The questionnaire had been completed in the form of personal interviews.

5.6 Definition of Terms

Below are the definitions of the terms as they are used in this study:

- **Plot:** a piece of residential land, which has legal, judicial demarcations and is identified with a number. There is no fixed standard size or specific shape to all the plots in the old traditional neighborhoods.
- **Traditional House:** a house unit which is not designed by architect and mainly built using traditional building materials.
- **Modern House:** a house unit which is designed by architect and mainly built using modern building materials.
- **Household:** as per the New Method English Dictionary, household refers to all those living in one house. In the 1983 census of Sudan, the definition of household was that: household is a unit consisting of a group of related or unrelated individuals who normally share living quarter and eat together.
- **Hoshe:** It is the Sudanese way of describing a complex residential structure that consists of many sections (within one or more plots), in which its residents are drawn from different branches of one original extended family.
- **hosh:** this term (with small h and without e ending) means courtyard within the living spatial structure, while Hoshe (with capital H) is the extended family residence.
- **baladi :** traditional

- **Jaloos:** Brick made of mud mixed with thatch compressed and dried with the sun.
- **Diwan:** a room which is mainly used by the male and the male guests.
- **Raccoba/Veranda:** semi shed area linking the closed spaces with the open yards, mainly used for sitting and sleeping when the weather is acceptable. It can also be used as kitchen.
- **Dukan:** small shop or canteen for selling groceries with small area of approximate 25 Sqm.
- **Bab-elrugal:** main entrance for the house plot for the use of males and male guests.
- **Agied:** Jack arch roof is composed of arches of either brick or lime concrete, supported on lower flange of R.S.J.s. The joists are spaced 1.0 to 1.5 m centre to centre, and are supported at their ends either on walls or on longitudinal girders. The rise of the arch is kept 1/12th of the span.

5.7 Provisional Findings

In terms of the used building materials, the selected cases have been classified as traditional and semi-modern. The first classification uses the basic traditional building materials while the latest classification which has cases built during the 1990s or after the 2000s using semi-modern materials; eg concrete and cement blocks.

Allowing for the family structure, the cases have been categorized as nuclear, semi-independent or extended family residences. The selection of cases covered each group of the three family structures for the syntactic analytical study.

Chapter Six:

Presentation of the Selected Case Studies



People with very different attitudes and ideals respond to varied physical environments. These responses vary from place to place because of changes and differences in the interplay of social, cultural, ritual, economic, and physical factors. Amos Rapoport

The objective of this chapter is to present the selected cases and display the interesting findings. The study selected 16 cases with rich information to illustrate the characteristics of the traditional house in Aburouf. The cases will be

The field study will be based on an ethnographical study consists of observations, informal interviews, constructed questionnaire, daily notes by the inhabitants about space-time occupation as well as an architectural study for the houses spatial layout.

The ethnographical data for presented cases will be submitted to the syntactic analysis within the following chapter.

6.1 The Selection of Cases

The primary goal of the field study is to gather qualitative information on building design and materials, as well as socio-cultural lifestyle and their interactions. The fieldwork covered 50 houses in order to learn about the building materials, layout design and user's lifestyle and the relationship between inhabitants and their homes and neighborhoods.

Traditional houses make up the majority of the selected cases, which were chosen from various places within the Abu-Rouf neighborhood, while modern dwellings make up the minority.

However, relying on the layout of the spaces in the case studies, it was established that the extended family structure has two sorts of domains. The family structure in the Abu-Rouf can be classified into three main categories based on their spatial independence: nuclear family residence, extended family residence; which consists of a number of dependent domains, and semi-independent family residence; which consists of semi-independent domains within the same House.

6.2 Presentation of the Cases

The presentation of the cases chosen to be further analysed, highlights data covers the location, type of house, plot area, spatial design/layout, construction materials, family type and general description of resident. Additionally, the presentation of each case includes graphical plans showing the basic topographical information for the case, the layout of rooms and their titling, the identification of the spaces in relation to the nature of their users (e.g. males, females, guest). One of the graphical representations depicts essential inherited Sudanese social codes and its resemblance in the spatial layout of the house.

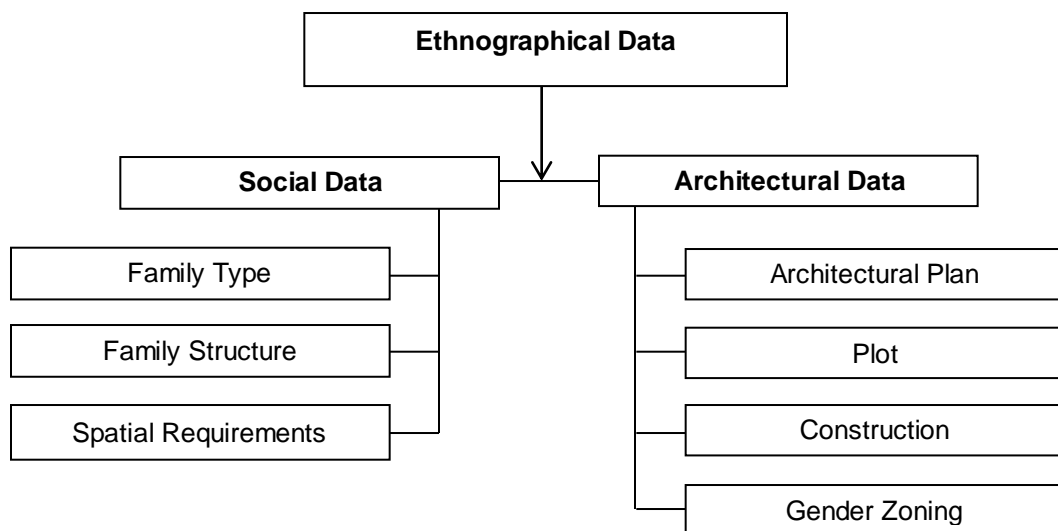


Fig. 6.1: Data Representations for the Cases

6.3 The Case Studies

Case 1: Hamid Al-Tayeb House:



Fig. 6.2: Case 1- Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This case is an inherited land located at the north-west side of Abu-Rouf and covering an area of 750 sqm. The house was built in 1940 using basically traditional materials; mud bricks “Jaloos” walls covered with thin layer of cement/sand plaster. The rooms are covered with traditional wooden roof covered with “khafji” layer, and metal doors and windows were installed.

Family:

This case represents the residence of the independent household. It is a residence of a semi-independent household family consists of 7 members in total (4 males and 3 females), living in the house at the time of the study. The family has 3 working members and 4 students.

Plan Layout and Changes:

The layout of the house could be seen as a combination of two spatial domains: the family domain is for the use of the family and female and the male domain meant for the males and their male guests. The spatial arrangement separates the male and family domains. The family domain consists of the rooms, *veranda* and kitchen while the males’ have the *diwan*, *veranda* and a guest room. Each domain has a separate courtyard “*hosh*” with a separate shower and pit latrine in each.

There are two entrances in this example that lead directly to each domain. One entrance is defined as the male/main entrance (*Bab el-rugal*), while the other entrance, which is smaller, is for the use of the family/female members and- female guests only.

Case 2: Safia Hussain House:

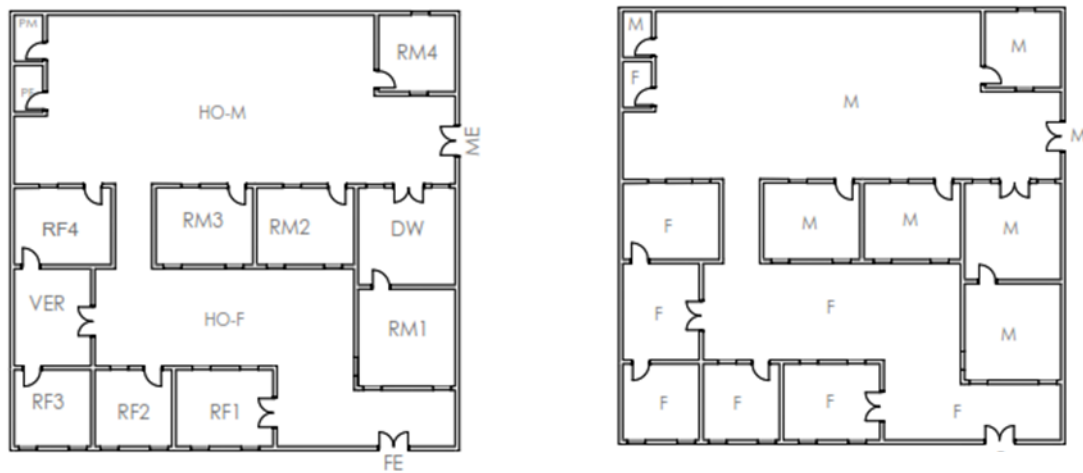


Fig. 6.3: Case 2 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This house is located at the northern side of Abu-Rouf. The overall plot area is 800 sqm. The house was built in 1987 using traditional mud bricks “*Jaloos*” walls covered with thin layer of cement/sand plaster. Some rooms were roofed with traditional wooden roof while others used *zink* corrugated sheets.

Family:

This case represents the residence of a semi-independent household. This house is a residence of an extended family (EF) consists of 20 members in total (10 males and 10 females), living in the house at the time of the study. The house is accommodating the nuclear families for the two married brothers as well. The family has 4 working members and 10 students.

Plan Layout and Changes:

The layout of this house can be interpreted as a combination of 2 domains. The first domain is designated for the males while the second is specifically for the occupation of the family/female. There are 2 entrances for this case; The first is serving the *diwan* and the males domain while the other for the family/females domains use. Similarly, there is a separate courtyard “*hosh*” as well as a shower/pit-latrines in each domain. The kitchen’ *raccoba* (which is a semi-shed area) is for the use of the female members.

Case 3: Yousif Hassan House:

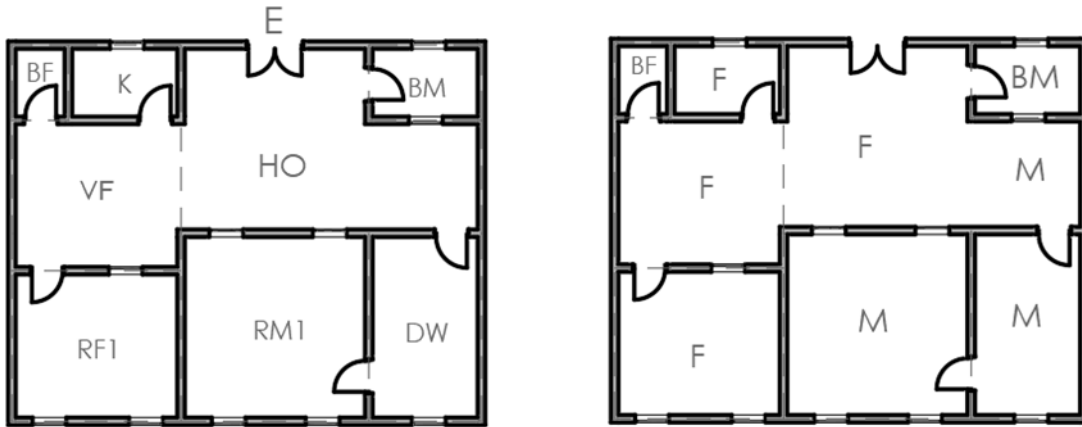


Fig. 6.4: Case 3 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This house is one of the oldest houses in Abu-Rouf. It is located in Abu-Rouf east with close proximity to the river Nile. It is inherited 144 Sqm plot. It was built 1896 using traditional building materials. The walls were built using mud bricks lately covered with thin layer of cement/sand plaster. All rooms are covered with traditional corrugated *zink* sheets.

Family:

The family consists of 6 persons, 3 adults (the mother, father and 2 sons and 2 daughters. The father and his eldest son are working in the own carpentry workshop which located at one corner of the plot.

Plan Layout and Changes:4

This residence consists of spaces that are specified for the use of family/female and for male. There is one entrance in this structure and one court yard which is mainly for the use of men yet the family/female members also use it when there is no male guest. This house comprises 3 bedrooms, a kitchen, two latrines and a workshop (which was lately added to the house). There is one of the rooms located near to the main entrance is designated for the father and his male guests playing the role of the diwan beside its function as a bedroom.

Case 4: Babiker Ahmed House:

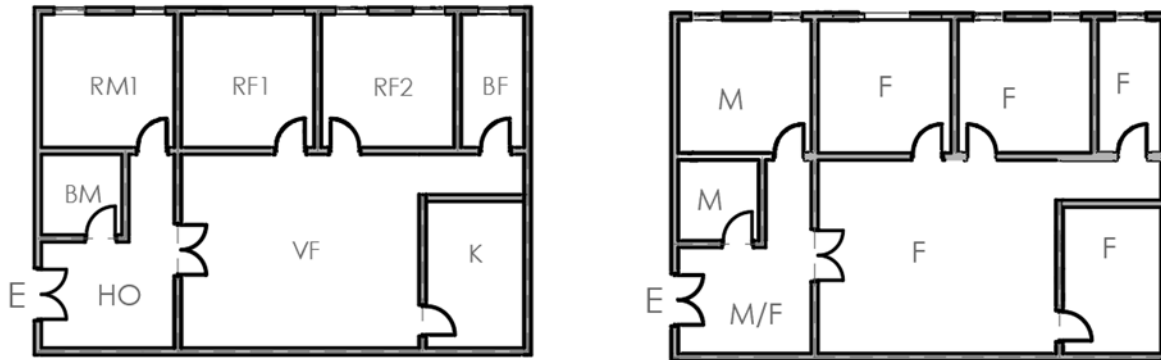


Fig. 6.5: Case 4 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

It is located in Eastern Abu-Rouf near the River Nile bank. The plot is 129 Sqm. When house was inherited in 2004, it consisted on only one room and a latrine. The remaining rooms were built after 2004 using traditional materials. The walls built with mud bricks covered with thin layer of cement/sand plaster and the corrugated Zink sheets are used for the roofs.

