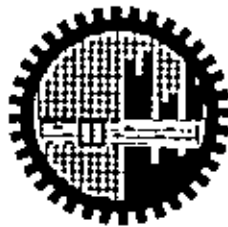# CRITERIA OF RENTAL HOUSING CHOICES ACCORDING TO FAMILY STRUCTURES IN DHAKA CITY

By

KASPHIA NAHRIN

MASTER OF URBAN AND REGIONAL PLANNING

DEPARTMENT OF URBAN AND REGIONAL PLANNING
BANGLADESH UNIVERSITY OF ENGINEERING AND
TECHNOLOGY, DHAKA

June 2009

CRITERIA OF RENTAL HOUSING CHOICES ACCORDING TO FAMILY STRUCTURES IN DHAKA CITY

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A Thesis
Submitted to the Department of Urban and Regional Planning in
partial fulfillment for the degree of
Master of Urban and Regional Planning

DEPARTMENT OF URBAN AND REGIONAL PLANNING
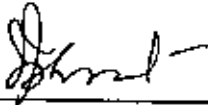BANGLADESH UNIVERSITY OF ENGINEERING AND
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THESIS ACCEPTANCE FORM

Criteria of Rental Housing Choices according to Family Structures in Dhaka City

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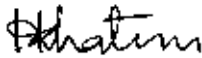### KASPHIA NAHRIN

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Candidate's Declaration

I hereby declare that this thesis has been prepared in partial fulfillment of the requirement for the Degree of Master of Urban and Regional Planning at the Bangladesh University of Engineering and Technology, Dhaka and has not been submitted anywhere else for any other degree.

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Acknowledgement

Abstract

Dhaka, the capital of Bangladesh is facing high urbanization rate and acute housing crisis. Most of the middle-income households do not own their house, and they live into rented houses. Several factors influence the decisions for choosing residential area and a rental house in a locality by the middle-income families and it varies with respect of the family structures. The dwellers make some negotiations among the choices regarding selection of location and type of house. The objective of the study is to address the relatively importance of rental house locations and a rental apartments choice criteria by the middle-income dwellers by applying Analytic Hierarchy Process (AHP). The study attempts to determine the relative weight of selected variables on the basis of elicitation through questionnaire survey of three types of middle-income single families: type A- having no school going children, type B- having school going children and type C- having children who are older than school going age.

The study reveals that all types of middle-income families give priority to proximity to workplace for selecting present apartment location; it is high for family type A. The families type B prefer closeness to school equally to the distance to workplace. Then comes the importance of distance to market that is slightly more important than distance to bus stop to all of the family types. These families evaluate more the physical attributes like planning of neighborhood, municipal service, and road width compared to social attributes. Proximity to open area finds least importance to all of the family types. The residents are hardly satisfied completely with the housing environment. The difference of the comparative importance of the variables for selecting the existing apartment location verses the preferred apartment location is predominant for planning of neighborhood and municipal facilities.

All of the family types evaluated the factor affordability mostly for apartment selection, since, family type B consider it most important. Utility services get the second priority and number of bedroom get the third rank. Number of bedroom has relatively more importance to the families that have higher household size. All of the target families have compromised the qualities of utility services and availability of air and sunlight to attain other apartment qualities in the present apartment.

Table of Content

List of Tables

List of Maps

List of Figures

List of Abbreviations

AHP	Analytic Hierarchy Process
BBS	Bangladesh Bureau of Statistics
BUET	Bangladesh University of Engineering and Technology
CAB	Consumers Association of Bangladesh
CBD	Central Business District
CI	Consistency Index
CR	Consistency Ration
DCC	Dhaka City Corporation
FAR	Floor Area Ratio
GDA	Greater Dublin Area
GIS	Geographic Information System
GoB	Government of Bangladesh
MNL	Multinomial Logit
NL	Nested Logit
QFD	Quality Function Deployment
RI	Random Index
SPSS	Statistical Package for Social Science
STP	Strategic Transport Plan
Tk.	Taka
US	United States
WAM	Weighted Arithmetic Mean

Chapter 01

Introduction

Chapter-01: Introduction
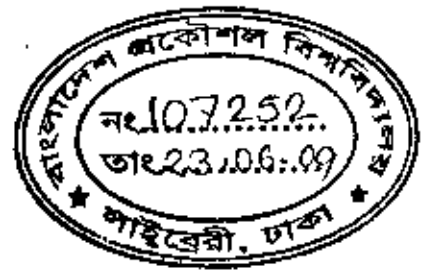
1.1 Background of the Study

Dhaka, the capital of Bangladesh is facing high urbanization rate and acute housing crisis. Most of the people of the city cannot afford housing with habitable environment. Owner occupancy dwelling of the city is only 30 percent (UNCHS/World Bank, 1992). This indicates that 70 percent people of the city live into rented apartments or houses. Most of the middle-income households do not own their housing, and they live into rented apartments or houses. The private individuals' housing mostly operates rental-housing market. Though large proportion of the residents of the city is tenant, very few researches were undertaken to identify the choices of tenants for rental houses. The preferences of the tenants for selections of housing location and house quality have not been sufficiently recognized. In the regulatory framework of sustainable housing should address the choice of the tenants at local and national level. It is important to know about the consumer's appreciation in terms of dwelling and environment characteristics (Kauko, 2007). This study attempts to deal with the preferences of the tenants in Dhaka City.

The research primarily includes middle-income group of people whose monthly income range is in between Tk. 20,000 to 50,000. The study targets the middle-income families, as they are the largest segment of population (60 percent) in Dhaka City (Islam, 2005). Though investment in housing is a profitable sector, middle-income families have less affordability for purchasing a house in Dhaka City (Zahur, 2008; Sharmeen, 2007). Thus, most of them look for the rental houses for living in the city. Several factors influence the decisions for choosing residential area and a rental house in a locality by the middle-income families. According to Khatun (2003) household's housing needs and aspirations are different in various stages of life cycle. This indicates that the relative importance of decisive factors for selection of locality and house standard varies with respect to family structures. The study attempts to determine the housing preference profiles of middle-income nuclear families who live in privately owned rented apartments. For this purpose, three types of nuclear families are focused: the families without school going child, families with school going children and families that have children above school going age.

1

The role of location and quality in housing consumption is increasingly important for builders and developers as well as for planners and policy makers. Geophysical, environmental, political, social, economical and regulatory factors interact to define the housing possibilities of the dwellers for decision regarding rental-housing selection. However, the dwellers make some negotiations among the choices regarding selection of a housing location and type of house. Even, sometimes the decisions are arbitrary. Individuals choose their home location taking into account not only their daily activity schedules, but also their most preferred mode of transport. It has been defined as a self-selection process (Peng, el al 2007). Other researchers in this field identified various factors like land features, transport condition, political regulation and law, community environment, quietness of the area, distance from city center, schools, commercial facilities, and green area, service infrastructure and so on for housing area choice (Bender, et al 1997; Chaung, 2001; Kauko, 2007). Considering the socio-economic condition of the people in Dhaka City the study attempts to address the relative importance of the variables like distance from workplace, school, market, and bus stop, plan of neighborhood, condition of municipal services, road width, social status, proximity of relatives or colleagues and proximity of open areas for residential location choice.

A number of factors interact with the house choices of the middle-income tenants for decision-making. The tenants want to adjust with the requirement, preference and affordability to choose the rental house. This study also focuses on the attributes for selecting a rental house by the tenants in the city such as affordability, condition of utility services, number of bedroom, number of toilet, availability of air and sunlight, and number of floor of the apartments.

The middle-income households take decisions regarding rental house quality and locations considering a number of attributes that are influenced by preferences and requirements. They try to adjust with their preferences and affordability to choice a residential area and to rent a house. A preferred house can fulfill all the optimal requirements and choices of the tenants within their affordability. The tenants can achieve all required locational as well as quality indicators of the houses altogether in expected level in a preferred rental house. However, the families hardly achieve all of the options altogether at required level for selecting the present house location and

2

standard. Most of the time, there remains some gap between the preferred house and rented house. The research attempts to explore the gap between relative weights of the present rented house and preferred one in the regard of the location and standard.

Considering the diversed demand, the consumption pattern of housing comprises a set of different preference profiles. From operational point of view, some outcome genarated through ranking location attributes with respect to their relative imporatnce by the tenants. The procedure of ranking the locational attributes of house location as well as type may be based on comaparision of the attributes by Analytic Hierarchy Process (AHP) (Kauko, 2007). To address the relatively important preferences of the criteria to the middle-income dwellers for selecting rental house locations and rental house, the study applies AHP. AHP enables the decision maker to express his qualitative judgments in a quantitative format. According to Chauhan et al. (2008) there are two primary benefits for application of AHP. AHP is a technique for breaking down a complex problem with many factors by relating pairs of factors. The decision makers can connect quantitative analysis and the subjective judgment of the factors. Therefore, the study determined the relative weights of the housing choice indicators by aggregating the preferences of the tenants reside in Dhaka City.

1.2 Objectives of the Study

The preferences of rental housing location choices and selection of houses are subjected to a number of attributes. The research is outlined based on the hypothesis that relative importance of different attributes for residential location and rental house selection by the middle-income families are influenced by the family structures.

The main objectives of the research are:
1. To assess relative importance of determinants for location choice of rental houses in Dhaka City with respect to the family structures;
2. To determine comparative weight of the facilities and standard criteria for selecting rental houses by the tenants according to their family structures in Dhaka City.

1.3 Rational of the Study

The present housing shortage in Dhaka City will be increased drastically in future unless proper housing plan is prepared. It is becoming crucial for public organizations and private developers as well as planners and policymakers to be aware about the preferences of the rental housing consumers. Their choice in terms of their diverse strategies and lifestyle segmentation has become important to know. For the increasing housing crisis in Dhaka City, both public and private mass housing planning should follow the requirements and preferences of the middle-income group of people that covers a major economic class stationed within the city. Nevertheless, it is a matter of fact that there is no research to address the housing choices the middle-income families according to different family composition. This study focuses on exploring the prioritized options of households for selecting residential areas and rental houses to live within the city in the perspective of diversity in family structures. This also determines the gap between relative weight of the most preferred options and selected present housing environment by the tenants. The findings obtained by primary serveys of the dwellers would assist to enhance further housing market analysis. Furthermore, this researh would facilitate the inititives of public and private housing schemes within the Dhaka City as well as other urban areas of the country .

1.4 Scope of the Study

Residential location choice and the rental house choice of the tenants should be considered in national housing plan with great care. The scope of the study is confined to the analysis of the variations of tenant's housing choice according to family structures in Dhaka City. Only middle-income families are considered as target population. The study includes two major issues of decision making regarding selection a rental apartment: location and house quality parameters by the middle-income nuclear families.

The study determines the relative weight of different spatial, physical, social, environmental attributes to different types of middle-income nuclear families in Dhaka. The study depicts the variance between comparative weights of the preferred housing location and the location they selected for living. This represents the relative picture of the decisions regarding residential location of the tenants. Moreover, this

study represents the comparative importance of housing qualities that are considered by different types of families for selecting rental houses. The study also determines the trade off among the attributes of present house and preferred house by middle-income nuclear families in Dhaka City.

1.5 Limitations of the Study

The findings of the study on quality and location specific housing consumption by different family structures are achieved at the cost of some undoubted and unavoidable drawbacks. Few constraints and limitations could not be completely overcome through conducting the research.

A number of factors are associated with decision-making for rental housing area and house selection by the dwellers. It was not possible to address all of the criteria for housing decision making in Dhaka by the study. Only some spatial, social, physical, and environmental factors are considered in the study in some selected sample residential areas. There is a great variance of the choices among the individuals. Even there could be different views among the family members that could not be addressed in the study.

There could be spatial variations of the housing decisions in Dhaka City by the dwellers. However, the resource limitation restricted the scope of the study to determine spatial variation all around the city regarding housing preferences by the middle-income tenants. For the same reason, the correlation of the decisions of housing choice compared to family income and expenditure of the families are denied in the study. Moreover, in the study there is lack in modelling robustness, restrictiveness of averaging the elicitation of the relative weight of the criteria by the respondents.

The consistency of determined relative weight of the indicators by AHP depends on complete logical values of each pair of attributes. As such single input of illogical value of any pair of attributes distorts the complete result. As the study depends on the responses of the households, the final output could be distorted. Moreover, the questionnaire of AHP is comparatively rigorous and intricate for some dwellers to

reply appropriately by proper understanding. Since, the study depends on the response of the dwellers to determine the relative importance of the criteria according to the tenants. Again there are no sufficient relevant studies regarding this subject matter on the context of Dhaka City. So, it was not possible to get a picture of Dhaka in the form of secondary data to do comparative judgment of the findings.

1.6. Organization of the Thesis

Organization of the thesis is arranged by the following chapters.

Chapter 01 is introduction that represents background of the study, objectives of the study. Justification, scope and limitations of the study have been also discussed in the chapter. This chapter also represents how the thesis has been organized.

Chapter 02 consists of literature review and theoretical framework. The chapter attempts to clarify the terminologies regarding rental housing, criteria of private rental residential location choice and house choice. The chapter also discussed the theories of decision-making as well as Analytical Hierarchy Process (AHP). Empirical studies of housing decision-making and an overview of Dhaka's housing rental market are discussed in the chapter.

Chapter 03 is methodology that the study have followed to achieve the objectives. This chapter has been represented sample design, basis for selecting the study areas. The chapter also clarifies the process of data collection, data preparation and analysis.

Chapter 04 provides the study area profile, socio-economic characteristics of the sample households. Furthermore, this chapter presents the physical characteristics of the studied residential areas study areas and the apartments where the sample people reside.

Chapter 05 opens up the possibilities to show the relative importance of different locational attributes according to the middle-income tenants. The chapter attempts to provide a comparative picture of rental housing location choices according to family

structures. Moreover, it presents the gap of relative importance of the different locational attributes of the present house with the preferred house.

Chapter 06 presents the relative weight of different standards for rental apartments according to the sample middle-income tenants. The chapter also provides a comparative analysis of the rental house qualities by different types of middle-income households. Moreover, it presents the comparison of the different factors of the present house with the preferred house.

Finally, chapter 07 concludes summery of the findings, general observations regarding the house location choice and house choice of middle-income families in Dhaka City. This chapter also provided some recommendations and prospect for future research works.

Chapter 02
Literature Review and Theoretical Framework

Chapter-02: Literature Review and Theoretical Framework

2.1. Introduction

Every research should be based on some specific concepts that direct the approach to attain the objectives. The study developed a theoretical framework in order to develop concepts and to get a complete picture of rental housing choices in Dhaka City. A number of books, published journals, magazines, unpublished thesis and web based research papers have been consulted to attain a clear knowledge on this field. It helped for better understanding and also opened new windows of imagination. . This chapter attempts to clarify the terminologies regarding rental housing, criteria of private rental residential location choice and house choice. The chapter also discussed the theories of decision-making with special emphasis on Analytical Hierarchy Process (AHP). Empirical studies of housing decision-making and an overview of Dhaka's housing rental market are discussed in the chapter.

2.2. Terminologies

This part of the study attempts to clarify different terms relating to the private rental-housing choice by the middle-income families.

2.2.1. Middle Income Group

The middle-income group is those people or households whose monthly income is in the middle of the income range of overall population. According to Islam (2005) 50 percent people (3.75 million) of Dhaka City Corporation area and 53 percent of Dhaka Metropolitan Area (6.4 million) belong to middle class who are divided in three subgroups:

a) Lower-middle: monthly household income is in the range of Tk. 5,000-10,000,

b) Middle-middle: monthly household income is in the range of Tk.10,000-25,000, and

c) Upper-middle: monthly household income is in the range of Tk.25,000-50,000.

According to STP (2005) 48.6 percent people of Dhaka City are middle-income households whose monthly income ranges between Tk. 12,500- 55,000.