Family:

At the time of the interview, there are 6 family members are living in the house; the father, his wife, 3 sons and 1 daughter. The father is the only working member in the family by running small canteen “*Dukan*”.

Plan Layout and Changes:

Due to the small size of the plot, the house has only one entrance and one court “*hosh*” for the use of the men, yet, the family/female members also use it when there are no male guests in the house. The house comprises 3 rooms; the one is for the use of father and the male guests “*diwan*”, and the other 2 are for the family use. There are 2 bathrooms one for Males and the other for family/females.

Case 5: Fahmy Merghani House:

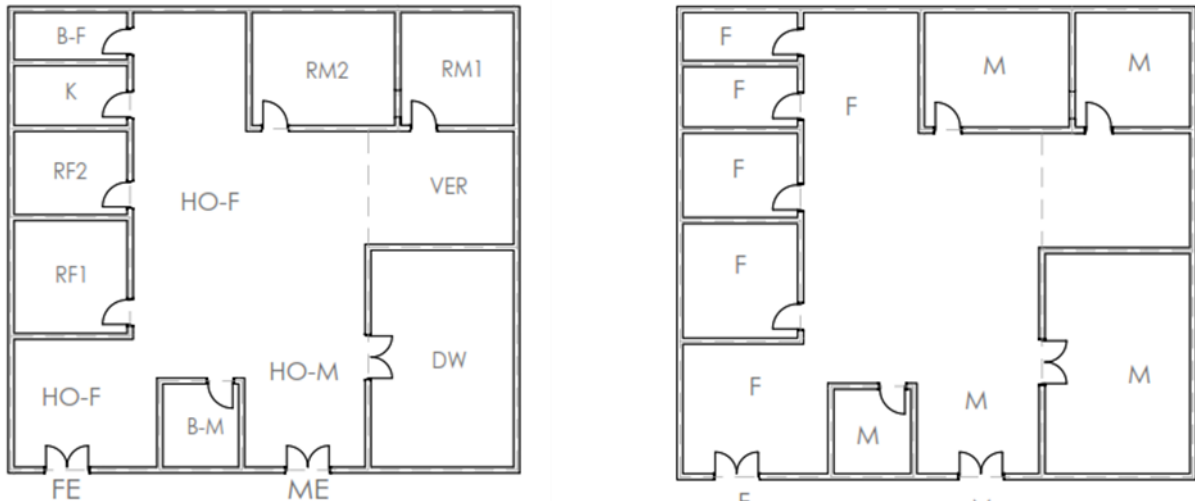


Fig. 6.6: Case 5 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This case is an inherited house located in the north-east side of Abu-Rouf. The plot area is 200 sqm and it was part of an extended family residence built 1896 using traditional materials. The walls built with mud bricks and all the rooms are roofed using traditional Zink sheets.

Family:

The house is occupied by a traditional nuclear family consists of 8 members (3 males and 5 females), Both the 45 years father and the 40 years wife are running private business.

Plan Layout and Changes:

The plan consists of 2 sections. One is for the use of the male and their guest, while section 2 is for female use. The family section consists of a kitchen, shower/latrine, veranda, a courtyard and 4 bedrooms. The males section has a salon "diwan" courtyard and a separate shower/latrine. There are two entrances in this example; the first is serving the diwan and the males section while the other is designated for the family/females domains use.

Case 6: Ahmed Omer House:

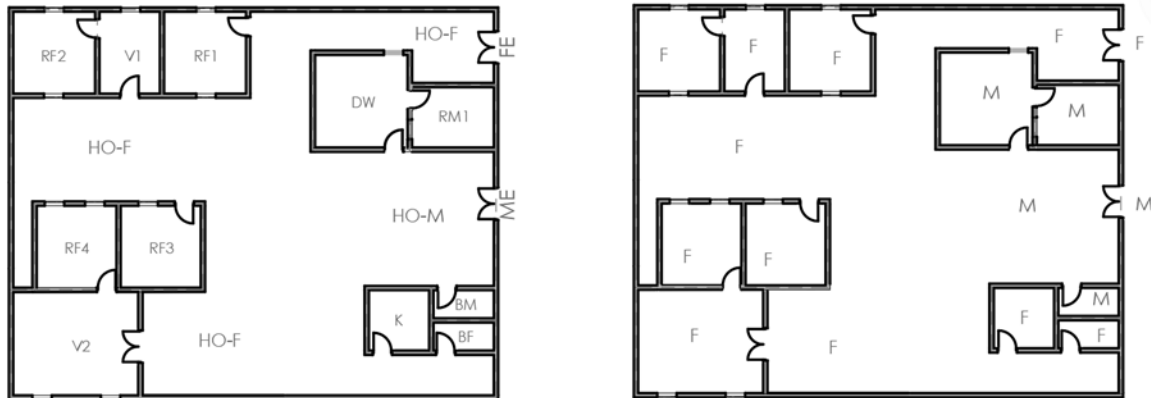


Fig. 6.7: Case 6 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This house is located at the eastern side of Abu-Rouf and built in a 414 sqm plot. The extended family has inherited this plot and first built the house since 1880 using traditional mud bricks “Jaloos” walls covered with thin layer of cement/sand plaster. The rooms are covered with traditional corrugated sheets covered with thin “khafji” layer.

Family:

This case is a resident of an extended family consists of 13 members in total (9 males and 4 females), living in the house at the time of the study. All of the family members are working members.

Plan Layout and Changes:

The layout of the plan could be seen as a combination of three spatial domains: the first domain is for the male and male guests use which consists of the “*diwan*”, bath and bedroom. The other 2 domains are for the use of the females/family for the 2 extended families. Each of the family/females domains has 2 rooms and a *Veranda* while both share the use of the kitchen and one of the shower/latrines. The second shower/latrine is for the males domain use. There are two entrances in this house; one entrance is defined as the male/main entrance (*Bab el-Rugal*), while the other entrance, which is smaller, is for the use of the family/female members and- female guests only.

Case 7: Yasser Obeid House:

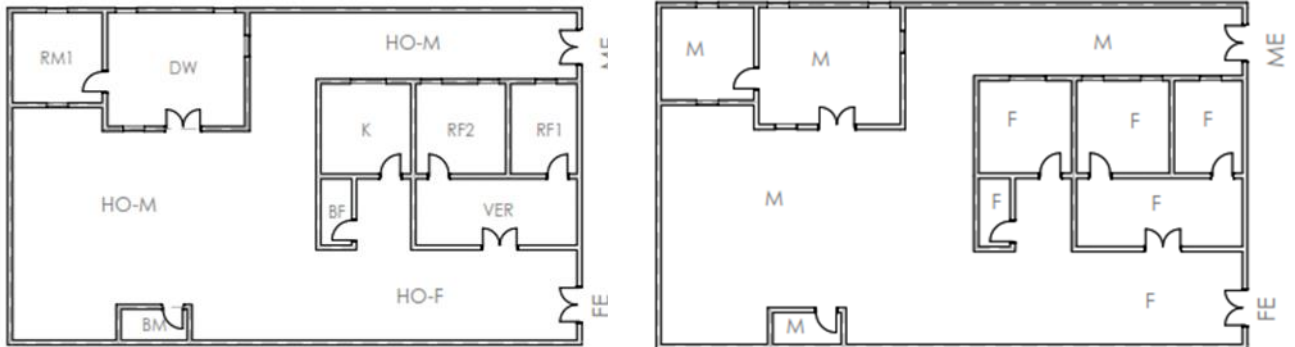


Fig. 6.8: Case 7- Layout Plan and the Male & Female Domains Layout

Plot and Construction:

It is located in Abu-Rouf east. It is a nuclear family residence that covers an area of 416 sqm. The house was built in 1996 using traditional mud bricks “*Jaloos*” walls covered with thin layer of cement/sand plaster. The rooms are covered with traditional corrugated sheets covered with thin “*khafji*” layer.

Family:

The nuclear family members are 9 in number; 4 males, 4 females. The father and his elder Son have different types of occupations.

Plan Layout and Changes:

The layout of the plan could be seen as a combination of two spatial domains, family/female and male. The family/female domain is for the use of the females and family members, while the other domain consists of spaces that are meant for the use of the males and male guests. The males domain consists of the *diwan*, *room* and *shower/latrine*. There are two entrances that lead directly to each domain. One entrance is defined as the male/main entrance (*Bab el-Ruga*), while the other entrance is for the use of the family/female members and female guests. There are two courtyards within each spatial domain as well as two pit latrine.

Case 8: Mahmoud Othman House:

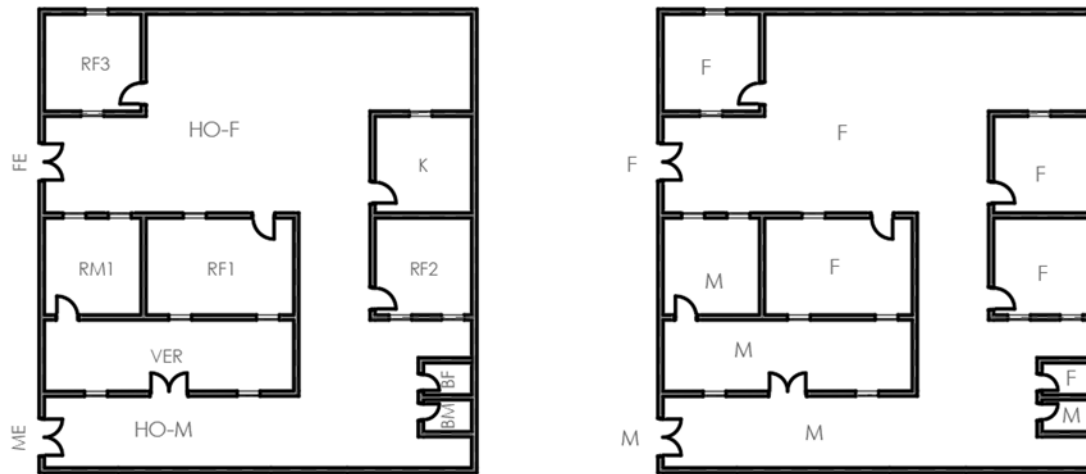


Fig. 6.9: Case 8 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This is located in Abu-Rouf South. , it is a residence of a nuclear family (NF) that covers an area of 17S sqm. The construction materials are the basic traditional ones. The family has owned the land since 1951. It was part of an extended family residence; but today it is a nuclear inherited one, although surrounded by relatives as neighbors.

Family:

The household consists of 7 persons, (5 males and 2 females), the husband, his wife and their son and daughter. In addition 2 male relative lives with them. All of them are over 18 years old.

Plan Layout and Changes:

The layout of the plan could be seen as a combination of two spatial domains, family/female and male. The former domain is for the use of the family members, while the latter domain consists of spaces that are meant for the use of the males and the male guests. The males domain consists of the *diwan*, *room* and shower/latrine. There are two entrances that lead directly to each domain. One entrance is defined as the male/main entrance (*Bab el Rugal*), while the other entrance is for the use of the family/female members and female guests. There is a separate shower/latrine and a yard “hosh” in each domain.

Case 9: Abdulwahab Ali House:

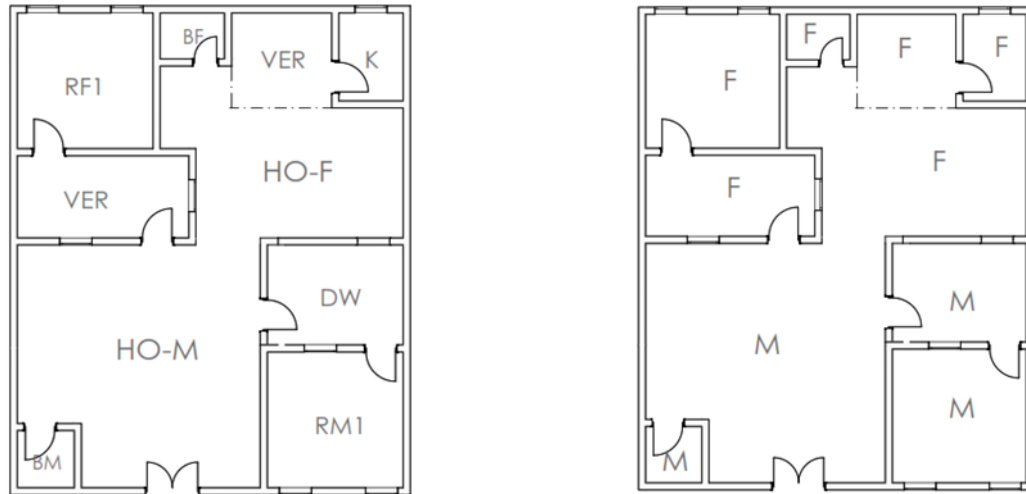


Fig. 6.10: Case 9 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This is inherited house since 1997 located in Abu-Rouf North. It was first built in 1880. The house is a residence of a semi-independent family that covers an area of 200 sqm. The construction is basically traditional using traditional mud bricks “*Jaloos*” walls covered with thin layer of cement/sand plaster, with corrugated Zink sheets for all roofs.

Family:

The house is occupied by two households live together in the house semi-independently. The households consist of 5 members; they are 2 males and 3 females, 2 husbands/brothers, sister and 2 wives. All of them are above 30 years old. Each family has a semi-independent domain in the house.

Plan Layout and Changes:

The layout of the plan could be seen as a combination of two spatial sections, each section specifically designated for the occupation of one household. They both share the use of specific spaces in the house. There is a separate courtyard “*hosh*”, 1 room, veranda and a shower/latrine for each section. The kitchen is shared by both domains. Due to area limitations, there is one entrance in this case.