During the reconnaissance survey in the study areas, no apartment dwellers was found whose household income was less than Tk.20,000 per month. So, the research only targeted the households (as middle-income household) whose monthly income ranges between Tk. 20,000 to 50,000.

2.2.2. Middle Income Area

The middle-income area is the area where the dominant households are from the middle-income family groups. There is no spatial demarcation of the residential areas according to the income group in Dhaka City. The study assumed the residential areas as middle-income whose land prices are moderate compared to the land prices of other areas. It is apparent that there is wide variety in land prices all over the residential areas in Dhaka depending on the basis of number of attributes. The study selected the residential areas as middle income on the basis of the land price determined by Shohag et al. (2005).

2.2.3. Tenants

Tenants are the households paying a prearranged rent for the exclusive occupation of all or part of a dwelling unit. This tenure also includes both formal and informal situations. That is to say, the term renting embraces households who pay a regular sum of money to the landlord irrespective of whether a formal contract has been issued. . The landlord can be a government institution, a cooperative or a private individual. A landlord in a self-help settlement establishes a verbal contract with the tenant. So long the tenant is recognized that there is a contractual relationship with the individual who has ownership rights over the property and a regular payment is being made.

2.2.4. Rental House

The rental house can be defined as the house that the landlord let the tenants to occupy all or part in the contract of a regular payment of a sum of money by the tenants. In general, the rental house can be subdivided into two types:
   a) Public rental housing and
   b) Private rental housing.

Public rental house is owned by government institution or co–corporative. Private individuals or households own private rental houses. Private rental houses can be

individual house like bungalow or multistory apartment. The study only focuses on the house type of privately owned rented apartments where the sample middle-income nuclear families reside.

2.3. Household Types

There are two basic types of families: nuclear and extended. The study only deals with the requirements of housing by the nuclear families. In nuclear families parents live with their unmarried children. There are different structures of the nuclear families. Abu-Lughood and Foley (1960) classified nuclear household life cycle in seven stages. Among the stages, four taxonomies are before marriage of children that are as follows.

Stage 1: Married – newly married;

Stage 2: Pre-child – married, awaiting for first child;

Stage 3: Child-bearing – married with child under six years;

Stage 4: Child-rearing – married with all children over six years.

According to Kauko (2007) and Bender et al. (1997), proximity to education services is important for housing choice that fits with socio-demographic housing theory. So, the study attempted to classify the nuclear families on the basis of school going age of children. The study considered the first three satges of families (with no school going child) according to Abu-Lughood and Foley (1960), as one group (Type A). Moreover, the study classified the child-rearing family type in two groups according to age of the children such as families with children of school going age and more than school going age. That indicates, among different categories of nuclear families the research attempts to explore the housing preference of the following three types of households.

2.3.1. Type A: Nuclear Families without School-going Children

This category defines the nuclear-family types who are newly married and having no children. This also covers the families whose children are young enough to go to school. The young families whose children are not living with them are also included in this category of household type.

10

2.3.2. Type B: Nuclear Families with School-going Children

This form of nuclear family has at least one school going child. This type also covers the nuclear families that have some young children below school going age or children older than school going age along with school going children.

2.3.3. Type C: Nuclear Families with Children Above than School Going Age

The category comprises the type of nuclear families who have children, above than school going age. The children of the families can go to college or universities. Moreover, the children can also be earning member of the families.

2.4. Criteria for Residential Location Choice

The set of attributes are very important for any research. The variables of location choice for housing vary country-to-country, society-to-society. This is mainly responsive to the socio-economic condition of any country. There are several determinants for choosing rental house. Factors to be considered in the selection of rental housing differ from person-to-person and family-to-family. Morrow and Daley (2005) considered the following attributes to house location selection.

- **Environment:** Traffic, parking for tenants and visitors, temporary parking for service and delivery vehicles, noise, smoke, dust, odors, adjacent dwellings, general neighborhood, access to public transport, access to shopping areas.

- **Health and safety:** Crime rates (check with local police), pets (restrictions on pets in building and neighborhood), fire exits and routes present and clearly marked, lighting on streets and walks, police protection, building security, railing on stairways, locks on doors, locks on windows, conformity with fire codes, carbon monoxide.

- **Services:** Maintenance and repair, garbage and trash collection, care of public areas and building exterior.

- **Recreation:** Play areas for children, space for social gatherings and hobbies, rules for parties, proximity to neighbors for noise.

- **Design characteristics:** Outside appearance, view from windows, interior space, privacy, storage, laundry facilities, wall and floor coverings, room arrangement, size of rooms, sound insulation, lighting, efficiency and convenience of kitchen and dining areas, appliances, work areas.

- **Utilities:** Heating and cooling systems, telephone and television installation available, convenient light switches, ventilation to exterior in bath and kitchen, low plumbing noise level, adequate number of electrical outlets, exposed wiring, leaky plumbing.

Among the above criteria some are not highly applicable for the context in Dhaka City. For example, restrictions on pets in building and neighborhood, storage, laundry facilities, sound insulation, heating and cooling systems, building exterior etc. Some other researchers have suggested numerous criteria for the housing location selection. These decision factors include availability of transportation facilities, cost of transportation, cost of living, availability and nearness to raw materials, proximity to markets, size of markets, attainment of favorable competitive position, income and population trends, cost and availability of utilities, government attitudes, tax structure, community related factors, environmental considerations, assessment of risk and return on assets (Ko, 2005).

Khatun (2003) determined the variables for selection of a particular destination after intra-urban migration by the original residents of old Dhaka (*Dhakaiya*) from old Dhaka. The study classified the reasons in six headings that are: neighborhood characteristics, economic reasons, dwelling space, familial opportunity, proximity to school and work and other factors. Good environment, good accessibility, open and clean neighborhood and secured area are considered as neighborhood characteristics. The factor of low land price and economic affordability are treated as the economic reason. Enough space and independent house are considered as familial opportunity. Factors of close to school and work are treated as indicator for location choice. The other influencing factors are comfort, new house, government accommodation, low expenditure and no other option."

2.5. Housing Location Choice Attributes for the Study

For the purpose of selection of the housing location choice criteria, primarily a set of criteria were selected considering the socio-economic characteristics of the households of the study areas. Then a reconnaissance survey was conducted to middle-income nuclear families to determine most important location choice criteria.

The finalized ten determinants are categorized into four groups. Following ten attributes were finally selected for the study as housing choice location criteria.

2.5.1 Spatial Attributes

The selected spatial attributes for the study are discussed below:

□ **Distance to workplace**

Proximity to workplace expressed in kilometer is a significant criteria by the household to choice locality to rent house. It is not easy to identify whether the choice is conditioned on another or vice-versa. There are some studies that assume that the influence of residential location on job location decisions is as important as the influence of job location on residential location (Abraham and Hunt, 1997; Romani et al., 2003; White, 1998, Freedman and Kern, 1997, Khatun, 2003). According to Islam (2005) access to work and distance of work place from home is supreme important for house rent determination. Therefore, both decisions are treated simultaneously in the earlier empirical studies from different point of views. This indicator not only defines proximity to workplace but also considers the level of accessibility and availability of mode of travel, travel time and cost to workplace.

□ **Distance to school**

The neighborhood concept of Perry defines that the physical environment of neighborhood should be like that a mother knows that her child will have no traffic streets to cross on his/her way to school (Gallion, 1949). It is apparent that in Dhaka a number of families provide more importance on location of school of children while selecting rental house location. According to Kauko (2007) and Bender et al. (1997) proximity to education services is important for housing choice that fits with socio-demographic housing theory.

□ **Distance to market**

Distance to market can be defined as distance of house from kutcha bazaar, grocery shop, shopping center, departmental store or other shopping facilities. Simonds (1961) expressed shopping center as an important feature of a community. Bender (2007) identifies that proximity of market place is perceived as important factor for house quality.

❑ **Distance to bus stop**

A number of researches pointed out the importance of accessibility and convenient transport of the dwellers in the city (Kauko, 2007; Bender, 2007; Palma, 2005; Chuang, 2001; White, 1988). It is apparent that almost half (44%) of the trips of the residents in Dhaka City are dependent on buses that carry 70% dwellers of the city (STP, 2005). Buses are the cheapest travel mode in the city. As a result, a number of dwellers may prefer to rent a house close to the bus stop to minimize the travel cost and increase the accessibility.

2.5.2 Physical Attributes

The selected physical attributes for the study are discussed below:

❑ **Planning of neighborhood**

Deitz (1998) gave empirical evidence on the relationship between employment and residential location and proved that access to work was not the main determinant of residential location. He said that some other factors such as neighborhood characteristics were found to be more likely to influence location decisions. Planning of neighborhood increases the convenience of the life as well as attractiveness of the residential areas to live.

❑ **Municipal services**

Municipal government is responsible for municipal services provision within the municipal jurisdiction areas. Municipal services such as solid waste management, streetlight, sewerage system, storm sewerage management, are also important for residential locational choice (Huh and Kwak, 1997; Morrow and Daley, 2005). Municipal services increase the convenience and comfort of the city dwellers and reduce sufferings.

❑ **Road width**

According to Islam et al. (2007) road width is an important factor that have influence on land price. Road width determines the accessibility as well as availability of other facilities. So the residents importantly consider road width for housing location selection. On the contrary, narrow roads in front of the house increase sufferings of the residents.

14

2.5.3 Social Attributes

The selected social attributes for the study are discussed below:

□ **Social status**

Kauko (2007) explained that the prestige of neighborhood is very important factor for market driven urban renewal. Richardson, Vipond and Furbey (1974) have pointed out the importance of social class of neighborhood for residential location selection.

□ **Proximity to relatives and colleagues**

Socio-demographic urban sociology explains that a number of families prefer to live close to relatives, friends and colleagues. It happens that a number of families look for rental apartments where they can find aquatints. This increases the social cohesion and builds social capital.

2.5.4 Environmental Attribute

□ **Open area**

Simonds (1961) pointed out the importance of recreational area in a neighborhood. He also provided desirable environmental features of the community that are greenbelt, river, ridge, cliff, ravine or other physical barrier. He also expressed the idea that a park gives a community its identity. The research of Bender (2007) shows that the distance to green area (i.e. park, lake, play ground) is very important factor for housing quality. Open areas are the breathing space of the city dwellers.

The list of the selected attributes for house location choice by the middle-income nuclear families for the study is shown in the Table 2.1.

Table 2.1: Selected Attributes for House Location Choice for the Study

Attribute Group	Sl no.	Attribute Name	Comment
Spatial Attributes	1	Distance to workplace	Distance in Kilometer form house to work place
	2	Distance to school	Distance in Kilometer form house to school of the children of the families
	3	Distance to market	Distance in Kilometer form house to nearest kutcha bazaar, grocery shop, shopping center, departmental store or other shopping facilities
	4	Distance to bus stop	Distance in Kilometer form house to nearest bus stop
Physical Attributes	5	Planning of neighborhood	Neighborhood areas where residential community plan is implemented properly
	6	Municipal services	Availability of the services for which municipal government is responsible to provide
	7	Road width	Front road width of the apartment in feet
Social Attributes	8	Social status	Prestige of the neighborhood
	9	Proximity to relatives and colleagues	The residential areas where relatives and colleagues reside and distance in Kilometer from their house.
Environm ental	10	Open area	Recreational area in a neighborhood such as park, lake, play ground

2.6. House Choice Attributes for the Study

Primarily sets of house choice determinants were selected on the basis of literature review. The short listed attributes were evaluated through reconnaissance survey of the middle-income apartment dwellers. Based on the priorities provided by them, finally six apartment selection criteria were finalized. The following six attributes are selected as house selection criteria for the study.

2.6.1. Affordability

Affordability is very important indicator for apartment selection. This is expressed in monthly house rent of the apartment. This can also be defined with the willingness to pay by the tenants for the purpose of house rent. According to Khatun (2003) the tenants prefer to move to better house with increase in income. Affordable cost is always a goal for capital expenditure reasons, but many important goals exist simultaneously in the residents' selection in housing and at times these goals may conflict (Chauhan et.al, 2008). This factor constraint them to select most preferable house location as well as type of house.

2.6.2. Utility Services

According to Hossain et.al (2008) a great percentage of people change rental house for the problems of utilities. Chuang (2001) pointed out that stable utility supply increases the inclination for choosing a house. Utility services increase the conveniences and comfort of civic life.

2.6.3. Number of Bedroom

Hossain et.al (2008) shows that inadequate number of rooms, one of the major problems faced by the growing households in the city of Dhaka. Requirement of more number of bedroom forces the households to shift their living place. The number of bedroom is very important indicator for house rent. The indicator also presents the size in square feet and as well as design of the apartment.

2.6.4. Number of Toilet

The attribute number of toilet represents the space of the house. Hossain et.al (2008) noted that requirement for larger home is important attribute for housing mobility. Sharmeen (2007) noted that this factor influences the rent of house, eventually the preference of a house. Bender et al. (1994) suggested that the structural variable like number of bathroom is significant for house selection.

2.6.5. Availability of Air, Sunlight

Mahmud (2007) has pointed out that about 94 percent of buildings of the city someway have violated the *Building Construction Rule (BCR)*, 1996 (GoB, 2006) or deviated from the approved plan. The common practice is to use up the whole land space between the high-rise and next building, thus blocking out sunlight and air. As a result, there are a number of apartments that cannot find sufficient air and sunlight. Dwellers consider this issue while looking for a rented apartment in Dhaka City.

2.6.6. Number of Storey

If there is no escalator in an apartment, the household considers the number of floor of the apartment for renting. For instance, the families who have old or sick members prefer lower levels of apartments to live. Furthermore, some dwellers do not prefer the top floor for the high temperature of the rooms during summer.

17

The selected house choice attributes by the respondents for the study are enlisted in the Table .2.2.

Table 2.2: List of the selected house choice indicators

Sl. No.	Name of Indicator	Comment
1	Affordability	Willingness to pay as percentage of monthly income by the tenants for the purpose of house rent
2	Utility services	Availability and quality of utility services
3	Number of bed room	Number of bedroom of apartment the respondent
4	Number of toilet	Number of toilet of the apartment of the respondent
5	Availability of air, sunlight	Availability of air for ventilation and sunlight
6	Number of storey	Level of the apartment in the building.

2.7. Theories of Decision-making from Multiple Choices

Extensive effort has been devoted for solving location problems employing a wide range of objective criteria and methodology used in the decision analysis. Geoffrion (1978), for instance, includes decomposition, mixed integer linear programming, simulation and heuristics that may be used in analyzing location problems. He noted that a suitable methodology for supporting managerial decisions should be computationally efficient, lead to an optimal solution, and be capable of further testing. Other researchers stress the importance of multiple criteria that must be included in the decision analysis (Erlenkotter, 1975). Many methodologies have been utilized to solve the facility location problem. Baumol and Wolfe (1958) have solved the location problem for minimum total delivery cost with nonlinear programming. Others have incorporated stochastic functions to account for demand and/or supply (Rosenthal, White and Young, 1978; Wesolowsky, 1977). Other approaches that have been employed include dynamic programming (Geoffrion, 1978: Saaty, 1996; Tansel, Francis and Lowe, 1989), multivariate statistics using multidimensional scaling (Asami and Walters, 1989) and heuristic and search procedures (Kuehn and Hamburger, 1963). In many location problems, cost minimization may not be the

most important factor. The use of multiple criteria has been thoroughly discussed in the literature of Schniederjans and Garvin, (1997) and Sweeny and Tatham (1976).

Sophisticated consumer choice modelling methodologies have been proposed by Di Clemente and Hantula (2003) and Guerin (2003). Methods based on stated (as opposed to revealed) choices allows to identify consumer choice empirically using semistructured interviews. Within this tradition of housing research known as perceptions/preferences modelling. Many other specific methodological issues have gained attention too, such as group decision-making (Molin et al., 1999), neighbourhood aspect (Galster, 2001). Multidimensional decision analysis techniques comprise a sophisticated tool for land use related or environmental problems that require behavioural or prescriptive treatments (Gregory et al., 1997). While this genre fits well into the housing consumption and preference modelling tradition, it eschews the more philosophical debates within economic theory and methodology that tend to be attached to the use of stated choice methods. A related multi-criteria decision making methodology has been applied for the determination of the utility degree and market value of real estate using experts' assessments of preference decisions on competing alternatives (Kaklauskas et al., 2007).