Case 10: Malik Ibrahim House:

Fig. 6.11: Case 10 Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This case located in Abu-Rouf north-east. The house is one of the oldest houses in Abu-Rouf built in 1880 in a plot covers an area of 430 sqm. It was built using basic traditional materials; mud brick walls with thin layer of cement/sand plaster and wooden roofs topped with thin “*khafji*” layer.

Family:

The house is occupied with a nuclear family of 7 members; (4 males and 3 females). The 57 years old head of the household has a private business while his wife is working in the public sector.

Plan Layout and Changes:

The layout of the plan could be seen as a combination of two spatial domains, family/female and male. The family/female domain is for the use of the family members and female guests, while the other domain consists of spaces that are meant for the use of the males and male guests. These spaces are the *diwan*, and shower and pit latrine. There are two entrances in this case; one is defined as the male/main entrance (*Bab el-Ruga*), while the other entrance is for the use of the family/female members and female guests. There are two courtyards “*hosh*”; the front one is for the use of males and their guests while the back is for the family/female.

Case 11: Attiya Mohamed House:



Fig. 6.12: Case 11 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This plot is located at the west side of Abu-Rouf covering an area of 322 sqm. It is a semi-modern building constructed in 1989 using reinforced concrete skeleton with brick walls and ceramic floorings.

Family:

This house is a residence of nuclear family consists of 4 members in total (2 males and 2 females); a 70 years old head of the household who is a pensioner, his wife, his son working in the private sector and his daughter is a university student.

Plan Layout and Changes:

Although this house was built using semi-modern building materials, but, still its layout could be seen as a combination of two spatial domains: the family domain is for the use of the family and female and the male domain meant for the males and their male guests. The family domain mainly consists of the family rooms; *veranda* and kitchen while the males' have the salon "*diwan*", and a guest room. There are two entrances in this house; the first is serving the males domain while the other for the family/females domains use. Each domain has a separate yard "*hosh*" with a separate shower and pit latrine in each.

Case 12: Ismael Abdulfatah House:



Fig. 6.13: Case 12 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

It is located in Abu-Rouf east with close proximity to the river Nile. This house is one of the oldest houses within the vicinity. It was built 1880 in a plot area of 200 sqm using the basic traditional materials. The walls built using mud bricks covered with thin layer of cement/sand plaster. The traditional wood is used for all roofs.

Family:

This house is a residence of nuclear family consists of 4 members in total (2 males and 2 females); a 70 years old head of the household who is a pensioner, his 58 years old wife who has no job, a 30 years old daughter and a 35 years old son running a private business.

Plan Layout and Changes:

The layout of the plan shows two spatial sections: the family section is for the use of the family/female and the men section. The first domain consists of 2 rooms, kitchen, store and a veranda, while the former section has the salon “*diwan*” and 1 room. Each domain has a separate entrance, hosh and shower/latrine.

Case 13: Saddiq Ahmed House:



Fig. 6.14 Case 13 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

It is located south-east of Abu-Rouf near the river. This house is one of the oldest houses in Abu-Rouf built. The plot is 200 sqm and was inherited in 1880. The house was built using traditional materials; the walls built using mud bricks covered with thin layer of cement/sand plaster and the traditional *baladi* wood was used for all roofs.

Family:

This house is a residence of nuclear family. It consists of 4 members in total (2 males and 2 females); a 70 years old head of the household who is a pensioner, his 58 years old wife who has no job, a 27 years old daughter who is a university student and a 25 years son who is has private business.

Plan Layout and Changes:

This example has 3 rooms, salon "*diwan*", sala "*Veranda*", a kitchen, 2 showers/latrines. The plot layout is divided into 2 spatial sections; males section for the use of the male s and males guests, and the family section for the use of female and females guests. There are two entrances in this house. The first is serving the males domain while the other for the family/females section use.

Case 14: Nadir Mohammad House:

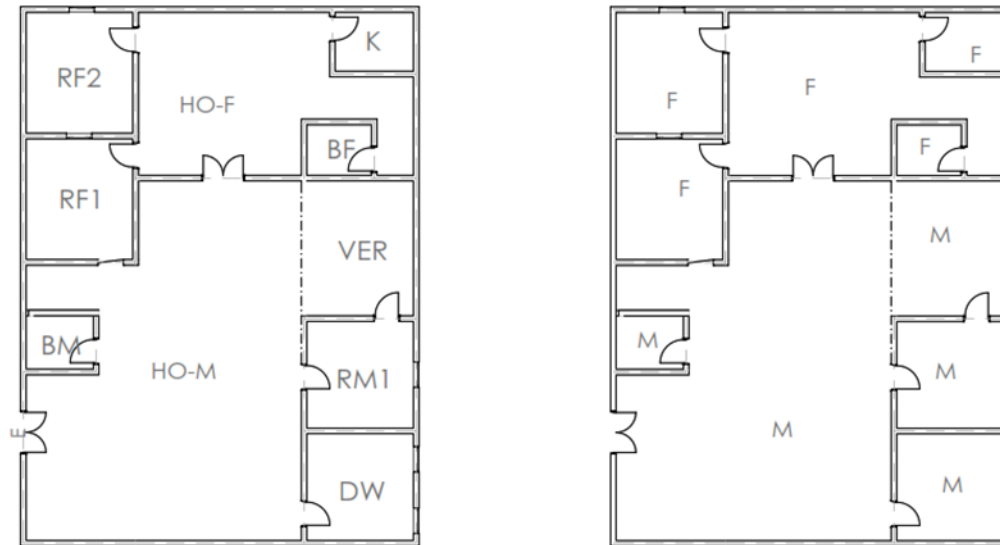


Fig. 6.15: Case 14 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This example is located at the heart of Abu-Rouf covering an area of 320 Sqm. The family owned the plot in 1995 but the construction was completed only in 2011 using traditional building materials. The walls were built using mud bricks covered with thin layer of cement/sand plaster with *zink* corrugated sheets covered with thin “*khafji*” layer for all the roofs.

Family:

This case represents a residence of a semi-independent household within an extended families that consists of 2 households. The members of this household are 15; 7 adults (the parents, 2 married sons and their wives) and 8 children under 10 years old.

Plan Layout and Changes:

The plan can also be conceived as male and family domains. There is one entrance in this case and one internal door linking the front males domain to the family/females domain located at the back of the plot. There are 2 yards “*hosh*” (males and family yards). These courtyards are adjacent to each other with a doorway as access between them. The *front male* hosh functions as transition area that leads to the male diwan. Each domain has a separate shower/latrine. There is a veranda located at in the males domain for the use of the males, yet, the family uses it when there are no male guests in the house.

Case 15: Abdulhalim Saiyed House:

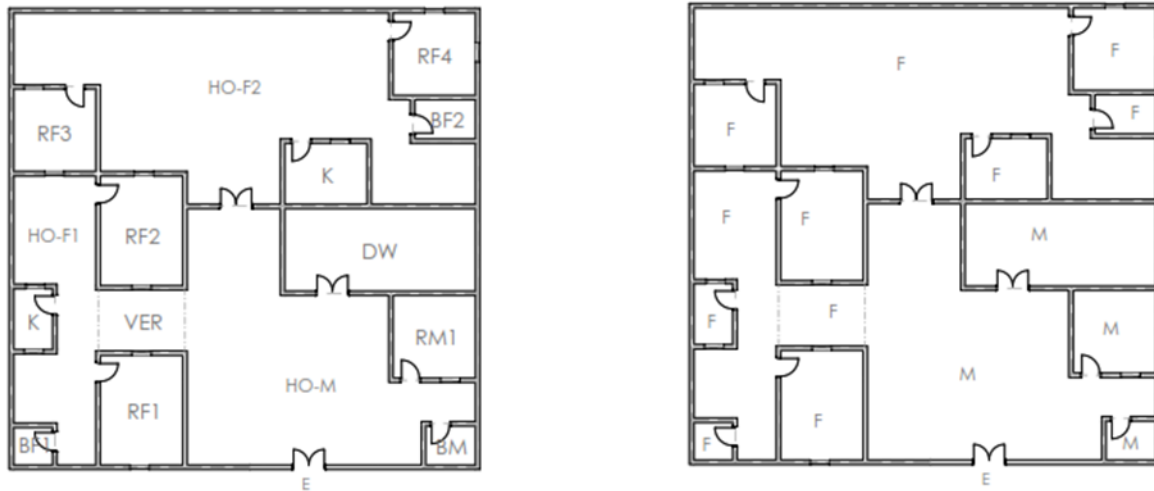


Fig. 6.16: Case 15 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This example is located in Abu-Rouf east covering an area of 372 Sqm. The family owned the plot in 1999 but the construction was completed only in 2002 using traditional building materials. The walls were built using mud bricks covered with thin layer of cement/sand plaster with *zink* corrugated sheets covered with thin "*khafji*" layer for all the roofs. Ceramic tiles are used for the internal floor and the concrete tiles for the courtyards'.

Family:

This case represents an inherited residence occupied by a semi-independent household within extended families that consists of 2 households. The members of this household are 6, they are 4 males and 2 females.

Plan Layout and Changes:

The layout of the structure can be interpreted as a combination of three sections. Two sections are specifically for the occupation of each household who share the use of particular spaces, the males' shower/latrine, the front courtyard and the diwan and the entrance. The "diwan" and pit latrine and front courtyard are male spaces. There are 3 courtyards in this case; two of them are used as family/female courtyards, while the other courtyard is mainly for the use of the male members of the family and their guests.

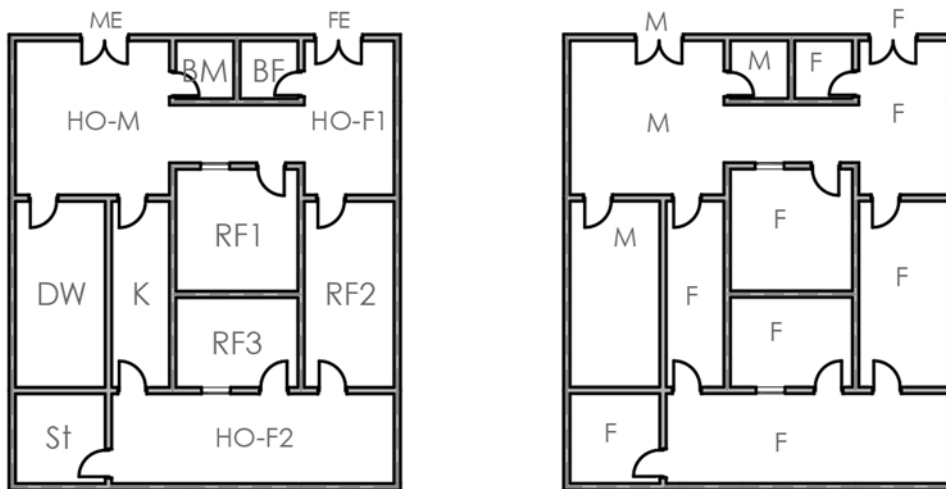
Case 16: Siddiq Ibrahim House:

Fig. 6.17: Case 16 - Layout Plan and the Male & Female Domains Layout

Plot and Construction:

This case is located at the heart of Abu-Rouf in a 315 sqm plot. The family owned the plot in 1935 but constructed the house in 1972 using traditional building materials. The walls were built using mud bricks covered with thin layer of cement/sand plaster. The roof is made of traditional wood panels covered with thin “khafji” layer. and metal doors and windows were installed. Ceramic tiles are used for the internal floor and the concrete tiles for the courtyards’.

Family:

This inherited house is a residence of nuclear family consists of 6 members; (5 males and 1 female); the father (54 years old), his wife (50 years old) and 3 students sons (between 14 – 23 years old). The head of the household is running a private business.

Plan Layout and Changes:

The plan shows clear combination of two domains, family/female and male, the former domain is for the use of the family members, while the latter domain consists of spaces that are meant for the use of the males and the male guests. The male domain consists of the diwan, Each domain has a separate courtyard “hosh”; the males hosh is the located at the front while the family’s is at the back of the plot. There are 2 showers/latrines that are identified as female and male, they are both closely located to the entrance for technical reasons. There are two entrances in this house. The first is serving the diwan and the males domain while the other for the family/females domains use.

6.4 Provisional Findings

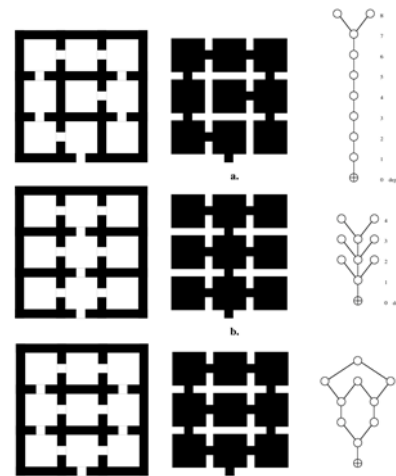
According to the objectives of this study, out of the 50 houses visited, seventeen cases are selected for the case studies. They are mostly traditional with few semi-modern cases. The cases covered variety of plot sizes and built-up areas. Moreover, the choices are meant to represent the three categories of the family structures; the nuclear, semi-independent and extended families, with different family sizes occupying the house at the time of the study.

Mostly, there are significant differences noticed between the special layout plans for the 19 selected cases. However, in general, the cases layout plans shows certain socio-spatial character represented by the division into two spatial domains; the family/female and male domains.

The next part of the study will give special concern to the spatial configuration, the gender occupations and the spatial characteristic of certain function spaces of the house. Space syntax parameters will be the analytical tool to analyses the traditional environment of the houses and the spatial configuration of the cases taking into account the Sudanese socio-cultural codes.

Chapter Seven:

Space Syntax Approach: Morphological Analysis of the Case Studies



*A house is a symbolic place combining paradoxical concepts that can easily be identified as "binary codes." Internal and external, private and public, female and male, sacred and profane, clean and dirty are binary codes used to explain roles and activities of people in spaces
(Lawrence, 1990; Ünlü, 1999)*

This chapter uses space syntax morphological analysis supported by other simulation and visualization techniques to analyse the selected cases in order to examine the extent to which socio-cultural patterns influence the spatial form of the Sudanese traditional house.

7.1 Space Syntax: Definition

The theory of space syntax was originally developed by researchers at the University College London in the mid-1970. It is a research program aims to investigate and understand the relationship between human behaviors and societies and space from the perspective of a general theory of the structure of inhabited space in all its diverse forms: buildings, settlements, cities, or even landscapes. It has developed a set of techniques capable of generation of simple representation and qualitative analysis of architectural formations and urban systems from the level of interior room to the wider level of the city.

It is a concept and a methodology used in urban morphology and architectural research to examine the influence of the spatial layout of buildings and cities upon the economic, social, and environmental outcomes of human movement and social interaction.

The Space Syntax approach allows making knowledgeable decisions about the planning, design and operation of places. Its models have been applied in planning and design projects worldwide. They explain key relationships between spatial location, spatial connectivity and urban performance outcomes including land value, physical and mental health.

In this context, Space syntax is used to analyze the two-dimensional spatial properties of architectural plans for the selected cases.

7.2 The Method of Special Syntax Analysis

In the context of this study, the main approach for the analysis is to investigate the morphology deals with access between rooms, the relationship between spaces, and the diagrams of these relationships. Since the analysis concentrated on social patterns in the spatial form of traditional Sudanese houses, the interior spaces will be the focus of the study analysis. Accordingly, space syntax, which is defined as the representative technique analyzes the spatial patterns in buildings, was used to analyze spatial configuration of spaces with social significance in the context of this study.

The space syntax will be used to view the internal special configuration and spatial elements for the selected cases to indicate their common attitudes and the hierarchy of their different levels. This will be to compare the syntactic properties (e.g. depth, integration), and can be achieved in two different methodologies where the exterior is defined as the 'root or the carrier'. Thus, for each example two approaches are considered; The Convex Map and The Justified Plan Graph (JPG Method).

The Convex Map:

The first step in the analysis process is typically the production of a "convex map" for each of the selected cases. The convex map serves to translate the general spatial layout for the houses into a diagram that reflects the configuration of selected properties of that layout. In this graph the spatial elements of the houses will be represented as a pattern of convex spaces, lines.

The Justified Graph:

Once the convex map is completed for the selected houses, a preliminary plan graph is drawn over the top of it. This graph does not differentiate between spaces that are large or small, high or low, but simply records the existence of a defined space, called a node, and whether or not the space is connected to any other space or to the outside of the house. Graphically this process converts the convex plan into a diagram of circular nodes, connected by lines.

The JPG method refers to the process of arranging the graph by the relative depth of nodes from the starting point “carrier” or “root” space, which are the house entrances in our context. Thus, the JPG is constructed for each case around a series of horizontal, dotted lines, numbered consecutively from 0, the lowest line. Each dotted line represents a level of separation between the house rooms. The carrier node (the entrances), often the outside world, is located on the lowest line on the chart (line 0). Those spaces that are directly connected to the carrier are located on the line above (line 1). Further spaces directly connected to those on line 1 are placed on line 2, and so on. The exterior is represented in the JPG as a crossed circle, while other nodes are given letters extracted from the name of the room.

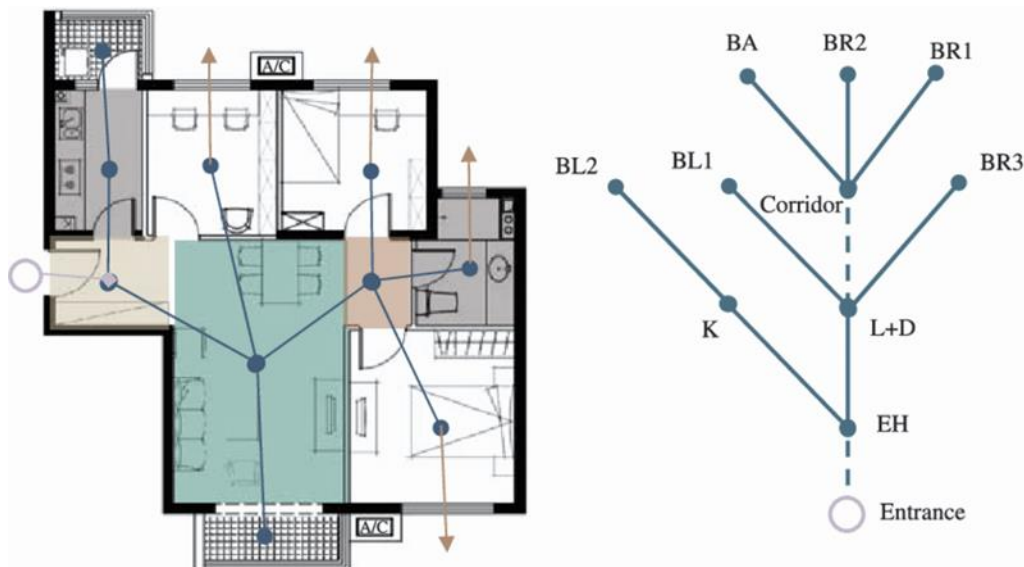


Fig. 7.1: Example of space syntax representation of housing floor plans
Source: Xiao Gao

7.3 Morphological analysis of houses layout:

Case 1:

The example has two entrances both open to the main street; the men and their male visitors usually use the main male entrance (ME). The other entrance (FE) is used by the women of the family and their female visitors, yet it can be used by the males of the family (father and the sons) who do not, however, use it often. The male courtyard (Hosh), the male veranda, the guestroom or (Diwan), and room-1, are considered as male domain. The kitchen, the female veranda and the family courtyard, are considered as the female domain. The family courtyard and the family veranda are used by both genders of the family yet they are predominantly used by the females, while the family bedrooms are strictly used by the females.

The basic justified graph, shows a comparatively deep tree-like spatial structure with 6 levels. The spatial structure of this case, generally, exhibits the following properties:

- The structure is deeper from the family entrance (8 steps) than from the male entrance (7 steps).
- The courtyards “Hosh”, in general, are the most and among the most integrated spaces, but the family courtyard is more integrated than the male courtyard.
- The kitchen is relatively segregated and deep from the outside and also more segregated from the male section. Yet the diwan is more amalgamate to the male entrance and very segregated from the family domain by a door.

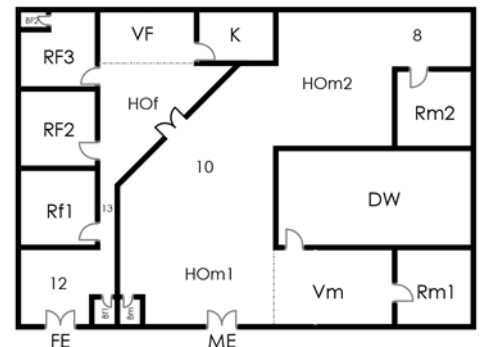
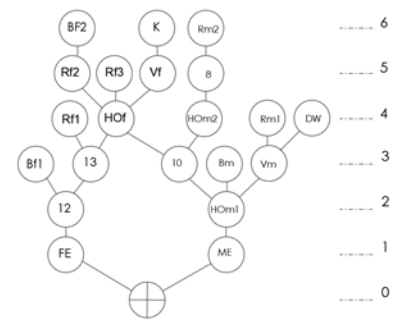
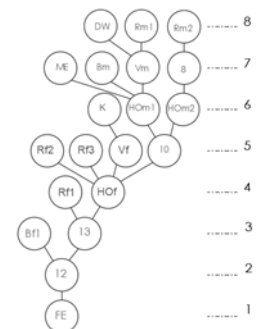


Fig. 7.2: Case 1 -. Space Syntax diagram (justified graph)



a. The basic justified graph



c. .justified graph (Males)

Case 2:

This house has two entrances. The first one opens to the main street is used by the males and the males guests. The other entrance, which opens onto the side street, is used by the females of the family and their female visitors and, occasionally, used by the males of the family.

The plan consists of two separated domains; the male domain comprises the diwan, male courtyard and four rooms to serve due to the large number of males in this house. The family domain has the kitchen, veranda, female courtyard and the female rooms.

The spatial structure of this case, generally, exhibits a relatively deep tree-like spatial structure with 5 levels with the following properties:

- Both males and females justified graphs are very deep from the outside carriers. Nevertheless, the females structure is found to be very deep (9 levels) and deeper than the males' (7 levels).
- The courtyards are the most integrated spaces in both domains, but due to the number of males and males used spaces, which is larger than the females' in the house, the males courtyard is the most integrated space in the house. The females' courtyard is the second most integrated space in the structure.
- The family used spaces are found to be the most separated spaces from the males carrier. Oppositely, the males used spaces are very separated from the females entrance.

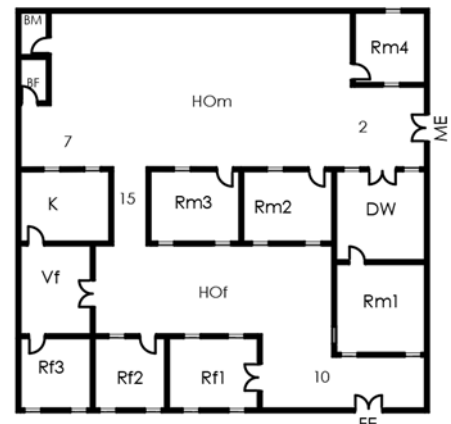
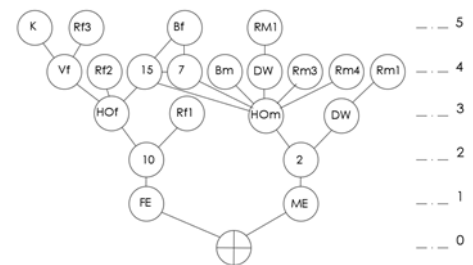


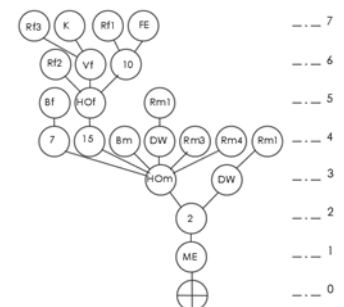
Fig. 7.3: .Case 2: Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c. justified graph (Males)

Case 3:

This house was built in a small inherited plot. It has one entrance used by all members of the family as well as the guests. The family mainly tries to strict the use of this entrance while there are male guests in the house.

Also, the house has one courtyard for the use of the whole family members. However, the female members with their females guests are rarely using it during the presence of male guests. The internal organization of spaces in the house is showing clear demarcation between two domains; the male's and the female's. The male domain comprises the diwan and the male room, while the female domain has veranda and the female room.

The basic justified graph shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

- This case has one carries used by all members of the family.
- The structure is relatively deep and a tree like.
- The courtyard and the veranda are the most integrating spaces in this structure.
- The kitchen is the relatively segregated and deep from the outside and also more segregated from the male section. Yet the diwan is more amalgamate to the entrance and segregated from the family zone.
- In general, the family used spaces are found to be the most separated spaces from the external carrier. Oppositely, the males used spaces are very integrated to the entrance.

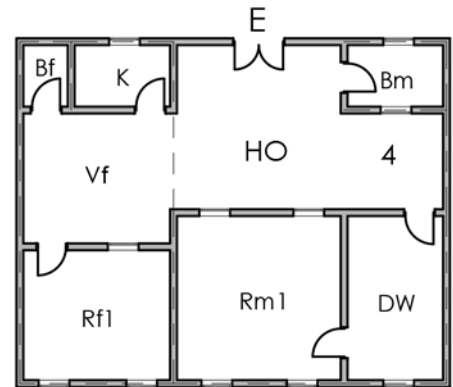
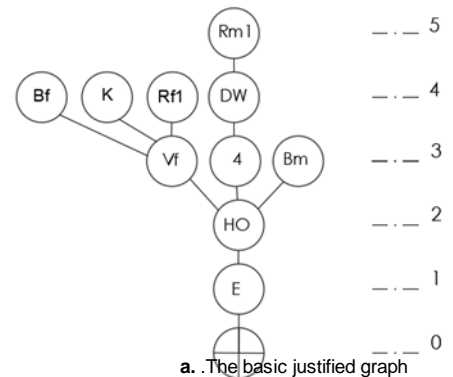


Fig. 7.4: Case 3 - Space Syntax diagram (justified graph)



Case 4:

This house also was built in a small inherited plot. It has one entrance used by all members of the family as well as the guests. The family mainly tries to strict the use of this entrance while there are male guests in the house. Also, the house has one small courtyard for the use of the whole family members. Again, similar to case 3 above, the female members and the females guests avoid using it while there are male guests in the house. The spatial organization of the house shows strong segregation between the male domain and the female domain. The male domain comprises the diwan which is mainly used as a males room as well as a male guests area. The family domain has veranda, kitchen and two family rooms.

The basic justified graph, figure shows a comparatively deep spatial structure with 5 levels. It generally, exhibits these properties:

- The courtyard and the veranda are the most integrating spaces within the structure. Nevertheless, the veranda is more integrated.
- The small courtyard plays major role of distributing spaces to the males and female domains.
- The kitchen and the family bath/toilet which are used by the female are the most segregated spaces in the structure.
- In general, the family used spaces are found to be the most separated spaces from the external carrier. Oppositely, the males used spaces are very integrated to the entrance.