Multidimensional value and benefit refers to a generic quality measure that goes beyond monetary value or transaction price (Gregory, 2000). According to this modelling tradition the elicited preference models are suited for making monetary values (i.e. market prices) commensurable with non-monetary (i.e. environmental, social, cultural, aesthetic, ecological etc.) values, for various locations or housing bundles (Kauko, 2002, 2003; 2006). In a related strand of inquiry, Daly and colleagues (2003) advocate the 'behavioural paradigm' in residential valuation, which puted more emphasis on the demand or consumer-driven factors related to preferences and intangible quality components.

2.8. Empirical Studies Focusing Housing Choice

Anas and Chu (1984) employed Multinomial Logistic and Nested Logit Model to predict the housing location choice and mode choice in travel work from 1970 U.S. census data aggregated to small zones of Chicago SMSA. The estimated models are

then used to drive the house rent, travel time and travel cost elasticities of location demand. The elasticities are also compared and found to agree with those obtained from other discrete models.

Khatun (2003) shows that indicators that influence the choice of destination are not always related to the factors that cause intra-urban migration of the original residents of old Dhaka (*Dhakaiya*). The study reveals the assumption that through intra-urban migration, a household adjusts its housing need to a change of household structure and of socio-economic condition. The mobility pattern is highly controlled by the housing opportunities. The literature demonstrates that the household's housing needs and aspirations are different in various stages of the lifecycle. The study examined importance of major six influential factors for selecting a particular area after intra-urban migration by the original residents from old Dhaka. The study determined that characteristics of the neighborhood hold the most importance to select new destination. Economic reasons are the second most important factor in selecting a destination. After then dwelling space, familial opportunity, proximity to school and work, and other factors are important respectively.

The research of Palma, et al. (2005) have succeeded in developing and estimating a model of residential location at commune level for the Paris region, with a rigorous econometric treatment of the endogeneity of housing prices. Further, the study has integrated UrbanSim with METROPOLIS, providing the first experience of connecting dynamic models of land use and traffic. By coupling these models it was possible to represent the endogeneity of residential location and traffic, given a distribution of job locations.

Vega et al. (2006) shows that the Greater Dublin Area (GDA) has experienced the extraordinary growth in population and employment during the last decade together with the unprecedented increase in house prices. These had significant repercussions for travel behavior and commuting patterns. In the study the researchers present the preliminary analysis of the simultaneous estimation of residential location and mode of travel to work. The study provides estimation results for the effects of socio-economic characteristics on travel behavior. Several discrete choice model structures

are described and results are shown for multinomial logit (MNL) and nested logit (NL) models.

Kauko (2007) assessed the determinants of intra-urban housing location attractiveness using the AHP tool. He attempted to understand the conceptual factors behind the resulting assessment in Budapest. In another study (2006) he reports some preliminary cross-country evidence on housing consumer preferences, based on expert elicited preference profiles generated by AHP. The findings indicated fundamental differences between the two housing market contexts: metropolitan Helsinki (in 1998) and Randstad Holland (in 2003). In Helsinki housing quality and a spacious environment found more important by the respondents. He determined location choice criteria in regard of the two aspects of 'accessibility' and 'pleasantness'.

The study of Chauhan et al. (2008) examines the significance of decisions in the housing project. The study applied AHP for decision making to the housing selection and mass housing planning in Surat, India. Researchers have integrated goal programming into a decision-support system with Geographic Information System (GIS) technology. The study attempted to provide a guideline to residents' selection, creating a methodology for decision optimization in the existence of conflicting goals. The overall objective was to select a housing scheme is the affordable to the different income groups. The study determined that geophysical, environmental, political, social, economic and regulatory factors interact to define the housing possibilities.

Hossain et al. (2008) conducted the study to identify the factors that influence the decision regarding the housing location change of the tenant households in some selected middle-income areas in Dhaka City. The result shows that a significant number of households shift their place of residences within the same area and peoples usually do not want to live in the same place more than 4-5 years. Furthermore, they identified that requirement of better and spacious housing are the key causes for shifting the place of residence. Besides tenants are forced to change their residential location due to rapidly rising house rent and conflict with the land lord/lady which arise mainly for amount of increasing rent and amount of water use.

2.9. Analytical Framework

The Analytic Hierarchy Process (AHP) is a decision-support technique. Rather than prescribing a "correct" decision, the AHP helps people to determine one. Based on mathematics and human psychology, the AHP provides a comprehensive and rational framework for structuring a problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

2.9.1. The Steps of AHP

AHP is a hierarchical representation of a system. A hierarchy is an abstraction of the structure of the system, consisting of several levels representing the decomposition of the overall objective to a set of clusters, sub-clusters, and so on down to the final level. The cluster or sub-clusters can be forces, attributes, criteria, activities, objectives etc. A step-by-step description of the method according to Eddie, et al (2001) is given below.

Step 1: Decision Problem: weighting the selection criteria

The decision problem should be defined clearly since it drives the whole process. Before the use of AHP, the user must ensure that it is an appropriate method for their study objectives. They should clearly explain what their problems are and why AHP has to be used. After then subjective judgments are made to guess each element according to an absolute rating scale, and compare it with other elements in the whole set dividing its weight by the total to get its relevant weight, where those with heavier weights are key elements.

Step 2: Framework for personal selection

In the step comprise of decomposing the complexity of a problem into different levels or components and synthesizing the relation of the components.

Step 3: Setting up the decision hierarchy

In this step the systematic representation of the decision hierarchy is developed that represents the system of the problem. The formation of hierarchy is based upon two assumptions, without which a problem cannot be dealt with using AHP;

(1) It is expected that each level in the hierarchy would be related to the elements at the adjacent levels. AHP recognizes the interaction between elements of two adjacent levels

(2) There is no hypothesized relationship between the elements of different groups at the same level.

Step 4: Data collection from the selection panel

Data are obtained by direct questioning the group who are actively involved in the decision problem. A questionnaire is designed to collect data that are useful to assign weights to the elements of the decision hierarchy.

Step 5: Employing the pair-wise comparisons

The elements of each level of the decision hierarchy are rated using the pair-wise comparison. The Saaty's scale (Saaty, 1980) of measurement used to rate the intensity of importance between two elements is adopted; this is shown in Table 2.1. After all elements have been compared with the priority scale pair by pair, a paired comparison or judgment matrix is formed.

Step 6: Estimating the relative weights of elements on each level in the hierarchy.

After the pair-wise comparison matrix is developed, a vector of priorities (i.e. a proper or eigen vector) in the matrix is calculated and is then normalized to sum 1.0 or 100 percent. This is done by dividing the elements of each column of the matrix by the sum of that column (i.e. normalizing the column); then, obtaining the eigen vector by adding the elements in each resulting row (to obtain "a row sum") dividing this sum by the number of the elements in the row (to obtain "priority or relative weight").

Step 7: Calculating the degree of consistency in order to validate the results

It is known that people are inconsistent in answering questions, an thus on of the important tasks of AHP is to calculate the consistency level of the estimated vector. Consistency Ratio (CR) is used to measure the consistency in the pair-wise comparison. Saaty (1990) has set the acceptable CR values for different matrices sizes, the CR value is:

(1) 0.05 for a 3-by-3 matrix;

(2) 0.08 for a 4-by-4 matrix, and

(3) 0.1 for larger matrices.

With the respect to the selection problem, all the comparison matrices were shown to have acceptable consistency. If there were more than one questionnaire where these questionnaires should have acceptable consistency, they were then aggregated to obtain the combined judgments on the weight at each hierarchy level. On some occasions, such as no usable questionnaire or research require more usable questionnaire, the application of the "looping" procedure (Figure 2.1) would be considered. These procedure include:

(1) If there is no usable questionnaire, the arithmetic method suggested by Saaty (1980) for the judgmental revision would be used to improve consistency. However, these methods may destroy the initial logic expected by the respondents. Therefore, the use of these methods may need special consideration.

(2) If the arithmetic methods are not usable, then another recourse to reduce the CR values is by re-estimating preferences for improving the quality of judgments in making pair-wise comparison. That is to request the respondent to provide another set of answers.

(3) If the second procedure fails, then the last resort is to jump back to step 3 so that the problem can be structured more accurately by grouping similar elements under a more meaningful attribute schema. In the other words, it may be necessary to redevelop the decision hierarchy and construct alternative questions so that another set of answers can be obtained.

Step 8: Calculating the relative weights of those ratings with accepting degree of consistency for the selection criteria

In this step relative weight of all selection criteria are calculated. Then each criterion is given certain score and calculated the final score for each alternative.
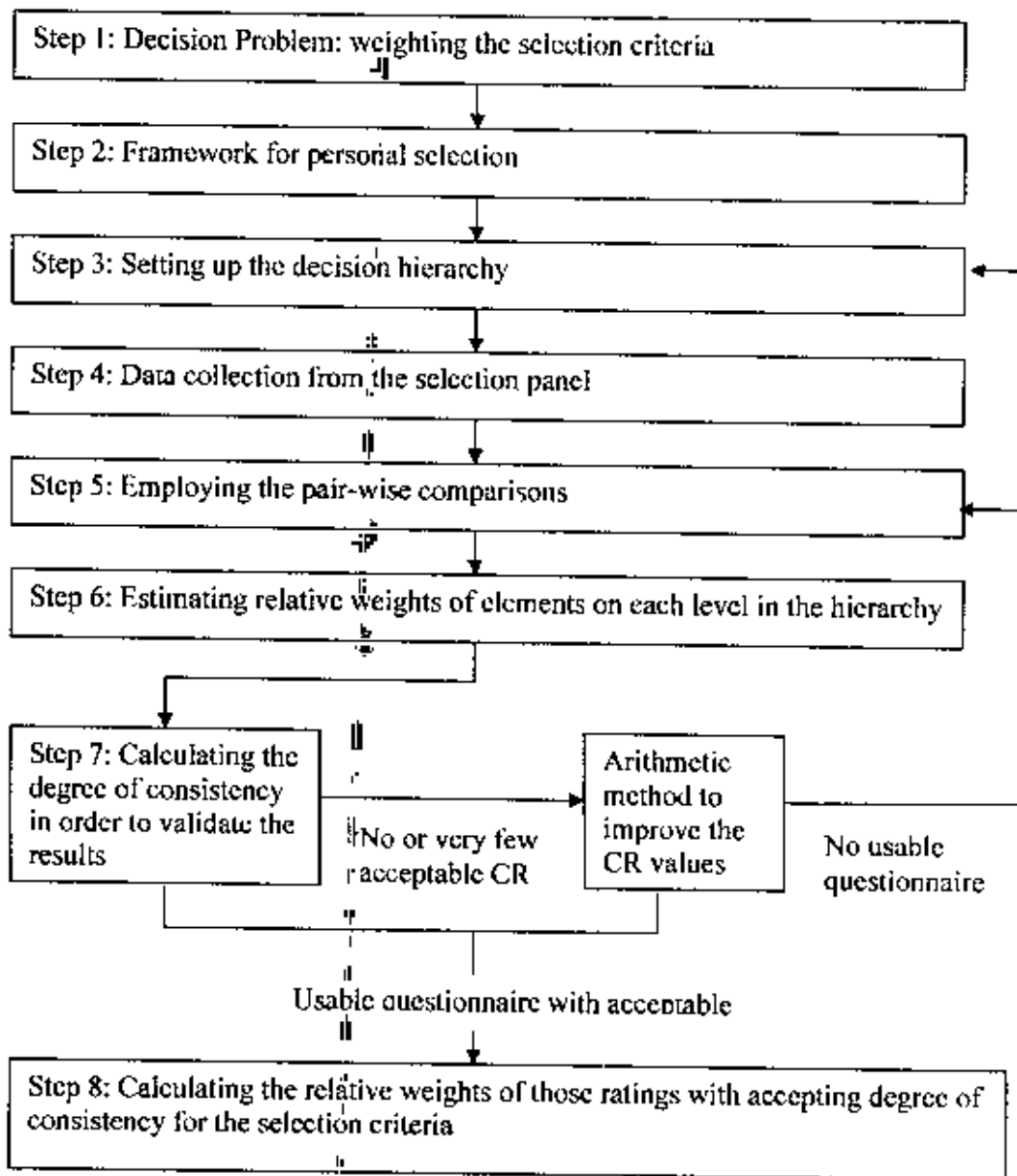
Figure 2.1: Steps of the Analytic Hierarchy Process

Source: Eddie, et al. 2001

2.9.2. Data Aggregation for AHP

If there is more than one respondent (or more than one group with a homogeneous elicitation) the different elicitations have to be aggregated. Although sophisticated techniques for numerical aggregation are available (Ball and Srinivasan, 1994), many studies use simple average measures. According to Nevalainen (1990) average should not be calculated; rather the median or the *Perth* -formula $(a + 4b + c)/6$, when a is

the smallest value, b the median and c the largest value of the observations. In this way extreme elicitations for a and c do not bias the calculations too much. Kauko (1997) also suggested this formula.

After data collection, in the initial stage of the study. the data (the responses of the respondents) was aggregated in two ways:

      1. *Perth* formula; and

      2. Weighted Arithmetic Mean (WAM).

After completion of AHP calculation, the study result showed that relative importance of the criteria calculated by using the value derived from WAM was more consistent than *Perth-* formula. For this purpose, finally the intensification of the criteria has been calculated from data aggregated by WAM.

2.9.3. Mathematical Description of AHP

In this section, the AHP technique is discussed to show how it helps the decision according to Chaung, et al. (2005). Suppose that there are m objectives, the AHP technique performs the multi-objective decision by the following steps.

1. Complete the following pair-wise comparison matrix A for m objectives.

$$A = \begin{bmatrix} a_{11} & a_{12} & & a_{1m} \\ a_{21} & a_{22} & \cdots & a_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mm} \end{bmatrix} \tag{1}$$

Where, a_{ij} indicates how much more important the ith location requirement is than the jth location requirement for constructing the column vector of importance weighting of location requirements. a_{ij} indicates how much more satisfactory the ith candidate location is than the jth candidate location for a particular location criterion for making the optimal location decision.

For all i and j, it is necessary that $a_{ii} = 1$ and $a_{ij} = 1/a_{ji}$.

The possible assessment value of a_{ij} with the corresponding interpretation is shown in Table 2.3.