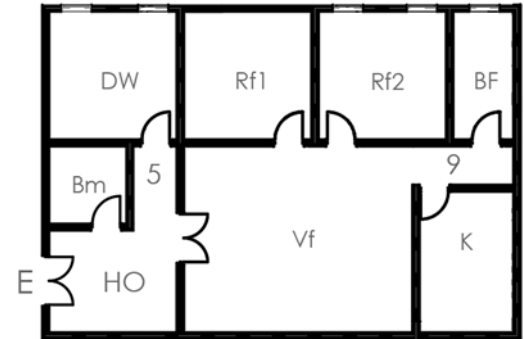
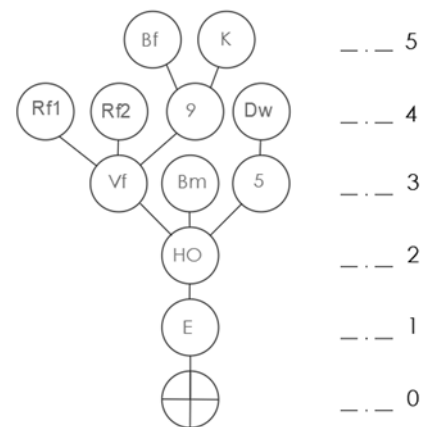


Fig. 7.5: Case 4- Space Syntax diagram (justified graph)



a. The basic justified graph

Case 5:

This case has two entrances; both open to the main street, the first one is used by the males and their male guests, while the other is used by the females of the family and the female guests. The family entrance occasionally can be used by the males members of the family specially when there are no females guests inside the house.

The spatial organization of the house shows two semi-separated domains; the male domain comprises the diwan and the male courtyard. The family domain has veranda, kitchen, female courtyard and the female rooms.

The basic justified graph, figure shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

This structure is relatively deep from the street or the carrier of the system (5 steps). The structure is deep from both the family entrance (5 steps) as well as the male entrance (5 steps).

- The family courtyard is the most space integrated to other spaces and controls access to most of the main spaces within the house, while the male courtyard and diwan are semi segregated from the other family spaces.
- The kitchen and family courtyard are relatively segregated and deep from the outside, yet the diwan is more integrated to the male's entrance.

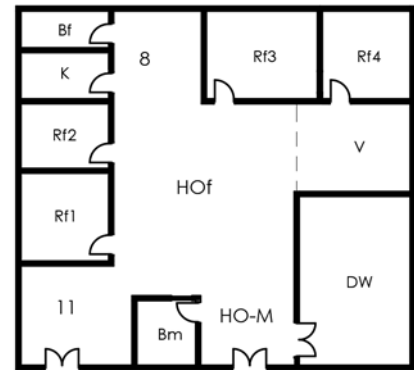
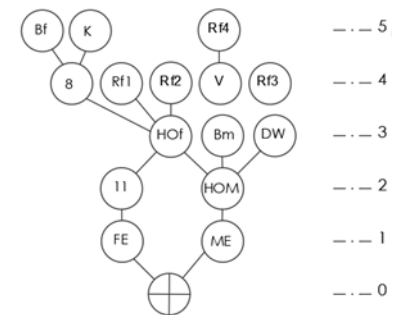
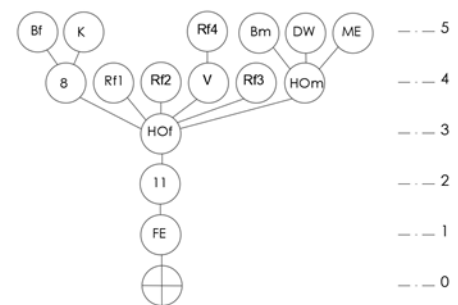


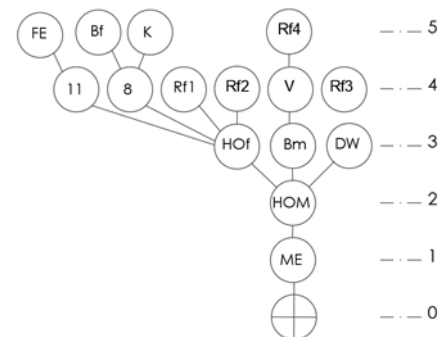
Fig. 7.6: Case 5-Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c. justified graph (Males)

Case 6:

The example has two entrances both open to the main street; the men and their male visitors usually use the main male entrance (ME). The other entrance (FE) is used by the women of the family, yet it can be used by the males of the family (father and the sons) who do not, however, use it often. The spatial layout of the house shows two semi-independent domains; the male domain has the diwan, males room and the males hosh. The family domain has veranda, female courtyard and the female rooms.

The spatial structure of this case, generally, displays the following properties:

- This structure is relatively deep from the street or the carrier of the system (5 steps) with some ring circulation within. It is deeper from family entrance (7 steps) than from the male entrance (6 steps).
- The courtyards “Hosh”, in general, are the most and among the most integrated spaces, but the family courtyards are more integrated than the male courtyard and they also function as distribution spaces to most spaces in the house.
- The kitchen is the most segregated and deep from the outside. The diwan is more integrated from the males’ entrance.
- In this case, the male entrance is less segregated than the female entrance. That indicates that it is mostly used by all of the family members inclusive of the female, and the other entrance is mainly used by the female.

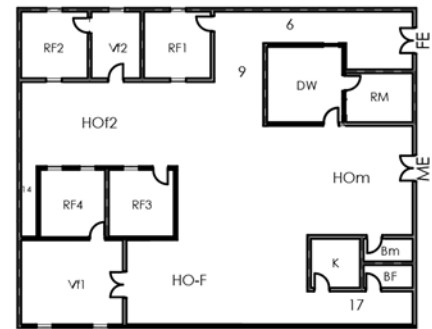
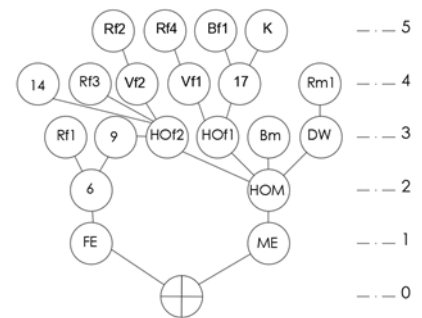
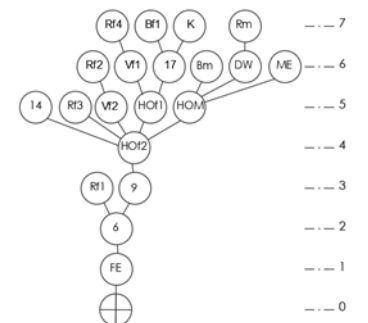


Fig. 7.7.Case 6: Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c. justified graph (Males)

Case 7:

The example has two entrances both open to the main street; the men and their male visitors usually use the main male entrance. The other entrance is used by the women of the family and their female visitors, yet it can be used by the males of the family (father and the sons) who do not, however, use it often. The internal organization of spaces in the house is showing clear demarcation between two domains: the male domain consists of the male courtyard (Hosh), the guestroom (Diwan), and the male room, while the family domain has the females courtyard, veranda, kitchen and the female rooms.

The basic justified graph shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

- This basic J-graph is deeper from male entrance (6 steps) than from the female entrance (5 steps).
- The courtyards “Hosh”, in general, are the most and among the most integrated spaces they also function as distribution spaces to most of the spaces of the structure.
- The family veranda is integrated to many of the spaces within the structure.
- The male entrance is most segregated space from the female carrier and shallow from the male entrance.
- The family used spaces are found to be the most separated spaces from the males carrier. Oppositely, the males used spaces are very separated from the females entrance.

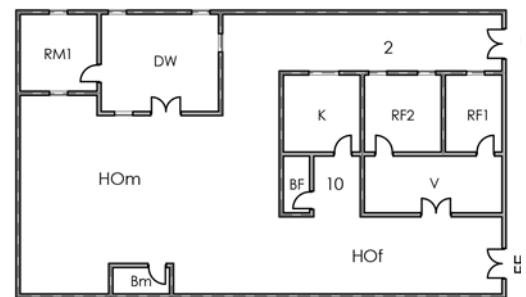
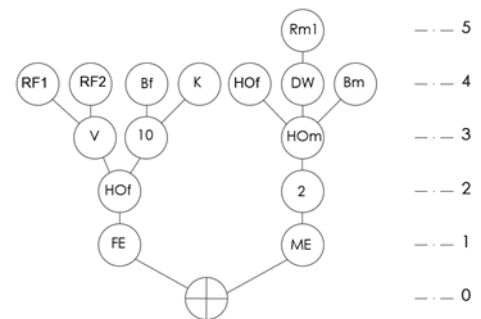
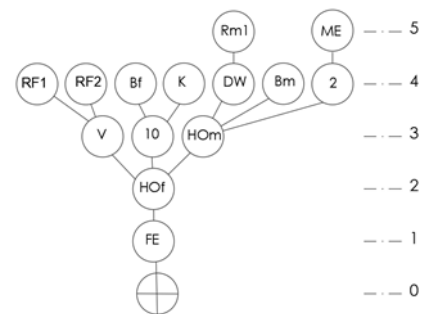


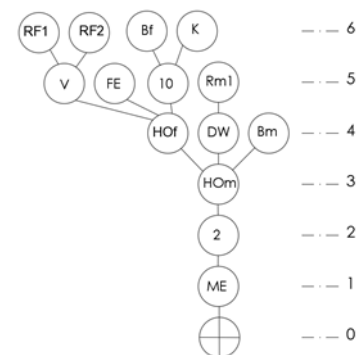
Fig. 7.8. Case 7- Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c.. justified graph (Males)

Case 8:

Similar to most of the cases, this house has two entrances open to the main street, one for the males and the male guests, and the other for the family and their female visitors. Also, the family entrance is occasionally used by the males of the family.

The house has two semi-independent domains; the male domain has the diwan, male room and the males hosh. The family domain has veranda, female hosh and the female rooms.

The basic justified graph, figure shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

- The structure is deep from the street (4 levels) and is a tree like structure. Both the males and females structures are deep from the street. But the female structure is very deep (8 levels) and deeper than the males structure (7 levels).
- The courtyards, in general, are the most and among the most integrated spaces, but the family courtyard is more integrated than the male courtyard. Also, the family veranda, is very integrated to the other spaces within the house.
- The kitchen is relatively segregated and deep from the outside, yet the diwan is more segregated and shallow.
- The female bathroom and bedroom are the most segregated spaces from the outside, while the male use spaces are very shallow and more integrated to the outside.

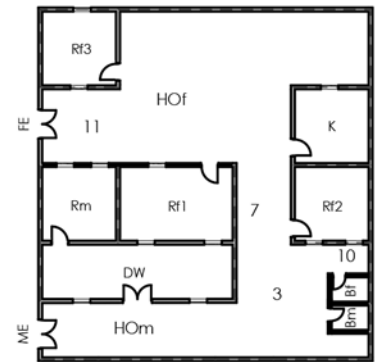
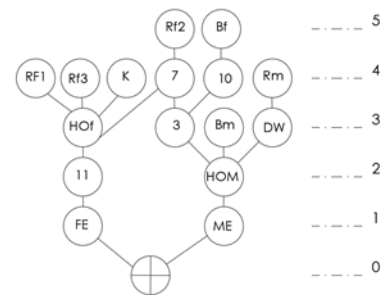
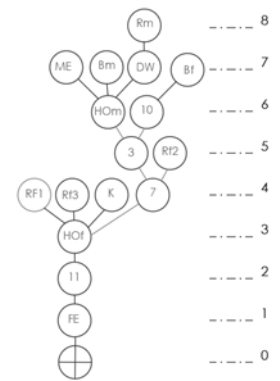


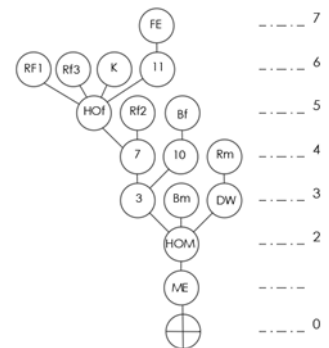
Fig. 7.9. Case 8 -Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c.. justified graph (Males)

Case 9:

This house is built in a small inherited plot. It has one entrance used by all members of the family as well as the guests. The family mainly tries to strict the use of this entrance while there are male guests available in the house.

The house has two courtyards. The spatial organization of the house shows semi-segregated two domains; the male domain and the family domain. The male domain comprise the diwan and a male room, while the family domain has 2 verandas, kitchen and 2 family rooms.

The basic justified graph, shows a deep tree-like spatial structure with 6 levels. The spatial structure of this case, generally, exhibits these properties:

- The structure is deep from the street and a tree like structure
- The courtyards “Hosh”, in general, are the most and among the most integrated spaces, but the male courtyard is more integrated than the family courtyard as it is directly integrated to the carrier.
- The kitchen is the most segregated space from the outside, while the male use spaces are very shallow and more integrated to the outside.
- Yet the diwan is more amalgamate to the entrance and very segregated from the family domain by a door dividing the two courtyards.

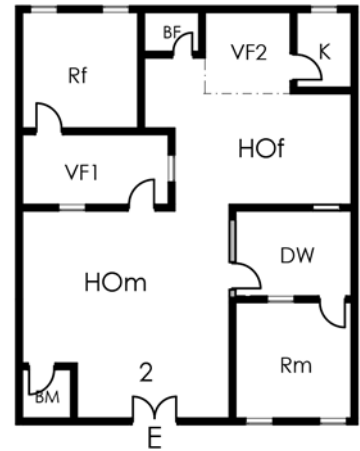
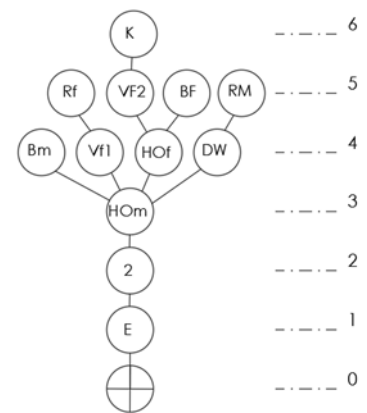


Fig. 7.10. Case9- Space Syntax diagram (justified graph)



a. The basic justified graph

Case 10:

The example has two entrances both open to the main street; the men and their male visitors usually use the main male entrance. The other entrance is used by the women of the family and their female visitors, yet it can be used by the males of the family (father and the sons) who do not, however, use it often.

The house has two domains separated by an intermediate space (space 7); the male courtyard (Hosh), the male veranda, the guestroom or (Diwan), and room-1, are considered as male domain. The family and female domain comprises the family hosh, veranda, kitchen and the family rooms.

The basic justified graph shows a deep tree-like spatial structure with 7 levels. The spatial structure of this case, generally, exhibits these properties:

- The structure is deep and is a tree like structure with rings passing through the courtyards. The male structure is very deep (8 levels) and deeper than the females structure (7 levels). The structure is deeper from the male entrance than from the female entrance.
- The courtyards are the most integrated spaces in both domains. In this case the female courtyard is more integrated than the male courtyard.
- The kitchen is the most segregated space in the structure and deep from the outside.
- In general, the family used spaces are found to be the most separated spaces from the males carrier. Oppositely, the males used spaces are very separated from the females entrance.

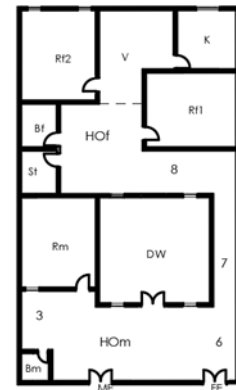
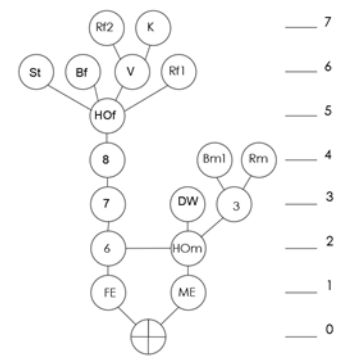
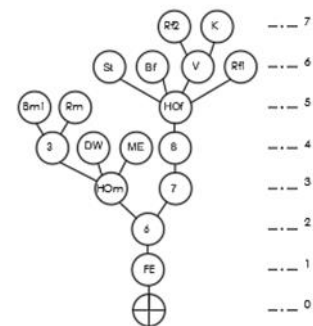


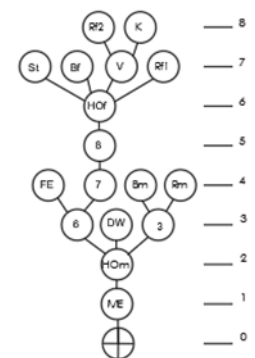
Fig. 7.11: Case 10-Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c. justified graph (Males)

Case 11:

This case has two entrances, both open to the main street. The men and their male visitors usually use the main male entrance. The other entrance is used by the women of the family and their female visitors, yet it can be used by the males of the family (father and the sons) who do not, however, use it often.

There are two semi separated courtyards: the men and their male visitors usually use the front yard near the entrance, it is occasionally used by the females while there are no male guests inside the house. The other courtyard located at the back of the house is used by the women of the family.

There are two semi separate domains in the house; the male domain comprises the diwan, males courtyard and the males room. The kitchen, the family veranda and rooms and the family courtyard, are considered as the female domain.

The basic justified graph, figure shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

- The structure is deep from both; the family entrance (6 steps) as well as the male entrance (6 steps).
- The family veranda and the family courtyard are the most integrated space to the other spaces within the house.
- The kitchen and family courtyard are relatively segregated and deep from the outside, yet the diwan is more integrated to the male's entrance.

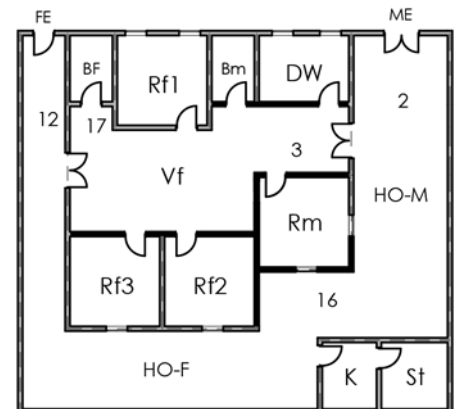
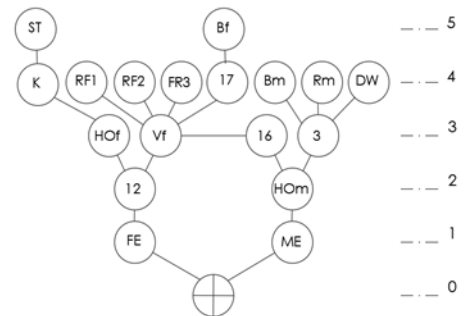
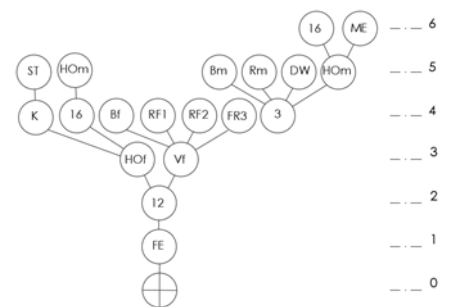


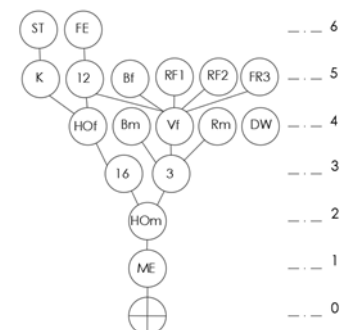
Fig. 7.12: Case 11- Space Syntax diagram (justified graph)



a..The basic justified graph



b. justified graph (Females)



Case 12:

This case was built in a small inherited plot. It has one entrance used by all members of the family as well as the guests. The family mainly tries to strict the use of this entrance while there are male guests available in the house. The house has two courtyards: the men and their male visitors usually use the front yard near the entrance, it is occasionally used by the females while there are no male guests inside the house. The other courtyard located at the cack of the house is used by the women of the family, yet it can be used by the males of the family (father and the sons) who do notuse it often. The spatial organization of the house shows segregated two domains: the male domain and the family domain. The male domain comprise the diwan and a male room, while the family domain has 2 verandas, kitchen and 2 family rooms.

The basic justified graph shows these properties:

- The basic J-graph shows a very deep tree-like structure (7 levels).
- The males courtyard and the family veranda are the most integrated spaces within the structure. However, both the male and female structures are very deep from the outside (8 steps). However, the female used spaces are noticed to be deeper than the male’s spaces.
- The male domain is shallower and more integrated to the exterior than the family domain. The diwan is very integrated to the entrance while the female spaces are very segregated. The family veranda and female courtyards are the most integrating space in both domains.

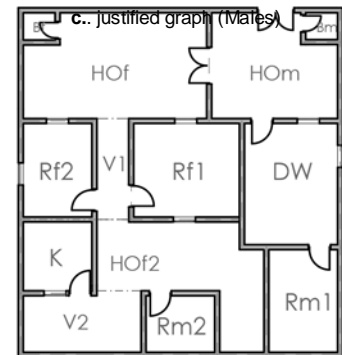
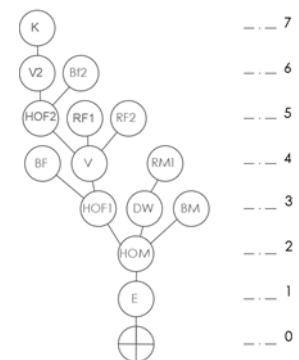
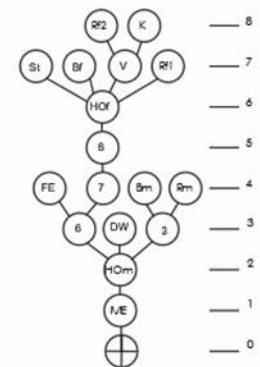


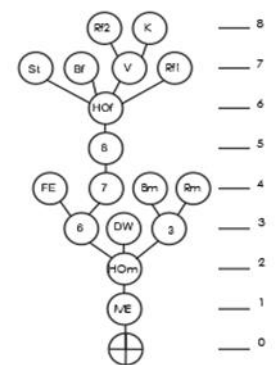
Fig. 7.13: Case 13-Space Syntax diagram (justified graph)



a. Basic justified graph



b..justified graph (Females)



c. .justified graph (Male)

Case 13:

The example has two entrances both open to the main street; the men and the male guests usually use the main male entrance (ME). The other entrance (FE) is used by the women of the family, yet it can be used by the males of the family (father and the sons). Like most of the cases, there are two domains in the house; the male domain consists of the diwan, males courtyard and the males room, while the family domain has veranda, female courtyard, female rooms and the kitchen. The two domains are separated by the layout of the main building and the orientation of rooms' doors. The house has two separated courtyards: the first one is for the men and their male visitors; it is occasionally used by the females while there are no male guests inside the house. The other courtyard located is used by the women of the family, yet it can be used by the males of the family (father and the sons).

The basic justified graph shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

- In general, both the male and female structures are very deep from the outside (7 steps).
- The kitchen and family rooms are relatively segregated and deep from the outside, yet the diwan is more integrated to the male's entrance.
- The male entrance is less segregated from the male domain than the family entrance.
- The courtyards in both domains are the most integrated spaces within the structure.

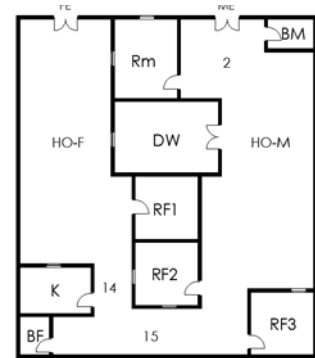
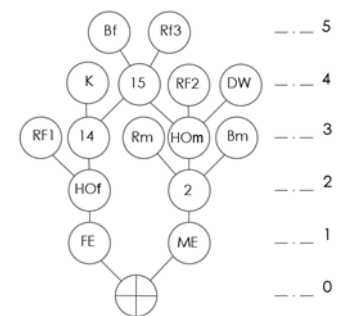
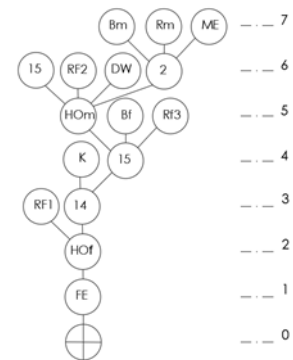


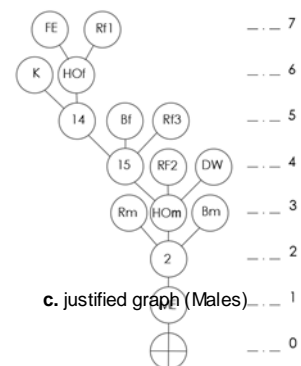
Fig. 7.14 Case 13: Space Syntax diagram (justified graph)



a. justified graph (General)



b. The basic justified graph (Females)



c. justified graph (Males)

Case 14:

This house is built in a small inherited plot. It has one entrance used by all members of the family as well as the guests. The family mainly tries to strict the use of this entrance while there are male guests in the house. The house has two courtyards separated by a door: the men and their male visitors usually use the front yard near the entrance, it is occasionally used by the females while there are no male guests inside the house. The other courtyard located at the back of the house is used by the women of the family, yet it can be used occasionally by the males of the family (father and the sons). The internal organization of spaces in the house is showing clear demarcation between two domains: the male's and the females. The male domain comprises the diwan and the male room and veranda, while the family domain has veranda, kitchen and the female rooms.

The basic justified graph shows a comparatively tree-like spatial structure with 5 levels. It exhibits the following properties:

- In general, the female used spaces are deeper than the males, while the male domain is more integrated to the exterior than the family domain. The diwan is more integrated to the entrance than the family veranda.
- The courtyards are the most integrating space in both domains.
- The female bathroom is the most segregated space from the outside, while the male use spaces are very shallow and more integrated to the outside.

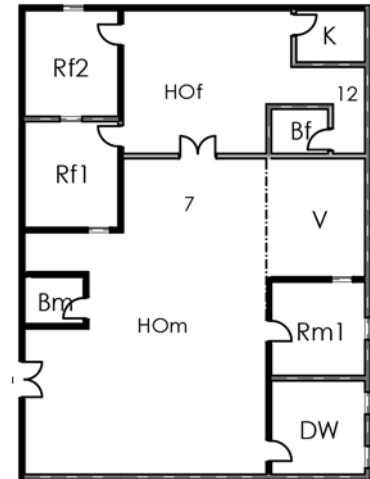
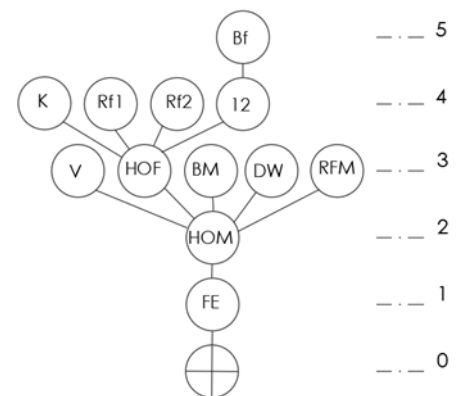


Fig. 7.15: Case 14- Space Syntax diagram (justified graph)



a. justified graph (General)

Case 15:

This house has two entrances both open to the main street. the men and their male visitors usually use the main male entrance (ME). The other entrance (FE) is used by the women of the family and their female visitors, yet it can be used by the males of the family (father and the sons) who do not use it frequently. The plan consists of two separated domains: the first is the male domain which consists of the Male courtyard, diwan, and the male room. There are two separate female domains in this house; each one has its own family courtyard, a kitchen and two family rooms. Similarly to most of the previous cases, the family domains, in general, are predominantly used by the females.