26

Table 2.3. The Assessment of a_{ij}

Value of a_{ij}	Interpretation
1	Objective i and j are of equal importance
3	Objective i is weakly more important than objective j
5	Objective i is strongly more important than objective j
7	Objective i is very strongly more important than objective j
9	Objective i is absolutely more important than objective j
2,4,6,8	Intermediate values

Appropriate rating among the attributes to each other between 1-7 is used for this study. For the values the verbal equivalences of Table 2.4 are given for this research:

Table 2.4. The assessment rating among the attributes used in the study

Verbal equivalences	Value
Extremely important	7
Strongly important	5
More than equal	3
Equal importance	1
Less than equal	1/3
Strongly unimportant	1/5
Extremely unimportant	1/7

2. Divide each entry in column i of **A** by the sum of the entries in column i. This yields a new matrix **Aw**, in which the sum of the entries in each column is 1.

$$
A_w = \begin{bmatrix}
\dfrac{a_{11}}{\sum_{i=1}^{m} a_{i1}} & \dfrac{a_{12}}{\sum_{i=1}^{m} a_{i2}} & \cdots & \dfrac{a_{1w}}{\sum_{i=1}^{m} a_{iw}} \\
\vdots & \vdots & \ddots & \vdots \\
\vdots & \vdots & \ddots & \vdots \\
\dfrac{a_{w1}}{\sum_{i=1}^{m} a_{i1}} & \dfrac{a_{w2}}{\sum_{i=1}^{m} a_{i2}} & \cdots & \dfrac{a_{ww}}{\sum_{i=1}^{m} a_{iw}}
\end{bmatrix}
\quad (2)
$$

3. Compute ci as the average of the entries in row i of Aw to yield column vector C.

$$
C = \begin{bmatrix} c_1 \\ \vdots \\ \vdots \\ \vdots \\ c_m \end{bmatrix} = \begin{bmatrix} \dfrac{\dfrac{a_{11}}{m} + \dfrac{a_{12}}{m} + \ldots + \dfrac{a_{1m}}{m}}{\displaystyle\sum_{i=1}^{} a_{i1} \quad \sum_{i=1}^{} a_{i2} \quad \sum_{i=1}^{} a_{im}} \\ m \\ \vdots \\ \vdots \\ \vdots \\ \dfrac{\dfrac{a_{m1}}{m} + \dfrac{a_{m2}}{m} + \ldots + \dfrac{a_{mm}}{m}}{\displaystyle\sum_{i=1}^{} a_{i1} \quad \sum_{i=1}^{} a_{i2} \quad \sum_{i=1}^{} a_{im}} \\ m \end{bmatrix} \tag{3}
$$

Where, c_i represents the relative degree of importance for the ith location requirement in the column vector of importance weighting of location requirement. c_i represents the evaluating score that the ith candidate location is assessed for a particular location criterion for making the optimal location decision.

2.9.4. Consistency Arguments

To check for consistency in a pair-wise comparison matrix, the sub-steps are performed as follows.

(i)   Compute A·C:

$$
A \cdot C = \begin{bmatrix} a_{11} & a_{12} & \vdots & a_{1m} \\ a_{21} & \ddots & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & & \cdots & a_{mm} \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_m \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_m \end{bmatrix} \tag{4}
$$

(ii)   Compute Eigen Vector or Eigen value (δ):

$$
\hat{\delta} = \frac{1}{m} \sum_{i=1}^{m} \frac{ith \ entry \ in \ A \cdot C}{ith \ entry \ in \ C} = \frac{1}{m} \sum_{i=1}^{m} \frac{x_i}{c_i} \tag{5}
$$

(iii)   Compute the Consistency Index (CI) as follows:

$$
CI = \frac{\delta - m}{m - 1} \tag{6}
$$

(iv)   Compute Consistency Ratio (CR) by comparing CI to the Random Index (RI) for the appropriate value of m to determine if the degree of consistency is satisfactory.

28

$$CR = \frac{CI}{RI}$$

(7)

If CI is sufficiently small, the decision maker's comparisons are probably consistent enough to give useful estimates of the weights for the objective function. If CI/RI = < 0.10, the degree of consistency is satisfactory, but if CI/RI > 0.10, inconsistencies may exist, and the AHP may not yield meaningful results. The reference values of the RI for different numbers of m are shown below.

Table 2.5. Values of Random Index (RI)

M	2	3	4	5	6	7	8	9	10
RI	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

Source: Winston, 1993

2.9.5. Adavntage of AHP

The method AHP has two obvious and substantial benefits: (1) it allows for diversification of demand (and then indirectly also supply); (2) it ascertains an intangible elements in relation to perceptions (Kauko, 2004). According to Eddie et al. (2001) AHP has two advantages over the simple rating method. First, AHP adopts a pair-wise comparison process by comparing two objects at one time to formulate a judgment as to their relative weight. With an adequate measurement, this method is more accurate (with less experiment error) to achieve a higher level of consistency, since it requires the respondents to think precisely before giving their answers. Usually, the more a person knows about a situation, the more consistent results that can be expected from the person.

The main advantage of AHP is that it helps to determine relative intensities, or weights of identified attributes on the basis of the subjective judgments by pair-wise preference comparison of that attributes. By AHP it is possible to split a given goal into several sub-criteria, which are then could be assessed separately from each other.

Qualitative factors are crucial, but often cumbersome and usually treated as part of management's responsibility in analyzing results rather than quantified and included in a model formulation of the facility location problem (Lee, Green and Kim, 1981).

29

Qualitative decision factors can be readily incorporated into facility location problems if the AHP is employed.

2.9.6. Criticisms of AHP

Although the Analytic Hierarchy Process has been the subject of many research papers and the general consensus is that the technique is both technically valid and practically useful, there are critics of the method. Their criticisms have included:

A) since there is no theoretical basis for constructing hierarchies, AHP users can construct different hierarchies for identical decision situations, possibly producing different solutions,

B) AHP rankings are claimed to be arbitrary because they are based on subjective opinions using a ratio scale,

C) there are said to be flaws in the methods of combining individual weights into composite weights, and

D) the process has no sound underlying statistical theory (Wikipedia 2008).

The method has certain problems however, such as the inevitable lack of robustness. The inherent property of the AHP restricts the elements to compare to very few, and the inability to perform direct comparison of validity with results obtained with methods based on revealed choices and market outcome data (Kauko, 2007).

2.10. An Overview of Dhaka's Rental Housing Market

With high growth rate of urban population due to rural- urban migration and natural population growth, there is a large gap between the demand and supply of house. The annual requirement of housing in Dhaka is at least 60,000 units by the most conservative estimates. However, the average rate of production is only 2,500 units per year (Hafiz, 2000).

2.10.1. Public Rental Housing

Government's housing policies considers the rental housing with other policies. The government's public housing efforts that primarily involve the construction of dwelling for the public servants in Dhaka City. Public agencies directly construct residential units for the employees in accordance with employment status and scale of grade. However, during last third years, this program has not been able to

30

accommodate as much as one fifth of the government employees who constitute only ten percent of the total population of the city. The constructed houses are highly subsidized and also built on over generous standard (Asaduzzaman, 2006). The Dhaka's housing supply indicated that public housing accounts for about 7 percent of the housing stock (Islam, 2005). It is characterized by provision of government quarters to the government employees for a rental of no (0 percent) to 7.5 percent on the basis of the basic salary as house rent allowance that does not varies according to spatial region.

As the government of the country cannot supply house for all of the employees, monthly 'House Rent Allowance' is paid to them. According to this policy public servants who are not accommodated in the public housing are entitled to get this rent allowance with the salary. This amount varies from big cities (capital and divisional cities) and other areas. This is minimum 40 percent and maximum 65 percent of the basic salary within the organizations located in Dhaka Metropolitan Area that is larger than the other areas of the country. This varies according to the salary and employment status. Table 2.6 shows the house rent allowance of the government employees in Dhaka City.

The government employees who live in public rental apartments do not get the housing allowance. Moreover, certain percentage of salary is deducted from the basic salary for cost of utility services. This amount also varies with the salary structure.

2.10.2. Private Rental Housing

Private sector dominates the rental housing market in Dhaka City as Government failed to provide sufficient rental housing for the people of the city. Public housing accounts for about only 7 percent of the housing stock (Islam, 2005) and owner occupancy dwelling of the city is only 30 percent (UNCHS/World Bank, 1992). That indicates, almost 63 percent people of the city live in private rental housing or other informal types of housing. According to the National Housing Policy, 1993, about one third (33 percent) people live in slum and squatters (GoB, 1993). It indicated that about 30 percent people of the city live in privately owned formal rented houses and apartments in Dhaka. According to Nur (1981) in 1960, 53 percent of all households lived in privately rented house, but by 1973, this percentage has become 60.3 percent.

He estimated that more than two third of all households in Dhaka live in privately rented houses.

It is to note that all of the private rental apartments of the city are constructed by own initiatives or by joint venture with real estate companies. In our country, still now mass level private rental housing construction has not been started. Housing policy has not incorporated the policy to initiate mass private housing construction as a housing planning tool. As government housing policy and housing strategies fails to meet the requirement of public rental house, the percentage of private rental house construction have increased in the recent years. Real estate companies build apartment by purchasing plots or joint venture with the landowners. These formal land developing companies then sale apartments to the customers. The apartment owners rent the apartment if they do not live there. However, this entire trend is so much discrete. For instance, the spatial distribution of the private rental house is very much dispersed all around the city. There are basically two types of private rental houses in Dhaka City: fully rental house or apartments and subletting partial of the house.

There is no specific rule of fixing house rent in the private rental housing in Dhaka City. The level of house rent depends on various factors i. e. house type, location, size of house, utility services, environmental characteristics of the area, distance from CBD, length of tenancy etc (Nur, 1981). Although, the house rent is directed by a number of spatial attributes and standard of the apartments or house, however, it is finally is fixed by bargaining of the apartment owners and tenants. There is no specific policy of the government to control the private house rent. To protect the tenancy right Government enacted 'Premises Rent Control Ordinance, 1991' that is rarely enacted. Even housing policy also has not addressed the matter to preserve the tenant right in private rental housing. As a result, house rent of the private housing is increasing day by day. The house rent (per square feet) is highest in Dhaka City than other metropolitan cities of the country (Sharmeen, 2007). According to a survey conducted by the Consumers Association of Bangladesh (CAB), year-on-year increase in house rent in Dhaka City was 17.4% in 2001, 13.49% in 2002, 8.4% in 2003, 9.96% in 2004 and 7.89% in 2005. The CAB reports that although there is a law- 'Premises Rent Control Ordinance, 1991'- to protect the tenancy rights, it is not time- bound and of no use (The Daily New Age Metro, 2007).

32

High rent of the private rental apartments compel the tenants to compromise living in the residential areas having locational advantage and in most precious apartment having preferable variables. According to Nabi et al. (2003), it is expected that house rent should not exceed 23 percent of monthly income i.e. one week's salary. However, due to increased house rent the tenants in Dhaka City pay 35.63% of their monthly income as house rent (Asaduzzaman, 2006). He also determined that percentage spent as house rent is higher for lower income group than lower income group. Moreover, his study determined that house rent is comparatively higher for small size of housing unit than large size of housing unit. For that, the middle-income tenants have to make some negotiations of the location and quality of rental houses selection considering their affordability.

Chapter 03
Methodology of the Study

Chapter-03: Methodology of the Study

3.1. Introduction

The research is conducted with a pre-designed methodology that is consisted of selection of the sample areas, sample design, data collection, and data analysis. After conceptualization by reviewing literature of prior studies, goals and objectives have been formulated. To fulfill the objectives the methodology of the study is discussed in this chapter.

3.2. Selection of the Study Areas

The study assumed that most of the middle-income families live in middle-income residential areas. To fulfill the objectives of the study three residential areas are selected as sample middle-income localities within Dhaka in the respect of spatial location. In Dhaka City, there is no spatial demarcation of residential areas according to economic class. It is assumed that land price of the middle income residential areas are moderate compared to other areas. The middle-income residential areas are identified as study areas, on the basis of land price that are determined by the study conducted by Shohag et al. (2005). The residential areas in Dhaka City Corporation ward no. 3 (Mirpur Section 11 and 12), ward no. 22 (Rampura, Banasree), and ward no. 50 (Free School Street, Kanthal Bagan) are selected as sample middle-income residential areas in Dhaka City for conducting survey. Map 4.1 shows the locations of the study areas.

3.3. Sample Design

In order to cover all relevant interest groups' choice and to analyse by AHP the set of respondents have to be selected meaningfully, not randomly (Kauko, 2007). A set of sample middle-income household in Dhaka City is selected for the household questionnaire survey. The respondents (target households) are selected meaningfully on the basis of the following three conditions:

(1) *Income Group*: The set of respondents are selected from the relevant target groups whose family-income range is in between Tk. 20,000 to 50,000 per month.

(2) *Household Types*: For the study purpose the following three types of families are targeted.

    i)   Nuclear- families with no school going children: Newly married couples and having no children, and the families whose children are younger than school going age;

    ii)   Nuclear-families with school going children: Families have at least one school going child; and

    iii)   Nuclear families with children who are above than school going age.

(3) *Tenant of Private Rental Apartment*: Families are stationed as tenants at privately owned multistory apartments in the study area.

The study has applied Analytic Hierarchy Process (AHP) for data analysis. Collection of usable primary data for AHP through household questionnaire survey is very extensive and sensitive process. Moreover, data analysis by this tool is rigorous and complicated. It is very difficult to deal with large number of sample in this process. Even the prior studies show that the number of respondents for determining information of housing quality and area assessment was limited for computing consistent relative weights of the attributes by AHP (Bender, et al. 1997: Kauko, 2007).

According to Kauko (2002) the number of respondents does not have to be high for AHP. Depending on the application even one expert may be sufficient. Because, rather than relying on statistical sampling, the use of AHP is always dependent on qualitative information of the variables. In a similar setting, Ball and Srinivasan (1994) offered a rigorous evaluation of psychological factors for house selection in a suburb of Boston, US on the basis of opinion of one decision maker by the use of AHP. Prior studies show that the optimal size of selected respondents for questionnair survey was about twenty for the AHP when used for housing quality and area assessment (Nevalainen et al., 1990; Bender et al., 1997, for the use of questionnaire survey). Therefore, the sample size of respondents has been limited to 90 for data collection (10 from each type of families from each sample areas). The study primarily divided the target groups of middle-income families on the basis of family structure (earlier mentioned three groups) and established quotas on the number of the respondents for each group. Table 3.1 shows the quotas of the number of middle-income nuclear families of different study areas.

Table 3.1: Number of the Respondents

Family Type	Study Area	Number of Respondents	Total number of Respondents the Family Type
Family Type A	DCC Ward 3 (Mirpur Section 11 and 12)	10	30
	DCC Ward 22 (Rampura, Banasree),	10	
	DCC Ward 50 (Free School Street, Kanthal Bagan)	10	
Family Type B	DCC Ward 3 (Mirpur Section 11 and 12)	10	30
	DCC Ward 22 (Rampura, Banasree),	10	
	DCC Ward 50 (Free School Street, Kanthal Bagan)	10	
Family Type C	DCC Ward 3 (Mirpur Section 11 and 12)	10	30
	DCC Ward 22 (Rampura, Banasree),	10	
	DCC Ward 50 (Free School Street, Kanthal Bagan)	10	
Total			90

At the initial stage of the questionnaire survey, first respondent (who have fulfilled the three conditions) of a family type from a study area is traced randomly. Then other respondents of same family type are detected through 'Snowball Sampling' process. In this way the sample households of other types were found to conduct questionnaire survey. Every respondent from a quota are selected from different roads in a study .area to avoid biasness of spatial location of respondent's apartment.

3.4. Data Collection

Data collection has been involved from primary and secondary sources.

3.4.1 Primary Data Collection

In the initial stage of the study a reconnaissance survey was conducted for clear understanding of the study area. The study has required primary data regarding the relative importance of locational attributes for residing in a residential area and the standards of the houses in respect of the tenants. These data is collected through extensive household questionnaire survey of the sample dwellers in the study areas by using a structured questionnaire (Appendix A). Moreover, socio-economic characteristics of the sample families and physical condition of the residential

36

environment have also collected from the households through questionnaire survey.

3.4.2 Secondary Data Collection

The housing sub-market situation data (i.e. rental housing market) is collected from secondary sources. Different books, published journals, unpublished thesis, magazines, and newspapers are used to collect secondary data.

3.5. Data Preparation

Before data analysis the collected primary data through questionnaire survey was prepared through qualitative and qualitative techniques. Statistical Package for Social Science (SPSS) and MS Excel were used for data preparation related to socio-economic character of the sample households and locational and apartment quality. For determining the rating of each pair of attributes of housing location choice and housing characteristics data were aggregated in two ways, firstly in Perth formula, then by Weighted Arithmetic Mean (WAM). For data aggregation in WAM process the following stages were followed (Figure 3.1).

First stage- Frequency determination: At first discrete (ungrouped) frequency of the respondent's number who gave an assigned relative value of a pair of attributes have been determined.

Second stage- Weighted Arithmetic Mean (WAM) calculation: Then comparative values of each pair of attributes have been calculated through determining weighted arithmetic mean.

Third stage- Final Value of Each Pair of Attributes determination: For data analysis through the Analytical Hierarchy Process in data preparation stage the final values of each pair of attributes are calculated.

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┌─────────────────────────────────────────────────┐
│           Frequency determination                │
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│  Weighted Arithmetic Mean (WAM) calculation      │
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│ Final Value of Each Pair of Attributes determination │
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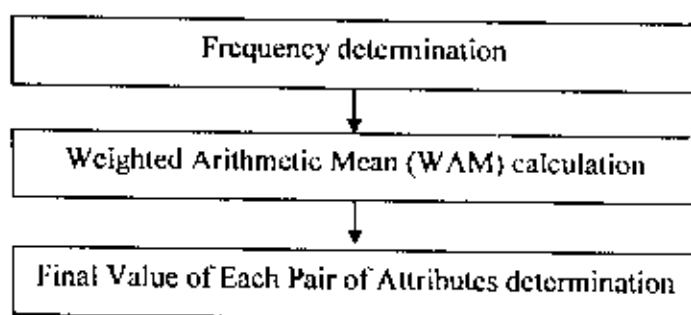
Figure 3.1: Stages of Data Preparation

For data aggregation by *Perth-* formula lowest, highest and median of each pair of attributes has determined for calculating the final value of a pair of attributes.

3.6. Data Analysis

Data analysis of the study has basically two parts. In the first part consists of the general analysis regarding the condition of the study area as well as socio-economic condition of the sample households. Second part of the study consists of determination of the relative weight of the variables of locational choice and house choice by applying AHP.

3.6.1. Generic Analysis

Statistical Package of Social Science software SPSS 11.0 and Microsoft Excel were used for generic analysis of socio-economic condition of the sample households, residential and house characteristics. Analyzed data is presented in Annex B, C and D.

3.6.2. Application of AHP

Various statistical tools have been used for defining the primary data. Then Analytic Hierarchy Process (AHP) has been used for data processing and analysis to determine prioritized options of the households for selecting residential locations and house types. The AHP is a worldwide and famous technique for supporting decision-making within a number of choices that is developed by Dr. Thomas L. Saaty. AHP is a decision-support-system that is based on mathematics and human psychology algorithm (Saaty, 1990). AHP has already been successfully applied by Bender et al. (1997), Chaung (2001), Kauko (2007) and some other researchers in the context of housing appraisal. It is a powerful tool to measure the relative degree of importance according to the customer's requirements in the situations of multiple objectives and diverse alternatives.

Chapter 04

Study Area Profile and Socio-economic Aspects of the Sample Households

Chapter-04: Study Area Profile and Socio-economic Aspects of the Sample Households

4.1. Introduction

The study deals with the housing preference middle-income tenants. The study assumes that most of the middle-income families reside in middle-income areas. For the study purpose three study areas are selected as sample middle-income localities within Dhaka City. This chapter presents the profile of the study areas, socio-economic characteristics of the sample households and characteristics of the study areas and apartments where the sample families reside.

4.2. Study Area Profile

Dhaka City Corporation (DCC) Ward no. 03, 22 and 50 are selected as study areas. The study basically targets the residential areas that are located in DCC Ward no. 03, 22 and 50. These wards are selected as sample middle-income localities within Dhaka City in the respect of spatial location as well as land price. Study area profile describes the location and area of the study areas.

4.2.1. Basis for Selection of Study Areas

To fulfill the objectives of the study, it attempts to identify middle-income residential areas to address the middle-income families. It is assumed that most of the middle class families of the city reside in middle-income residential areas. However, there is no spatial demarcation of residential areas in Dhaka City on the basis of economic class. The study assumed that the residential areas are middle-income whose land prices are moderate compared to the land prices of other areas. The middle-income residential areas are identified on the basis of the land price determined by Shohag et al. (2006). Among the middle-income areas the mentioned three residential areas are selected as sample middle-income localities within Dhaka City in the respect of spatial location. For instance, one study area is located in eastern part, one is in northern part and one is in central part of DCC territory. Map 4.1 represents the spatial distribution of the study areas.

Map 4.1: Location of the Study Areas

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R.F.1:25000
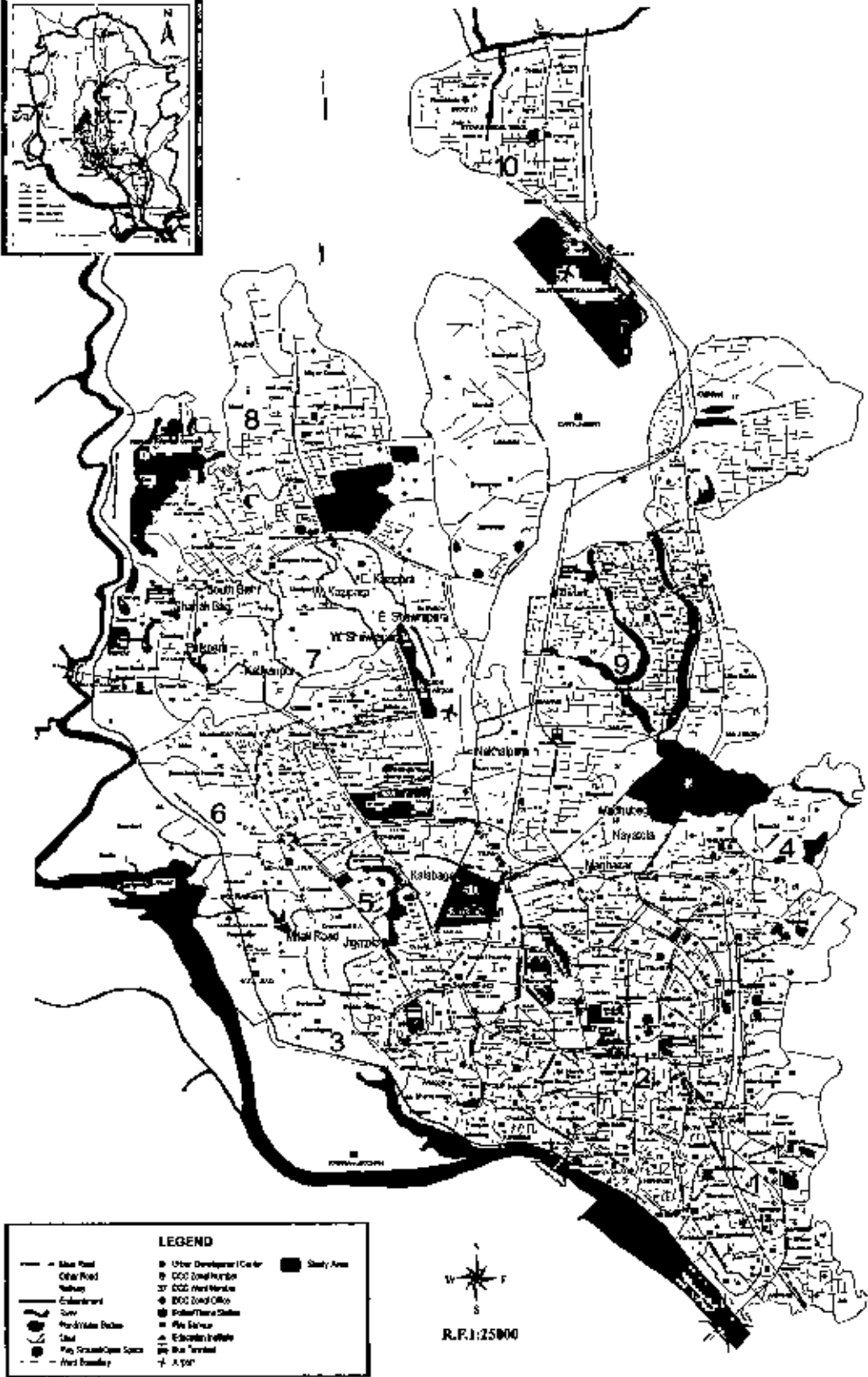
Map 4.2: Map of Ward No. 03

Legend

⋀⋁ Ward_boundary

⋀⋁ Road

▭ Buildup Area

41

1:4500

Map 4.3: Map of Ward No. 22
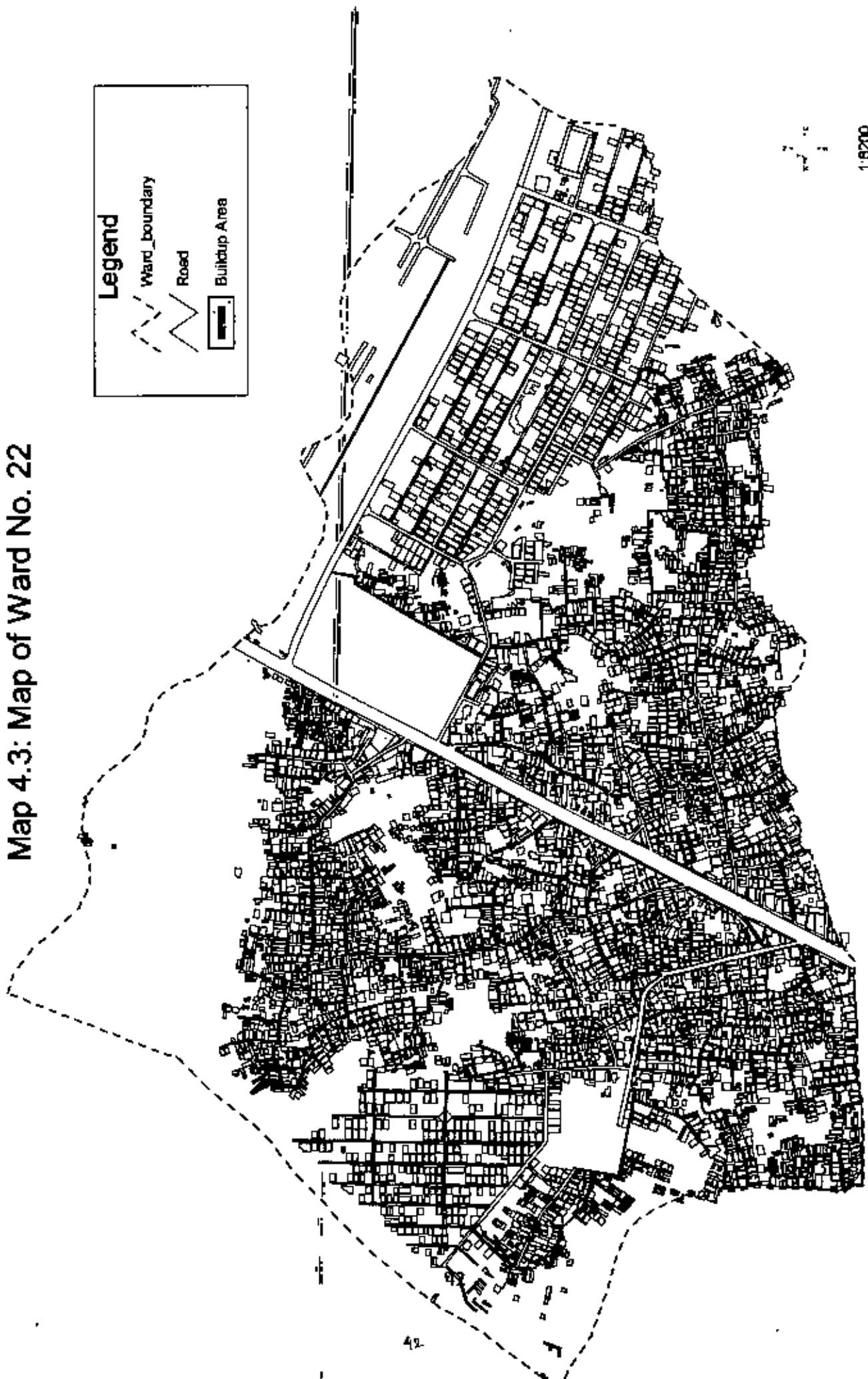
Legend

⌁ Ward_boundary

∿ Road

▭ Builtup Area

1:8200

Map 4.4: Map of Ward No. 50

Legend

⌁ Ward_boundary

⋀ Road

▭ Buildup Area

43

1:3600
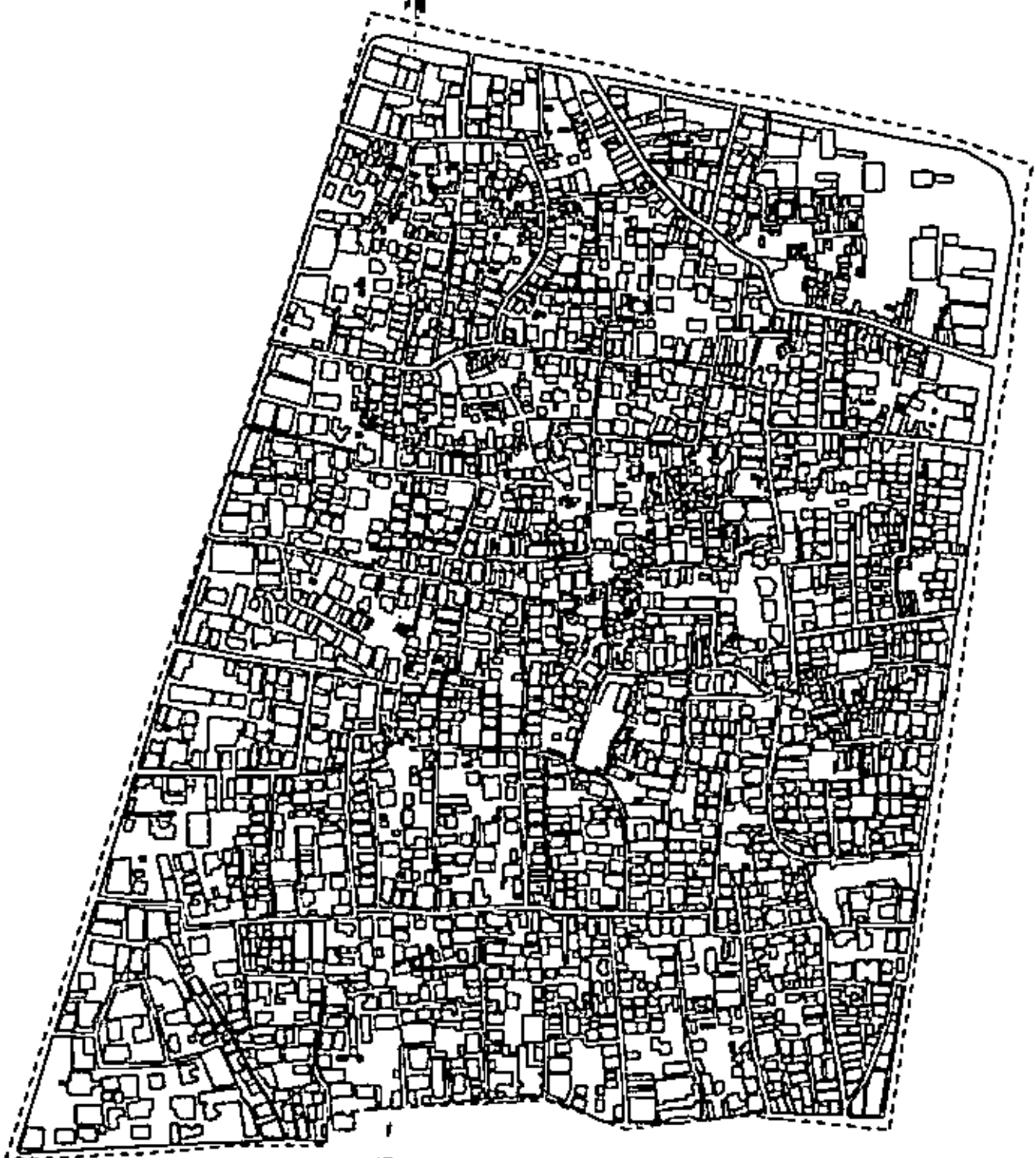
4.2.2. Location of the Study Areas

DCC Ward no 03 is located in Pallabi thana that is consists of Mirpur section 11s (Block C), Mirpur Section 10 (Block A, B, C). It is situated in the northern part of the DCC area. The ward is surrounded by DCC ward no. 4 and 5 in the east side, ward no. 5 in the north side, ward no. 7 in the west side and ward no. 14 in the south side.