The basic justified graph, figure shows a deep tree-like spatial structure with 6 levels. The spatial structure of this case, generally, exhibits these properties:

- The structure is deep from both carriers but it is deeper from the family/females' entrance (8 levels) than from the male's (7 levels).
- The courtyards are the most integrated to the other spaces in both domains. In this case the female courtyards are more integrated than the male courtyard.
- The female bedrooms are the most segregated and deep from the outside, while the males used spaces are shallow and integrated to the outside.
- The family used spaces are found to be the most separated spaces from the males carrier, unlike the males used spaces which are very separated from the females entrance.

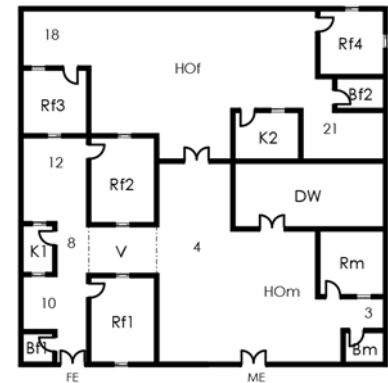
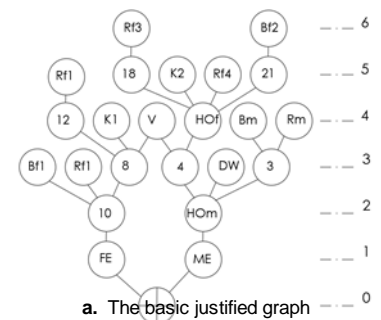
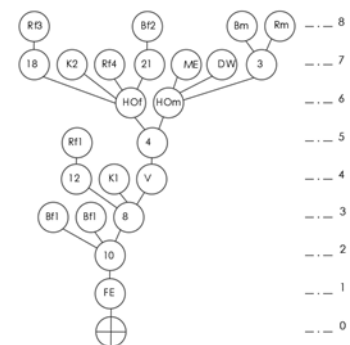


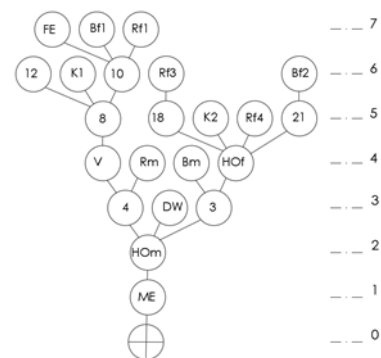
Fig. 7.16: Case 15- Space Syntax diagram (justified graph)



a. The basic justified graph



b. justified graph (Females)



c. justified graph (Males)

Case 16:

This case has two entrances, both open to the main street; the men and their male visitors usually use the main male entrance. The other entrance is used by the women of the family and their female visitors, yet it can be used by the father and the sons who do not, however, use it often. Like most of the cases, there are two separate domains in the house; the male domain consists of the diwan and the male courtyard, while the family domain has veranda, kitchen, female courtyard and 3 female rooms.

The basic justified graph, figure shows a comparatively deep tree-like spatial structure with 5 levels. The spatial structure of this case, generally, exhibits these properties:

- The males spatial structure (6 levels) is deeper than the females' (5 levels).
- This case has two separate carries: one separate carrier for the use of each domain in the house (Males, Females).
- The courtyards are the most integrating space in both domains.
- In general, the male domain is more integrated to the exterior than the family domain.
- The kitchen is one of the most segregated spaces from the outside. - It is relatively segregated and deep from the outside and more segregated from the male section.
- Yet the diwan is more amalgamate to the male entrance and very segregated from the family domain by an intermediate space No 4. "lobby" dividing the two domains.

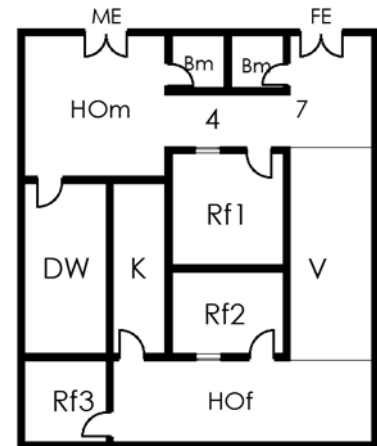
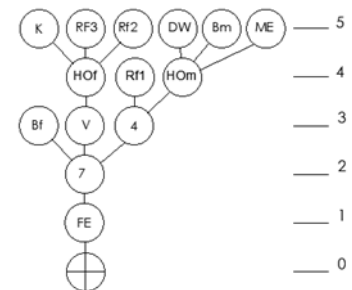
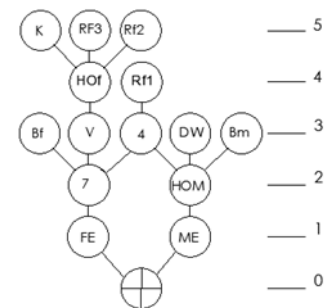
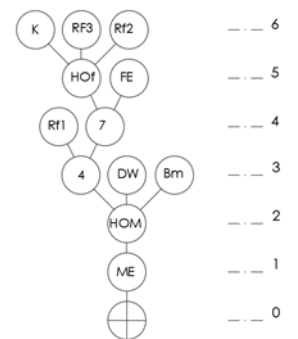


Fig. 7.17: Case 16- Space Syntax diagram (justified graph)



b. justified graph (Females)



c. justified graph (Males)

7.4 Provisional Findings

The previous analysis proves that the link between the exterior world and the interior of the private premises is influenced by certain cultural and spatial forces, which could be interpreted morphologically.

From the discussion throughout this chapter, it is very clear that the carrier cannot be considered as one exterior node in relation to the interior spaces of the structure (the house). Thus, while the public (exterior space) is usually used as a single root in common space syntax practice, it is clear from our results that, the properties of internal spaces are influenced by the number of entrances. Hence, when applying the space syntax method to Sudanese courtyard dwellings, the exterior space should not be treated as a single entity, but rather a number of roots corresponding to the number of entrances. And the gender of the users.

In general, the comparison of the spatial properties between the studied cases (integration and depth) it has been observed that the entrances have different integration characteristics that reflect the socio-spatial relations, with regard to the user's gender. The male entrances are more integrated to the males domain than the family entrances. Unlikely, the female used spaces are more integrated to the females entrances.

Moreover, it has been observed that; among most of the selected cases the relationship between the house and the street is generally demonstrated in a hard and sharp interface. The interface between public and private domains contains and embeds manifolds and deeply interesting nuances, which have been discussed and evoked by scholars. It brings to light many, implicit and explicit, social-spatial elements. The interface plays a vital role in the configuration of the private spaces into different domains and separating them.

*Chapter Eight:***Spatial Configuration of the Traditional House in Omdurman Sudan:
Syntactic Findings**

*A house is a symbolic place combining paradoxical concepts that can easily be identified as "binary codes." Internal and external, private and public, female and male, sacred and profane, clean and dirty are binary codes used to explain roles and activities of people in spaces
(Lawrence, 1990; Ünlü, 1999)*

The purpose of this study is to morphologically and syntactically analyze the social factors which affect the house design in the lower-income residential classes in Omdurman-Khartoum. The study has been carried out with the objective of identifying the socio-cultural elements that influence the spatial layout of the house. In the previous chapters the case studies were presented.

This chapter illustrates the findings and outcome of the space syntax morphological analysis for the selected cases and shows the extent to which socio-cultural patterns influence the spatial form of the Sudanese traditional house.

8.1 Family Structure, Gender and Spatial Configuration

In Sudan, household and family structure is the most important aspect of life. This research has examined the underlying spatial structure of the houses and how it has been impacted by the gender of the users.

In general, the traditional house in Sudan is defined into certain domains and zones, which are named and classified in accordance to the gender. In most of the traditional houses, the segregation between the two genders is playing a major role in the spatial morphology of internal spaces. The gender division is defining the house spatial layout, most of the houses demonstrate clear demarcation between two domains; the first domain is inhabited by the male members of the family and the males guests, while the second domain is for the females and the females guests, the young children are usually found within both domains, with more presence within the female zone.

The spaces are named in accordance to the user gender instead of their function. For example, the males domain is mainly named as "*biet elrojal*" meaning "the males part", and the females zone is called "*bait elnisoan*" which means "the females part". The same naming criteria is followed for the court yards as they are traditionally named in accordance to the gender of their users, the males court yard is named as "*hosh elrojal*", while the females is called as "*hosh elnisoan*". Generally, in the traditional houses, the demarcation between the two genders is clearly reflected in the naming of all spaces inside the house.

This naming criteria followed in all traditional houses in Sudan is rarely found in most of modern houses designed according to the so called modern/western designs concepts.

Culture, Religion and Space Division:

The division between male and female in different aspects of life and particularly in the domestic environment is a *vita* among traditional communities. Interestingly, the study reveals that the Sudanese traditional house is a composition of domains and zones of users and the demarcation between both genders has always been a main design necessity.

This gender division exists and well defines in the layout of the traditional Sudanese House is found to be promoted by means of socio-cultural oblige rather than religious compulsions. In Islam, there is no certain obligation concerning the spatial location of the female in the house. All the surat (Quran's verses) say concerning the built environment is about respecting others privacy and seeking permission to enter other private domains.

On that basis, this research dealt with the term "segregation of females" from a pure morphological perspective as a socio-cultural factor which has played a major role in the functional zoning and the configuration of spaces inside the house.

Socio-Cultures and Zoning:

The architectural designs of the traditional houses show interesting configuration of functional zones. The study reveals that, the spaces of the traditional house are generally grouped into functionally connected zones or domains according to the genders of which are directly connected or indirectly through an intermediate space connecting both zones. The layout of the spaces and their accesses in each zone is mainly governed by the social interaction between the inhabitants and the visitors such as the receptions, living, dining, and sleeping areas.

Mostly, each house comprises a zone laded as the male's domain or "*beit elrojal*" meaning "male zone" which mainly designated for the males of the family and the reception of the their males guests. The house also, contains a zone for the use of the family zone which is mainly named "*beit elniswan*" "more" private zone to ensure necessary privacy for the females of the family in terms of their living and sleeping. This family domain itself, could be seen as a combination of two domains in relation to users and use; a domain for the family of both genders to gather which is for the personal use of all family members with both benders, and the other domain accommodates spaces that are exclusively for the females' use.

Guests Routes and Spatial Zoning:

The interference between the inhabitants and their guests with their different genders is essential for home environment and for each culture. In the traditional environment in Sudan, hospitality towards guests is one of the cultural and religious compulsions.

The study of the cases shows that the in the traditional house, guests are received at different types of spaces in the house according to their gender. The identity of the guest in the Sudanese traditional environment mainly follows the Arab Muslim culture as the guest to the house is defined foremost as male/female rather than the level of formality of the visit whether formal/informal guest. This traditional identity embedded socio-cultural and religious norms have significant impact on the house spatial zoning and how the spatial morphology of the house will be shaped to define the best route for the guests according to their gender.

It is common fact among all traditional houses that; the family section is essential to be separated from the male guest zone as the male guests are not closely related to the family domain. This describes the spatial relation in the traditional house as "semi-private" front male domain vs "private" back female domain.

The routes of the guests' movements from outside to the inside the house and inside the house are regulated by means of gender segregation using some sort of barriers. The sequences and layout of spaces serving the guests inside the house are, to great extent, influenced by the number of entrances in the house.

The houses having two entrances; one for the male domain and the other for the family domain, show two deep justified graphs or sequences of movement from each entrance. Interestingly, the study found that the female generally private functionally spaces like the kitchen and female bathroom are the deepest spaces from the male entrance with more than 5 levels of spatial depths while the male guest hall "diwan" is very shallow.

On the other hand, the justified graph from the female/family entrance shows that the diwan is the deepest space on the structure with shallow depth for the female functional spaces. For all houses having one entrance, the justified graph clearly shows that the diwan is at the beginning of the graph while the female private spaces are the far end of the graph.

8.2 Spatial Layout and Usage of Spaces

The spatial layout of the house could be seen from different perspectives. It can be viewed according to the relationship between the different domains or zones as well as their relationship with the street "carrier". Also, the relationship between the street and the house or the public and the private plays major role in shaping the internal house space configurations.

The study intended to make a deeper understanding of how each domain and zone is used and which spaces are found in each case of the study. The location of each space into a certain zone is based mainly on the information received from the inhabitants themselves. The data used in this study, combines the architectural plans and ethnographical data from questionnaires, one-day diary tables, interviews and personal observations.

The questionnaire meant to deeply investigate "which place is considered as male, female, personal, and family collective space?". The inhabitants with their different genders were asked about where the family usually meets and for what reasons and if this or that space has duality of use. The interviews also include questions about how the

males and females of the family usually spend their normal week days as well as the weekends with the timing for each routine activity during the day.

The Exterior:

The traditional houses in Sudan are famous with their high external boundary wall to separate the house from the exterior world. Unless there are certain space limitations, all the houses have two entrances/exits; one is for the adult males of the family and their male guests, and the second one are for the family and the female guests use.

Moreover, it is observed that for the houses with a single entrance; the entrance is leading first to the front male domain and then to the back family domain in a parallel spatial relationship.

The Carriers:

The traditional house is always contained by a high external boundary wall to separate the house from the exterior world. Most of the houses have more than one entrance/exit. The usage of the access depend on the gender, the first entrance, which is considered as the main entrance of the house, is mainly used by the men and their male visitors and leading directly to the male domain. The other entrance is used by the females of the family and their female visitors and found to be directly leading to the family domain. It is also observed that the family entrance can be occasionally used by the males of the family.

In some houses, there is only one entrance mainly due to the small size of the plot, shape and/or location of the house plot. In this situation, the study found that; the single entrance usually leads first to the front male domain and then to the back family domain as a common sequential organization of spaces.

The Male Domain:

Each house of the studied samples consists of certain spaces which are mainly used by the male members of the family and their male guests who visit for longer or shorter periods. Those spaces are mainly defined as the "male domain" mainly consists of a diwan and a toilet and shower Bath). In some houses with larger spaces a male veranda and males bedroom can be found in this domain as well.

The study found that this male domain has two types of usages; the first as daily-inhabited area for the male members of the family and the second use is as a reception guestroom also for the male guests.

Generally, in traditional houses this domain this domain functions as a formal reception area, as well as being the place where the head of the family spends all or most of his time. He is always surrounded by the males of the family or visitors, who are welcome any time. In most cases, the diwan is furnished to accommodate beds to serve the guests who planning to stay for longer periods.

The Family Domain:

All traditional houses studied include spaces dominated by the female members of the family with strict use for the males'. Those spaces comprise a domain which provides freedom for the female to practice both domestic and private activities. In this domain, the females perform different types of activities which might need certain level of privacy and "seclusion".

The study reveals that the family gathering spaces are considered as a female zone, but not all the spaces of the female zone belong to the family gathering zone. Some spaces are classified according to the gender of the user (i.e. the female toilet) while some spaces are labeled according to the gender associated with the different kinds of activities, which occur in them (i.e. the kitchen). However, there are certain spaces, which could be labeled as "female" spaces:

- ***The "kitchen"***: In the traditional Sudanese cultures, the kitchen is considered as female space without with very limited use by the males. However, the male children less than 14 years are found to be occasionally using it.
- ***The "kitchen veranda"***: Among all of the traditional houses, this space found to be adjacent to the kitchen. It is a space where women spend most hours of the day, chatting, and/or receiving their female guest beside other private women activities related to their beauty care.
- ***Toilet***: In the Sudanese traditional environments the use of toilets is much gendered. In all the cases studied, there is a separate toilet/shower for each domain.

The Family Gathering Zone:

There is more than one space where the family gathers depends on the family situation. These spaces can be identified as the "family courtyard", "the family hall", and/or the kitchen' veranda (or room). In most of the traditional houses the family courtyard is considered as the "main" gathering space for the members for the family. Yet, in some

houses, the family hall becomes the main gathering space. In few houses the male courtyard can be used for gathering when there are no guests inside the house.

In general, the courtyards are used for gatherings during the good-weather seasons, while the family hall is used for the gatherings during the hot weathers. This custom exists in most of the houses in the traditional environment.

The Private Zone:

This zone consists of the family bedrooms and the family bathroom. In the sSudanese traditional environments, the bedrooms used only for the sleeping for few hours while the the activities expected to take place in bedrooms, such as relaxing, napping or sleeping, are practiced commonly in the gathering zone e.g. courtyards, veranda, diwan and occasionally in the kitchen.

8.3 Space Functional Classification

The syntactic analysis carried out for the selected cases showed that there are some influential spaces in all of the Sudanese traditional houses have very significant role in shaping the spatial layout inside the house. The functional and syntactic analysis made by comparing the spatial properties for houses clearly showed that there are certain labeled spaces represent some core functions and core users. Those spaces are highly connected to the daily domestic life of the family. The study give a rather deep understanding of the nature of the domestic life and how these spaces influencing the special morphology inside the house to meet certain social necessities which should lead to a more general proposition about pattern of spatial configuration and to display possible spatial types within the house.

The study found that the courtyards, diwan, family living area and kitchen are the most spaces to and indicate more controlled movement while moving to and from them. Consequently, the study showed the level of the spatial configuration and integration in the house in order to conform to the means of controlled movement for those spaces. The study results are shown in terms of spatial integration and segregation as shown in the following paragraphs.

The Male Courtyard:

In general, courtyards in traditional houses have certain functional values according to gender of the users. This space is found in all traditional houses studied unless there is certain limitations due to the size or shape of the plot which force the existence of a single courtyard used by all members of the family. It is a corresponding space mainly used by men but family members of both genders still sometimes use them when there are no male guests in the house. Unlike the modern houses, the male courtyard is not offering more choices of movement inside the house especially for the men. The study observed that in the traditional houses this space seems to be very less integrated with the family used spaces.

The Female/Family Courtyard:

Unlike the male courtyard, the family courtyard does not exist in all cases due to some space constraints. Also, the family can still use the male courtyard while there are no male guests on the house. The study reveals that the family courtyard plays the role as the central courtyard created an inner world for all the family members, providing them with the visual and physical privacy they needed and with an open natural area in which the family could sit and join in with social activities with other members of the household. Therefore, this space is found to be well connected to the other spaces.

The Male Hall/Diwan:

In all cases, it is found that this function space is mainly used for receiving male guests. It has many titles, it is known as the diwan, male bedroom or male hall but with the same functional role. In the traditional cases examined, this space is on the segregated side with very regulated and segregated spatial relation with the other family spaces.

The Kitchen:

This is a very essential space found in all cases. Interestingly, this is the most segregated space in the house. Unlike the modern architectural designs, the kitchen mostly lies in the deepest place in the traditional house.

Family Living Room/Veranda:

The "living room" is where the family members gather -during daytime and is found under different titles; eg. *veranda, family hall, sala, living room*, yet they all have similar functional and spatial roles, while in the modern houses its name is limited to the family hall. In all cases, this is the most integrated space in the house with high connectivity to most of the house family used spaces.

Generally, the analysis of the space configuration for the selected cases showed that the diwan and the kitchen are rather segregated functional spaces, while located on the segregated side of the house while the family courtyard, the living room and the male courtyard are rather integrated. Moreover, comparing the basic spatial graphs between the selected houses, the study concluded that there are no significant differences between diwan and the kitchen, between the family courtyard and male courtyard, between family courtyard and living room, and between male courtyard and living room.

8.4 Summary of Findings

In general, the internal spatial configuration of the Sudanese traditional house and its surroundings can be studied in many different directions; it can be investigated as integration between the two prime domains; the male zone and the female zone. The study has suggested that the two spatial domains comprising the traditional houses are equal, but different, in that they are occupied 'mainly' by each gender. The first domain is for the exclusive use of the male and the male guests, and the other is mainly for the female members of the family as well as a reception area for their female guests.

The study followed different approaches to analyze the spatial configuration of the houses as a result of family and socio-cultural influences. In the first approach the study investigates the relationship between the internal spatial configuration and the outside exterior (street). In this approach, the study found that; in relation to the street, in houses with two carriers (entrances) both domains positioned in a front location in the house spatial configuration with direct relation to the street, but with "back to back" spatial connectivity relation to each other. The spatial sequence in limited cases mostly with single carrier shows a front and back positions for the spatial domains in relation to the external. The front is for the male domain and the back is for the family/female domain.

The second approach of the study examines the use of the spatial components and domains. The study analyses the usage of functional spaces in the house in accordance to the routine life of the inhabitants (the male and female/family uses, family gatherings and private zones). It demonstrates that, in the traditional houses both the male members of the family and the male guests use the male domain unlike the modern designed houses where this zone became a formal reception area mainly for the use of the guests while the males of the family mainly spend their day in the family zone. In this approach, the study shows that in the traditional houses the female members of the family have a more defined zone, while this privilege is mostly missing in the modern-designed houses.

In another approach, the study showed that the definition of spaces and the spatial zoning in the traditional houses is named by the inhabitants themselves as a result of cultural traditions rather than religious believes whereas in Islam there isn't a single verse (in Ouran) that says women should be secluded and segregated inside the house during any periods of their lives. Islam as a religion emphasizes the importance of respecting other people's privacy, male or female, and the sacredness of their houses.

The study proves that, among all of the studied cases with their different spatial layout and different number of special components in each domain, there is a clear and common pattern of spatial configuration between the house two major domains from one hand and between the spaces inside each domain from the other hand.

Finally, the study concluded that, the spatial morphological spatial configuration for the traditional Sudanese house clearly demonstrates the cultural and social life pattern of the inhabitants, regardless of the family size, house type, size of spaces and building form.

Chapter Nine:

**Towards contemporary Traditional Housing Architecture:
Conclusions and Contribution**

Learning from tradition might be the best way to create a modern architectural style for our contemporary society.

Although traditional Architecture in Sudan is accumulated experience of successive generations, unfortunately, it is rarely considered by academics and decision makers in Sudan. The building standards and rules issued by the authorities are giving attention only to spatial features not common in the Sudanese cultures and ignored the traditional spaces have direct integration with the socio-cultural norms. The architects are more concerned to design “new” and so called “modern” houses regardless of social structure of family life.

This study has explored traditional Sudanese houses, with a focus on those in the Aburouf traditional neighborhood in Omdurman, one of the three twin cities comprising Khartoum the capital of Sudan.

Aburouf is one of the oldest neighborhoods in the capital. It has been selected as the location for a detailed study. The traditional domestic buildings in this neighborhood have developed traditionally by the inhabitants and the local builders without the interference of

professional architect. Most of the buildings in the neighborhood are built using traditional materials several decades back.

The development of traditional houses in Omdurman city with special emphasis to the Aburouf neighbourhood was observed from literature and from the conducted fieldwork; observing sample houses and interviewing family participants living in traditional houses built without any interface of professional architect. A field survey has been made covering 50 households from different parts in Aburouf. The survey has examined the inhabitants' spatial requirements inside their houses as a result of their cultural and social needs. The study targeted the non-architect-designed traditional houses which were built outside any academic traditions and without the professional guidance of an architect. The study followed a morphological analytical methodology to seek answers to the research questions; the integration of social factors into the house design, their importance and representation inside the Sudanese house.

In order to gain a better understanding of the houses in the selected area and their inhabitants, the study undertakes a field survey based on an ethnographical study consists of observations, informal interviews, constructed questionnaire, daily notes by the inhabitants about space-time occupation as well as an architectural study for the houses spatial layout. The Ethnographical study conducted gave an understanding into the traditional community and into the family's life lifestyle, patterns of use and socio-cultural needs and the general family structure inside the house. The study also made the exact measurements and prepared the scaled floor plan for each house so as to obtain real proportions for the spatial arrangements within the house.

The field survey observed that few modern buildings designed by professional architect have been built recently in the neighborhood by some inhabitants willing to follow new technologies and "modern" styles. But, from the interviews, the survey observed that the inhabitants believe that these modern houses are not fulfilling their traditional needs especially for the females. This observation confirms the main hypothesis of this study that most architects are not giving the adequate attention for the strong relationship between social norms and the space of home while designing the houses.

The study used the space syntax theory as a tool to analyze the data and the spatial layout of 16 houses selected to put them in the form of a graphical representations to give a better understanding for the relationship between users traditions and the spatial layout and also the spatial configuration of the built environment, particularly the interface between public and private domains. The study of the selected cases followed the space syntax graphical spatial analysis method to capture architectural knowledge on the daily family activities happen inside the house spaces (i.e. eating, sleeping, gathering, accepting guests etc.) and how they shape the internal spatial patterns of the house.

In other words, the study used the space syntax beside the ethnographical findings to develop a theory on how a spatial configuration inside the traditional house can be described and analyzed in order to gain better understanding of the fundamental architecture of the house in a traditional environment.

Applying the space syntax method integrated with the ethnographical approach and observing the house as a configuration of spatial user zones rather than function zones some significant interesting challenges and results were obtained.

The interface between the house private interior and the public exterior is an important feature in the architectural design of the house in the traditional environments study showed that the exterior zone is always segregated from the interior domestic life.

Moreover, interestingly, among almost all the houses studies, the deep understanding for the house layout as a result of the social and cultural needs for the inhabitants observes a general model for the house. This model describes the house as a collection of certain zones “domains”; the family and female domain and the male and male guests’. The spatial relationship and sequencing between the two domains is mainly governed by the number of carriers “entrances”. Most of the houses have two entrances leading directly to the male and family domains which describe the spatial relationship between them as a parallel relationship; this suggests that this parallel relationship should be considered as one of the design guidelines.

In other houses with single entrance closer to the male domain and recessing the female domain to the back of the house describes the spatial relationship between the two domains as consecutive relationship. This finding suggests that the design guidelines for the Sudanese house and the architects should consider the house as two domains.

The model also suggests internal spatial structure for the house where the courtyards in both domains are the most integrated spaces within the traditional house, followed by the family hall “veranda” as another main integrated space within the house. This significance of the courtyards in the house and their extensive use of the courtyards draw the attention that this space should be given a special consideration by as one of the design guidelines. Another interesting finding in the study, that the male guestroom (diwan) and the kitchen are at deep levels in relation to each other rather than in relation to the exterior world.

Added finding is that the male domain is found to be more segregated than the female domain. The field survey observed that the modern buildings designed by professional architect usually disregard the female inputs in the design process which makes the interior spatial structure rather inconvenient for the female members of the family. Henceforth, this finding showed that the female needs and special demands within the female domain should be given special attention by architects.

Finally, this study objective is mainly to gain fundamental architectural knowledge about the house in a specific traditional environment. This study mostly tries to assess the impact of social life on the housing environment and build a bridge between the authorities, academics and professionals in the architecture fields and between the socio-cultural needs for the inhabitants.

The best contribution to this study is to search for architectural deep knowledge can be made from an analysis and discussion of the plan layout of houses in a specific cultural context and to relate this to the inhabitants' way of life. This knowledge is meant to encourage the architects and decision makers to think about the house architectural design as product of socio-cultural norms and interaction between home and users rather than “unique” concept and form and modern construction techniques.

Lastly, we can strongly argue that, unfortunately, old buildings are replaced not because they are useless or inadequate to the way of life, but generally because of the magnificence of newness.

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