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Ward no. 22 is located in Khilgaon thana that covers the areas of Paschim Rampura, Paschim Hajipara, Purba Rampura, Uttar Banasree, Bagichar Tek, Mahanagar Project, Nasirer Tek, Oloner Tek, Omar Ali Lane. It is located in eastern part of the DCC area. The ward is surrounded by DCC ward number 20, 21 in the north side, ward no. 26 in the east side, ward no. 23 and 55 in the south side and ward no. 37 in the west side.

‖

Ward no 50 is located in Dhanmodi thana that consists of the areas of Crescent Road, Free School Street, Kanthal Bagan. It is located in Central part of DCC territory. The ward is surrounded by ward no. 37 in the north side, ward no. 57 in the east side, ward no. 52 in the south side and 51 in the west side.

The locations of the study areas are shown in the Map 4.1. Detail maps of the study areas are shown in the Map 4.2, Map 4.3 and Map 4.4.

4.2.3. Area

DCC ward no. 3 covers 531 acres of area. Ward no. 22 has an area of 530 acres whenever ward no. 50 surrounds 163 acres (BBS, 2001). The wards are average sized wards compared to other wards of DCC. The study areas are highly build-up residential areas.

4.3. Socio-economic Conditions of the Sample Households

Socio-economic condition plays an important role on residential housing location choice for rental house as well as selection of the rental apartment by the household. The study basically deals with the middle-income private apartment's tenants in the study areas. The part of the chapter discussed the socio-economic conditions of the sample households residing in the study areas.

44

Total population of DCC ward no. 3 is 69,956 and 86,363 is in ward no 22. The total population of ward no. 50 is 67,193. The average household size of wards no. 3, ward no. 22 and ward no. 50 are respectively 4.98, 6.56 and 4.99 (BBS, 2001). The average household size of the family type A, B and C are accordingly 2.5, 3.77 and 4.05. As the sample families are nuclear type, the average household size of the sample families is lower than the study area's overall average household size (Appendix B: Table B-1). Average household size of the sample families is 3.44.

The members of family type A are comparatively younger than the type B and type C. Type C have comparatively more elderly members compared to the other two types. Figure 4.1 shows almost half (42.67%) of the family members of type A are within the age range in between 21 to 30 that is also highest (35.54%) for type C. Type B have a significant percentage of member in the range less than 10 and 11 to 20 (15% and 27. 43% respectively) that is the age limit for school going. Only family type C has very few number (0.83%) of elderly people who are more than 60 year (Appendix B: Table B-2).
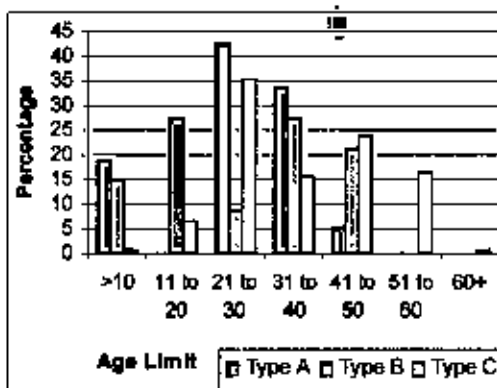
Figure 4.1. Age Structure of the Family Members of Sample Respondents
Source: Field Survey, 2009
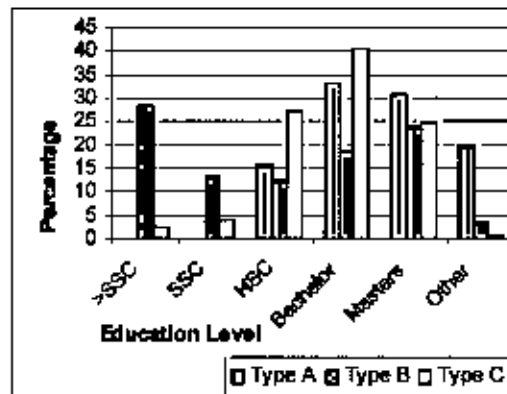
Figure 4.2.Education Level of the Family Members of Sample Respondents
Source: Field Survey, 2009

The graph of education level (Figure 4.2) shows that the members of family type A have mostly educated people who have passed Bachelor and Master that are 33.33% and 30.67% respectively. Family type B has the most significant percentage (28.32%) less than SSC or school going members. Family type C has comparatively higher level of educated members than the other two groups. Almost half (40.5%) of the

members of this type have completed bachelor (Appendix B: Table B-3). One point should be noted that the literacy rate of the sample household is prominently higher than the education level of the country.

The percentage of male members is slightly higher than female members to all of the sample families types (Figure 4.3). Type A, Type B and Type C family have respectively 52%, 57.52% and 59.5% male members (Appendix B: Table B-4).
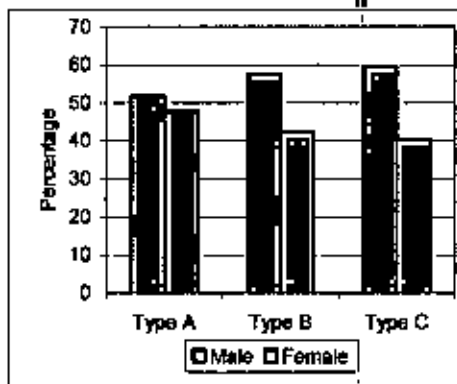
Figure 4.3: Gender Distribution of Family
Members of Sample Respondents
Source: Field Survey, 2009
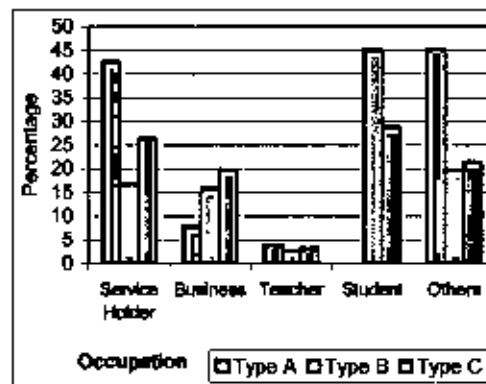
Figure 4.4: Occupation Pattern of Family
Members of Sample Respondents
Source: Field Survey, 2009

Figure 4.4 shows that almost half (42.67%) of the members of the family type A are service holder that is comparatively lower for type B and C that is accordingly 16.81% and 26.45%. The number of businessmen in the respondent's families is lower than the number of service holders. The percentages of businessmen for the three types of families are around 8%, 16% and 20%. Family type B have great number of student family members (46.02%) that is also high for type C (28.8%) (Figure 4.4). Among the students some are school going and some others are elder than school going age and are college or university students. A great percentage of household members are in other occupation group who are mainly housewives and housemaids that consists, 45.33%, 19.47% and 21.49% respectively for family type A, B and C (Appendix B: Table B-6).

The effective demand of size and quality of housing is largely determined by aggregated household income. In general higher level of income demands for larger

and more luxurious houses. The study found that most of the rental apartment dwellers are upper-middle income families.
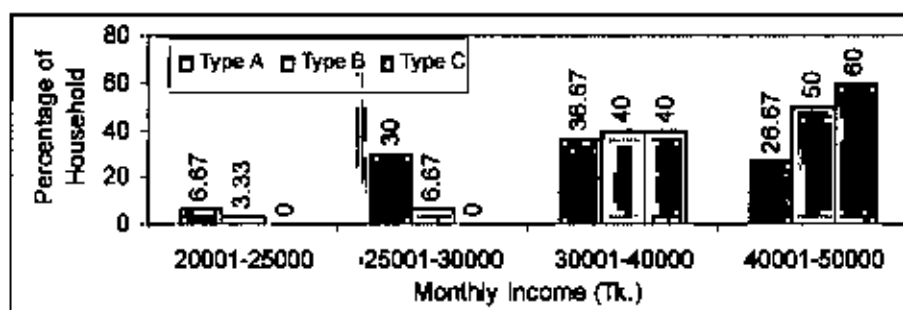
Figure 4.5: Household Income of the Sample Families

Source: Field Survey, 2009

The study reveals that very few percentages of family type A (6.67%) and type B (3.33%) have monthly household income within Tk. 20,001-25,000 (Figure 4.5). Family type C are comparatively well off than the other two types of families. More than half (60%) families of type C has monthly income in between Tk. 40,000 to 50,000. This may happens because of having comparatively larger household size. Even half (50%) of the family type B is within this range. Most (36.67%) of the family type A has monthly family income in between Tk. 30,001 to 40,000. Moreover, 40% Type B families and 40% type C families are in this income group that is comparatively less than type A. No family type C has less than monthly income Tk. 30,000. On the other hand major part of family type A have less than Tk. 40,000 monthly income (Appendix B: Table B-5).

The study found that 33% family members of type A and B and 53% members of family type C have two earning members. This is a significant cause of the high family income. As the education level of the sample respondents is high, it is also apparent that higher education envisages higher jobs and eventually higher family income.

4.4. Mode of Travel to Work Place

Travel to workplace is one of the major purposes on total trips. So, distance to workplace is very important indicator for housing location selection. The jobholders very significantly consider accessibility to job place.

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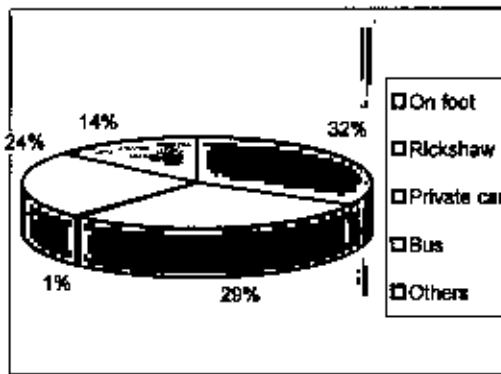
Figure 4.6: Percentage of Office Trip by   Figure 4.7:Time Required for Office Trip
the Working Members of Sample Families   by the Working Members
Source: Field Survey, 2009   Source: Field Survey, 2009

The study shows (Figure 4.6) that 32% of the primary travel trips of the sample
respondents to work places is by walking that covers the high percentage of total trip
number. After then, 29% primary travel trips are by rickshaw and 24% travel trip to
workplace is by public bus. Furthermore, only 1% of working members of the sample
tenants use private car. The rest 14% working members use other modes of travel
(Appendix B: Table B-7). Time required for travel to office depends on the mode of
travel, distance from home and traffic flow condition of the road. The study reveals
that (Figure 4.7) about 11% working members of the sample households need less
than 10 minutes to go to office. Most of the people need 31- 40 minutes travel trip to
workplace. Very few percentage (only 1.2%) of respondents need more than 1 hour
(Appendix B: Table 4-8).

4.5. Physical Characteristics of the Study Area

For selecting the residential areas for renting house, the tenants always consider the
physical characteristics of the areas. So, the physical conditions of any residential
areas are desperately important attributes for residential location decision making for
renting house. This part of the chapter is an endeavor to show the physical condition
of the localities where the respondents reside. This determined physical condition of
areas with respect to the sample households.

48

4.5.1 Road

The front road of house is very important to the dwellers for selecting rental house. All families significantly consider road width and road condition before selecting a house. However, some families are not satisfied with the condition of the access road.
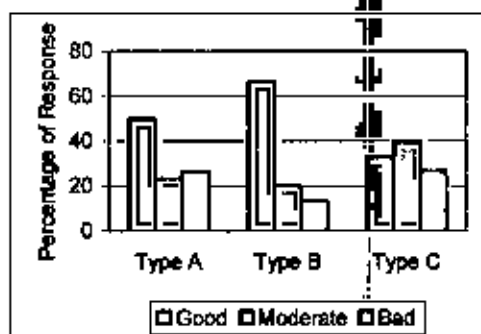
Figure 4.8: Condition of Front Road
of the Sample Household's Apartments
Source: Field Survey, 2009
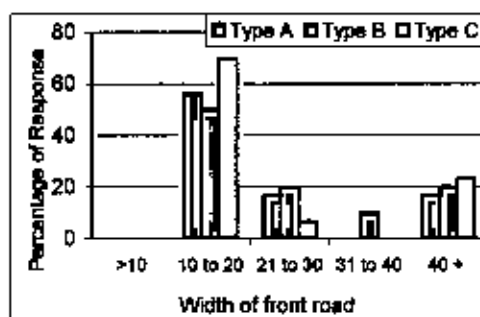
Figure 4.9: Front Road Width
of the Sample Household's Apartments
Source: Field Survey, 2009

Figure 4.8 shows about 27% of the family types A and C whose apartment front road is bad in quality that is 13% for the family type B. Maximum families of type B (almost 67%) have good access road compared to almost half from the type A and 33% from the type C (Appendix C: Table C-1). The study shows that maximum families have 10 to 20 feet wide access road. Figure 4.9 shows almost 57%, 50% and 70% sample families have this type of front road for the type A, type B and type C respectively. Whenever, no family has less than 10 feet access road. 27% of type A, 20% of type B and 23% of type C have road more than 40 feet wide access road (Appendix C: Table C-2). The respondents are multistory apartment dwellers. As a result, the width of front road does not represent the general trend in Dhaka City.

4.5.2. Rain-water Drainage

It is matter of fact that in Dhaka City the situation of rain water drainage system is not good. As a result, it occurs water logging immediate after rainfall at a number of residential areas and creates huge suffering for the city dwellers. Although incident of water logging negatively influence the decision of rent house, the study found that a number of families compromised this fact. Figure 4.10 represents that about 40 % of type A families suffer from water logging during rainy season that is almost 23% and 27% for type B and type C respectively (Appendix C: Table C-3).

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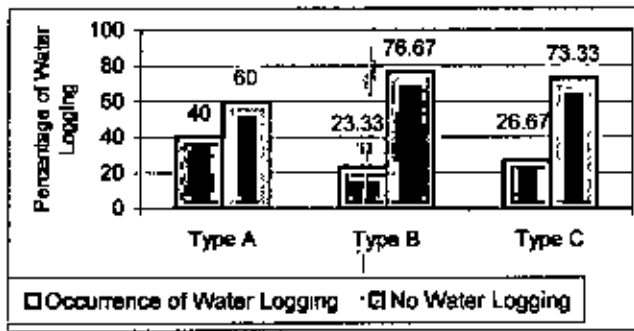
Figure 4.10: Incidence of Water Logging in the Front Road of Sample Households' Apartments

Source: Field Survey, 2009

4.6. Community Facilities of the Study Areas

Livability of a city is laid on a good neighborhood to grow up in. For a child growing up, a quality environment of a city is one where (s)he can safely and progressively conduct more responsibility and develop other life skills. Necessary community facilities within a city can put contribution to create a habitable neighbor community life. Provision of community facilities such as open space, parks, community centers and safe roads with street lights at night provides opportunity to the dwellers for interaction and building community attachment. This creates prospects to develop community conservancy and prevention of crime. This could also play a great role in safe guarding environmental and social quality of the community. The study shows that community facilities are not always situated in walking distance.
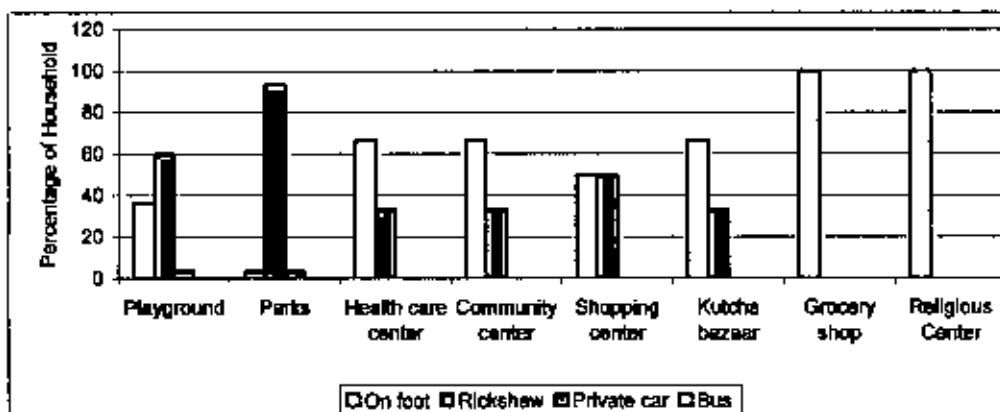
Figure 4.11: Mode of Travel to Reach Community Facilities by the Sample Families

Source: Field Survey, 2009

50

4.6.1 Educational

Educational center especially school are very important attribute that the families with school going consider with proper care for housing location selection. Among the types of sample households only family type B have school going children. So these subsections only concern about closeness to school. The study found that 3.33% of respondents from sample family type B can reach to school of the children on foot, wherever 50% respondents use rickshaw (Figure 4.12). That mean rickshaw is the most favorable mode to go to school. The figure also shows that 10% household use private car and 6.67% use bus to go to school to send their children to school.
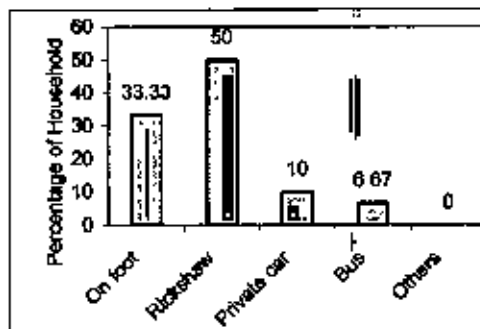
Figure 4.12: Mode of Travel for School
by the Sample Family Type B's Children
Source: Field Survey, 2009
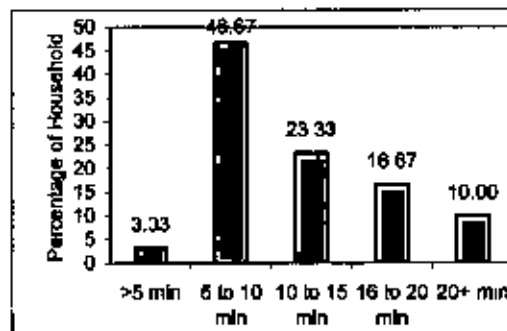
Figure 4.13: Travel Time to Reach School
by the Sample Family Type B's Children
Source: Field Survey, 2009

Figure 4.13 shows the travel time required to reach school by the sample families with school going children. The study found that very insignificant number (3.33%) of families' children can go to school within less than 5 minutes. Large percentage (46.67%) can go to school within 10 minutes. The figure also shows that 23.33%, 16.67% families' children go to school by respectively 10 to 15 minutes, 16 to 20 minutes. Furthermore, 10% families need more than 20 minutes to reach school.

4.6.2 Health Care Center

Health care center is one of the most important community facilities for residential area selection. People consider proximity of health care center before renting a house. The Figure 4.14 shows that 64.67% sample tenants can go the health care center on foot. Around 65% type A family members can go to health care center by 10 minutes that is almost 73% for type B and type C. About 30% type A household need more

than 15 minutes that is 20% for type B and 16% for type C (Appendix C: Table C-4 and Table C-5).
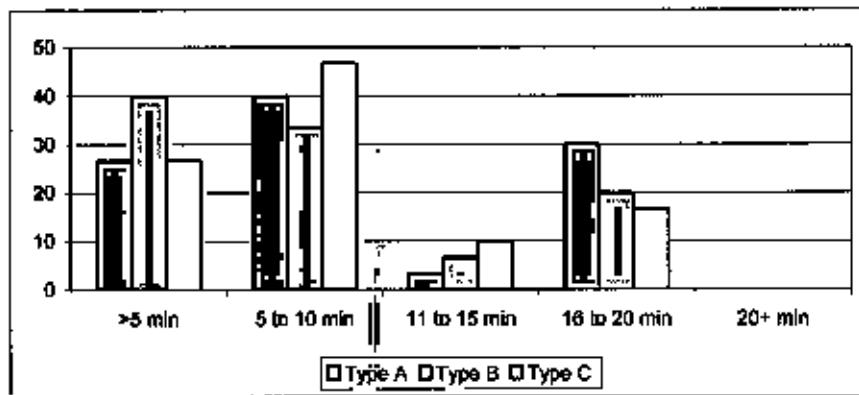
Figure 4.14: Travel Time to Reach Health Care Center

Source: Field Survey, 2009

4.6.3. Recreational

Recreational facilities are very important for the residents of any city. The people consider closeness of park, playground, lake and other facilities for choosing rental house. Even proximity of recreational facilities increases the attractiveness of a residential area. This also increases the apartment rent in an area. However, it is a matter of fact that most of the residential areas in Dhaka City do not have playground and parks within walking distance. Figure 4.11 shows only 27% surveyed families have playground and 2% have park within walking distance. Rest of the families goes to park and playground by rickshaw, bus, private car or any other travel mode (Appendix C: Table C-4).
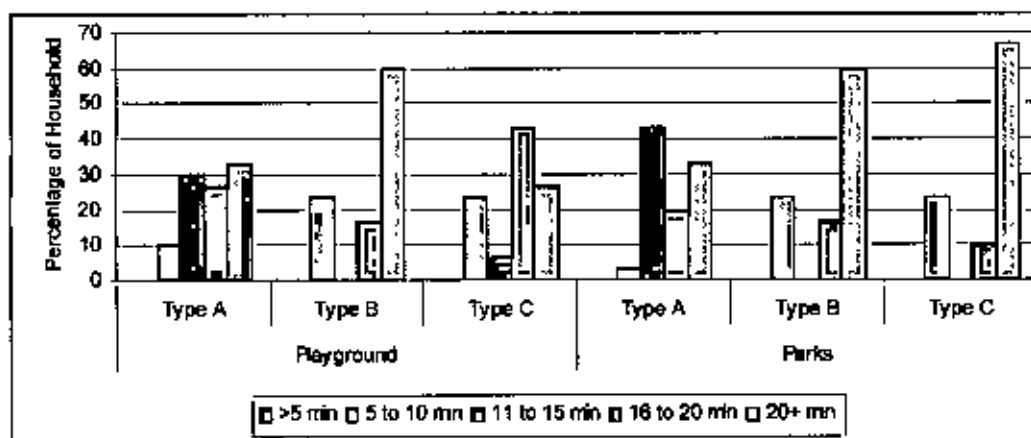
Figure 4.15: Travel Time to Reach Recreational Center

Source: Field Survey, 2009

No families have got any playground or park within 5 minutes distance. Only 10% family type A families can reach playground within 5- 10 minutes that is 23.33% for type B and type C. 30% sample family type A and 8% type C can get playground within 10 to 15 minutes (Figure 4.15). Around 27% type A, 17% type B and 43% type C families can reach playground within 16 to 20 minutes. Moreover, 33% type A families, 60% type B and 27% type C need more than 20 minutes to reach a nearest playground. The situation is more critical for park. Only 3% type A families and 23% type B and type C can reach nearest park with 10 minutes. 42% type A can reach park within 15 minutes. It takes 16 to 20 minutes by 20% type A, 17% type B and 10% type C. Great percentage of sample families cannot reach nearest parks within 20 minutes. The number for type A is 33%, that is a large percentage for type B (60%) and type C (67%) (Appendix C: Table C-5).

4.6.4. Community Center

Community center can play an important role for community building in a residential area. The study shows that the surveyed 63% families have close enough community center to go there on foot (Figure 4.11). Most of them can reach there within 10 minutes (Figure 4.16).
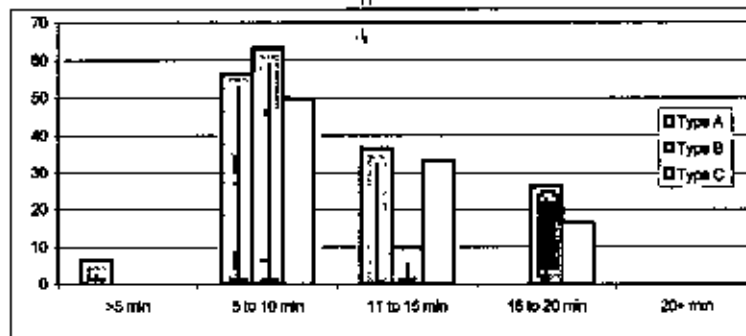
Figure 4.16: Travel Time to Reach Community Center
Source: Field Survey, 2009

4.6.5. Shopping Facility

The dwellers of city consider the location of any shopping center, market, grocery shop or any *kutcha* bazaar for selecting the rental apartment. Almost all residential areas have grocery shop within walking distance and prefer to go there on foot (Figure

4.11). 45% and 63% families have shopping center and *kuthcha* bazaar within walking distance and can go there on foot (Figure 4.11; Appendix C: Table C-5).
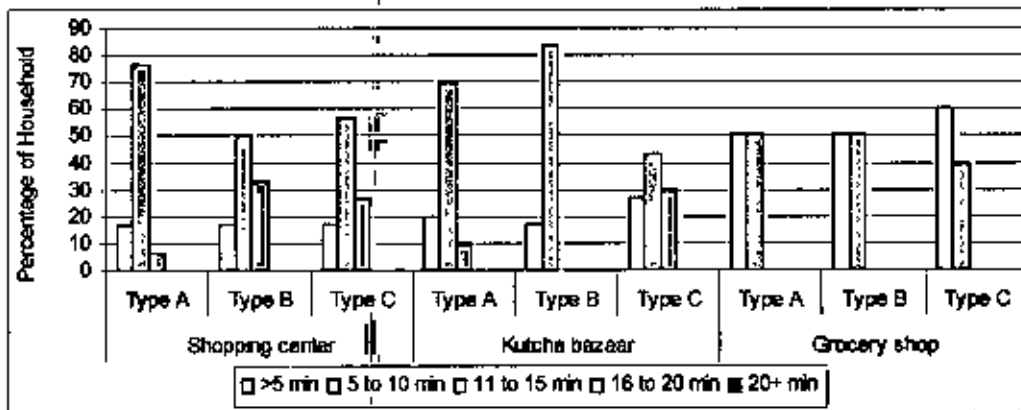
Figure 4.17: Travel Time to Reach Shopping Facilities

Source: Field Survey, 2009

Figure 4.17 shows that 18% sample type A, type B and type C can reach to shopping center within 5 minutes. It takes 5 to 10 minutes to go to there by 77% type A, 50% type B and 56% type C. It takes 11 to 15 minutes to go to shopping center by 8% type A and that is slightly higher for type B (33%) and type C (28%). The study shows most of the sample families of all types can reach to grocery shop within 10 minutes (Appendix C: Table C-6).

4.6.6. Religious Facility

In Dhaka City almost every residential areas have mosque within walking distance. This is also reflected in the study (Appendix C: Table C-4). Figure 4.18 show that all the residents can reach mosque within 10 minutes on foot (Appendix C: Table C-5).
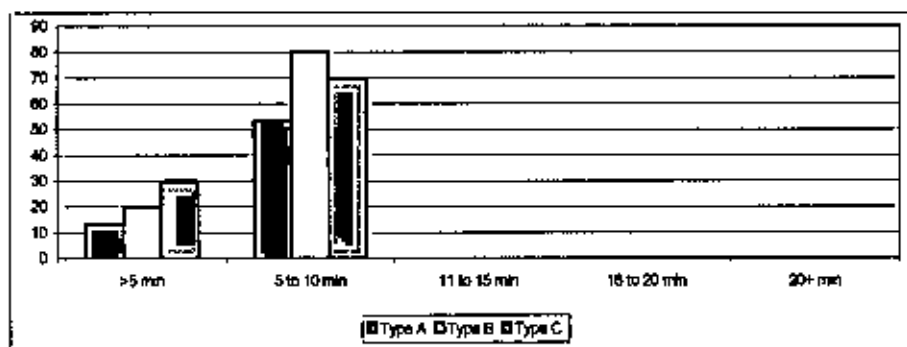
Figure 4.18: Travel Time to Reach Religious Center

Source: Field Survey, 2009

54

4.7. Physical Condition of the Apartments

This part of the chapter discussed about the apartment condition where the sample respondents reside. For selecting the apartment for renting, the tenants always make comparative judgments of the characteristics of the apartments. The physical condition of the apartments is very important to the target group of people. This part attempts to describe the condition of the physical attributes of the respondent's apartments of the study areas in respect to the family types.

4.7.1. Number of Storey

Apartment renters importantly consider number of floor. Most of the families do not want to live at ground floor for lack of privacy and security. The most top floor also is not a choice of the renters because of hard work to reach upper floors where there is no lift. On the other hand, the top floor generally absorbs more heat from sunlight and makes the floor warm during summer season. Generally, the tenants choose the floors other than ground and top floor, though the rent is higher to these floors compared to ground and top floors.
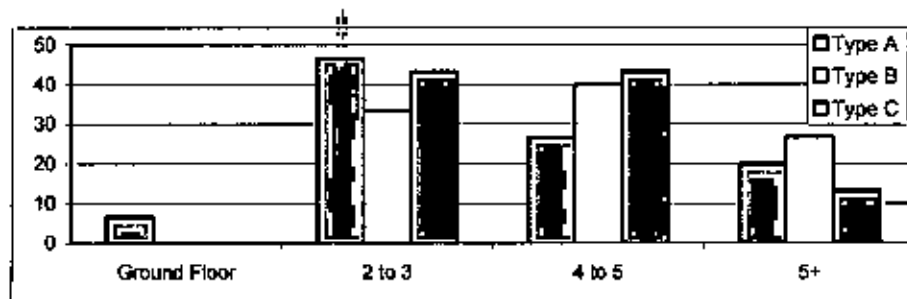
Figure 4.19. Number of Storey of the Apartments
Source: Field Survey, 2009

The study shows (Figure 4.19) that only few (8%) type A families selected ground floor for living. Most of the families of type A live in first and second floor that is 47%. The number of type B is significantly higher (40%) who live in 3rd and 4th floor. 32% type C families live in 1st and 2nd floor and 26% live in more than 5th floor. 42% family type C live in 1st and 2nd floor that is same in number for 3rd and 4th floor. Only 14% type C families live in more than 4th floor (Appendix D: Table D-1).

55

4.7.2. Floor Area

The size of apartment expressed in square feet is an important criterion considered by the household for renting house. Larger size of apartment increases comfortability for household. Specially, when the number of family member increases and the children of the families grow up, the family needs larger space. However, some families squeeze in a small apartment considering some other factors that restricts to rent then larger apartment.
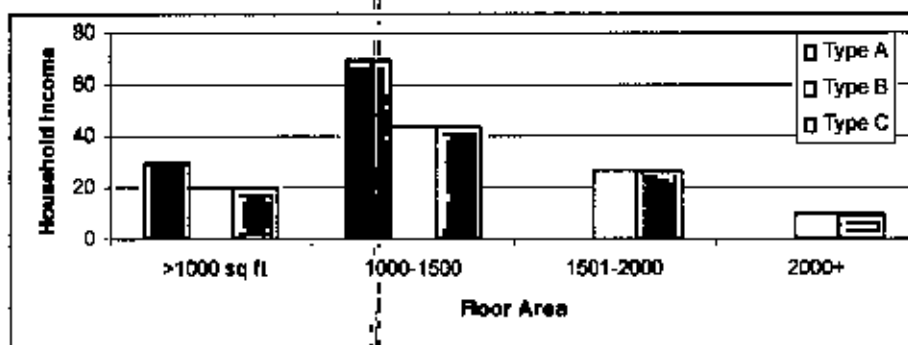
Figure 4.20: Floor Area of the Apartment
Source: Field Survey, 2009

The study shows that family type A whose household size is smaller than type B and type C, stay in smaller apartment than other two types. Figure 4.20 depicts that about 25% type A families live in less than 1000 sq ft apartment and rest of the families live in less than 1500 sq ft sized apartment. The study also found that most of the families of type B and type C live in 1000 to 1500 sq ft sized apartment. About 20% of the family type C live in less than 1000 sq ft sized apartment, when 23% in 1501 to 2000 sq ft and 5% in more than 2001 sq ft (Appendix D: Table D-2). This indicates that sample families having smaller household size are living in smaller apartment.

4.7.3. Availability of Air and Sunlight

In Dhaka City a number of buildings are constructed by lack of maintenance of set back rule. As a result, a number of apartments in Dhaka City cannot find sufficient air for ventilation and sunlight. The study found 20% sample household's apartment have neighboring building within 3 feet at least one side.

56

4.7.4. Number of Bedroom

The tenants always consider the number of bedroom before renting. Even small families look for at least two-bed apartment for future need or for the incident of guest accommodation. The household usually chose an apartment that can accommodate the members of the family with maintaining the privacy and comfort ability. The number of bedroom directs the house rent. As a result, families want to adjust between requirement of space and affordability. The number of bedroom of the apartment also depends on family income. The study found (Figure 4.21) that 3% of type A families have single bedroom, 47% families have 2 and 50% families have 3. No families of type B and type C have single bedroom. 47% type B families have 2 bedrooms and 53% have 3 bedrooms. As type C families have larger household type, they require more bedrooms. 80% families of type C have 3 bedrooms and rest families have 2 bedrooms (Appendix D: Table D-7).
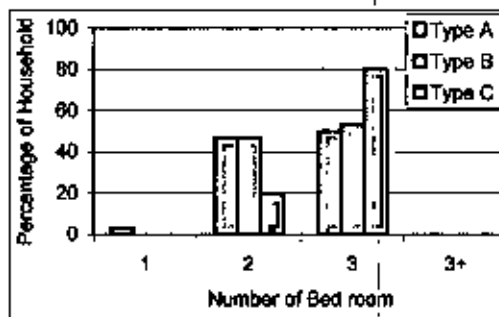
Figure 4.21. Number of Bed Room
Source: Field Survey, 2009
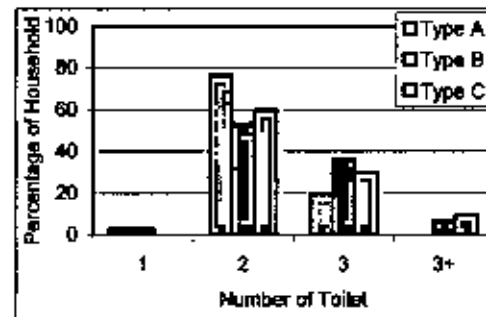
Figure 4.22: Number of Toilet
Source: Field Survey, 2009

4.7.5. Number of Toilet

Number of toilet and its quality represents the space of apartments. So, the tenants consider the number of toilet for renting apartment. The study shows most of the apartments have at least two toilets (Figure 4.22). Only 3% of family type A and type B have single toilet. 77% of family type A have two toilets where 55% of type B and 60% type B have same number of toilets. Respectively 20%, 36% and 30% families of type A, type B and type C have 3 toilets. 8% of family type B and 10% of family type C families have more than three toilets. One thing should be pointed out that now a day, some house owners or builders are constructing more number of toilets than number of bed. Sometimes, separate toilets are constructed for maids of the house (Appendix D: Table D-8).

57

4.8. Condition of Utility Service

The availability and continuity of utility services are very vital components for comfortable civic life. The tenants apparently consider the qualities of utility services before renting an apartment. Even lack of utility service or the unsatisfactory quality of any utility services can pay important factor for housing choice. However, in Dhaka city a number of household are suffering from lack of the utility services.
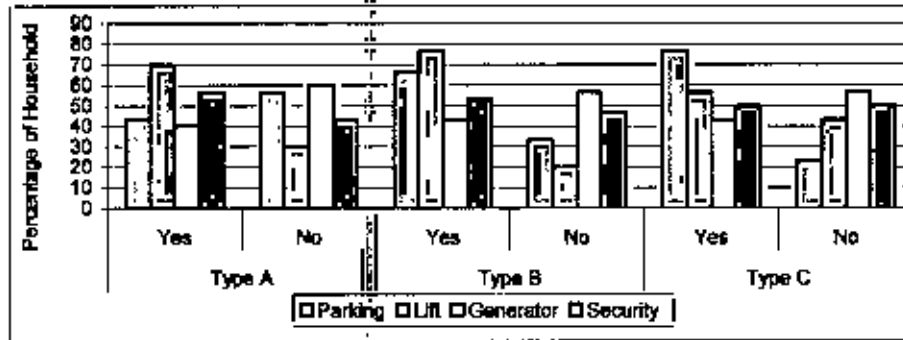
Figure 4.23: Availability of Utility Services in the Apartments of Sample Households
Source: Field Survey, 2009

Figure 4.23 shows that respectively 57%, 33% and 23% families have no parking facility for family type A, B and C. Furthermore, respectively 30%, 20 % and 43% household do not have lift or elevator, 60%, 57% and 57% do not have generator and 43%, 47% and 50% do not have any security in the apartment for family type A, type B and type C (Appendix D: Table D-10).
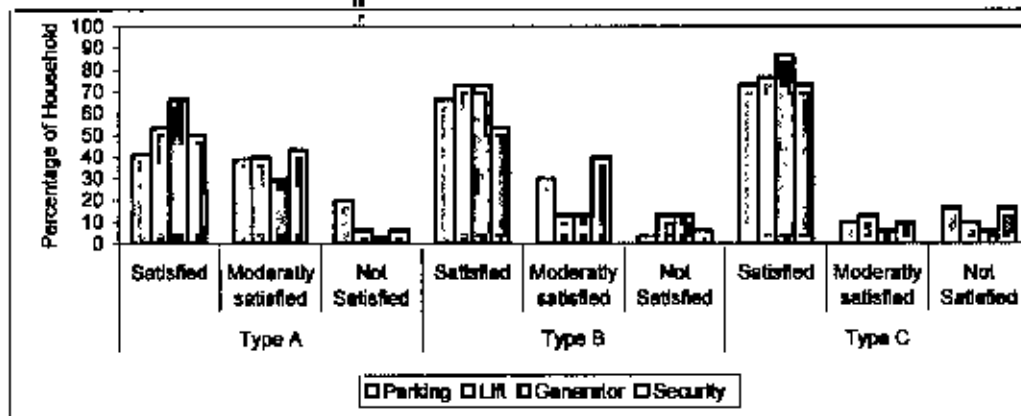
Figure 4.24-A: Satisfaction Levels for the Utility Services by the Sample Households
Source: Field Survey, 2009

58

Figure 4.24-A shows the satisfaction level of the earlier mentioned facilities by the households who got the facilities in their existing apartments. The figure presents that respectively 20%, 3.33% and 16.67% households of family type A, B and C are not satisfied with parking. Moreover, respectively 6.67%, 13.33% and 10% of the three types of families are not satisfied with lift. Furthermore, family type A, B and C are not satisfied respectively 3.33%, 13.33% and 6.67% for generator and 6.67%, 6.67% and 16.67% for security.
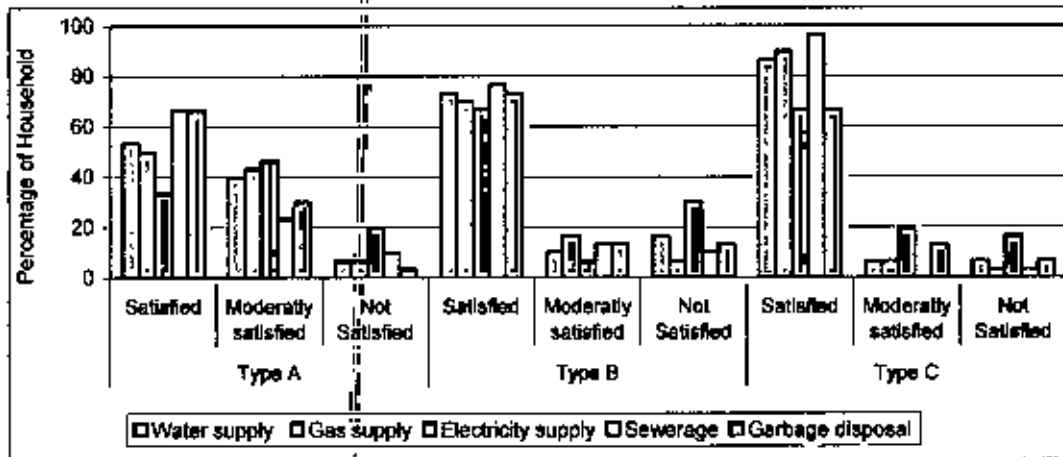
Figure 4.24-B: Satisfaction Levels for the Utility Services by the Sample Households

Source: Field Survey, 2009

Though almost all households of the study have water supply, gas supply, electricity supply and sewer and garbage disposal system, a number of households have not got the service quality in an acceptable level (Figure 4.24-B). There is a variation of satisfaction level of the three types of families. Comparatively family type A have less satisfaction level than type B and type C families. It is true that quality of utility supply vary within apartments and residential areas. For example, the satisfaction level of electricity supply is less compared to other utility services to all types of families. The electricity supply system all over the country is miserable for power shortage. As a result, the problem regarding load shedding is more or less same all over the city that increases during summer seasons (Appendix D: Table D-11).

4.9. Monthly House Rent

Affordability is expressed in terms of willingness to pay as house rent and it is a very important factor that affects the choice of rental apartment. In Dhaka City, house rent

is comparatively higher than any other areas of the country (Sharmeen, 2007). All over the city there is spatial variation of house rent depending on the locational quality as well as the quality of the apartment (Asaduzzaman, 2006). The present rent structure of the middle-income areas varies from place to place. However, the study considered the rent variation in respect to the family structure rather than area.

4.9.1. Monthly House Rent of the Present Apartment

The study shows (Figure 4.25) that very few (only 3%) family type A pay Tk. 3,000 per month. Respectively 18%, 23%, 52% and 7% family type A pay Tk. 5,001 to 8,000, 8001 to 10,000, Tk. 10,001 to 15,000 and more than Tk. 15,000 per month as house rent. Most of the surveyed families pay Tk. 10,001 to 15,000 per month that is 53% for type B and type A. Family type C pay respectively Tk. 5,000 to 8,000 (10%), Tk. 8,001 to 10,000 (28%), Tk. 10,001 to 15,000 and more than Tk. 15,000 (33%) house rent (Appendix D: Table D-3).
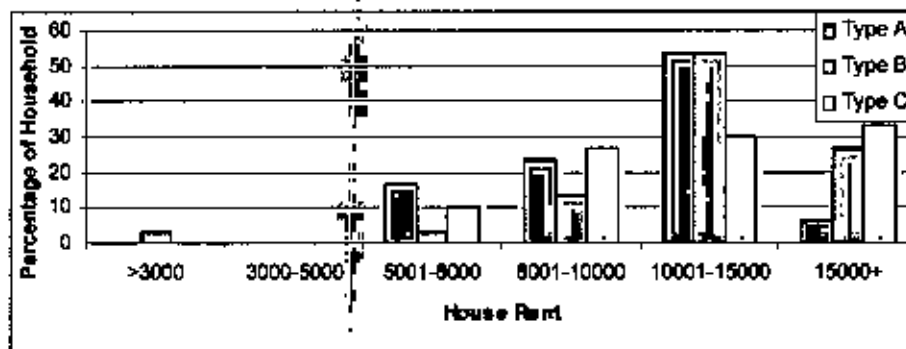
Figure 4.25. Monthly House Rent of the Apartment

Source: Field Survey, 2009

4.9.2. Per Square Feet Monthly House Rent

The study presents the average per square feet house rent of the apartment according to family types. Family type A, B and C pay respectively Tk 9.2, 8.7 and 8.4 as average per square feet house rent. On an average per sq ft monthly house rent of the apartment paid by the sample respondents is Tk 8.77.

This represents that the smaller households pay higher average house rent. Smaller families live in smaller apartments. This reflects that average house rent is higher for smaller apartment.
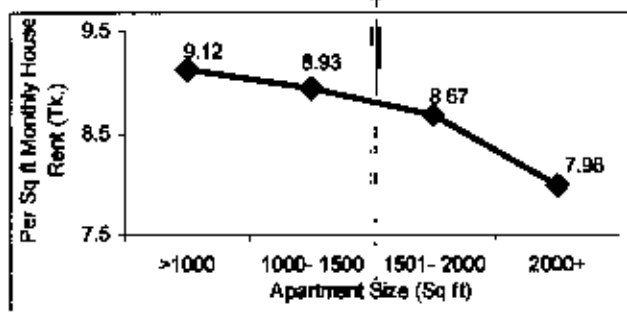
Figure 4.26: Relation of house rent and floor area

Source: Field Survey, 2009

This trend is also presented in the Figure. 4.26. Per sq ft monthly house rent is Tk. 9.12 for apartment size less than 1000 sq ft, wherever that is only Tk. 7.98 for more than 2000 sq ft sized apartment (Appendix D: Table D-6). The research of Asaduzzaman (2006) reveals the same fact that average rent for small housing unit is higher than medium and larger housing unit.

4.9.3. Household Income and Expenditure for Household Rent

Most of the middle-income families spent major part of their family income as house rent. According to Nur et al. (2003), it is expected that house rent should not exceed 23 percent of the monthly income i.e. one week's salary. However, the study found that the most of the household spend around 25 to 45 percent of their monthly income for house rent.

The study shows that family type A spend average 32.63%, type B spends average 31.57% and type C spend 31.44% of their household income for house rent. That means the sample households spend on average 31.88% of their monthly income for accommodation that is higher than the standard. This percentage spent, as house rent is slightly lower than the average determined by Asaduzzaman (2006) for house rent that was 35.63%. In general increase of household income increase affordability to spend more as house rent. However, the study shows different trend (Figure 4.27). This indicates that the families with lower monthly income spent more as house rent. Moreover, this represents smaller families pay higher percentage of monthly income for house rent.

61
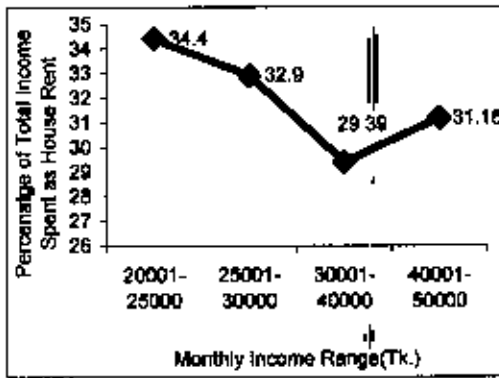
Fig 4.27: Percentage of Total Income
Spent as House Rent
Source: Field Survey, 2009
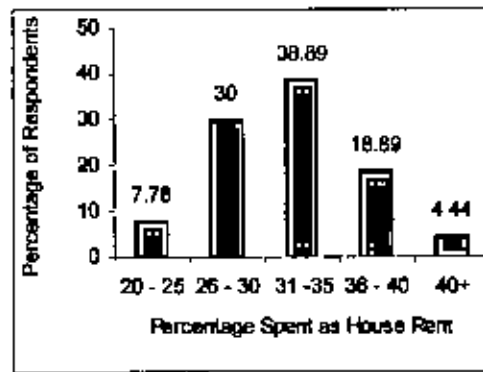
Fig 4.28: Percentage of Households of
Percentage of Income Spent as House Rent
Source: Field Survey, 2009

A significant portion of the monthly expenditure is for the purpose of house rent. House rent is the single main part of their family expenditure. The study shows percentage spent for the purpose of house rent of the total monthly income. Figure 4.27 reveals that house rent expenditure reduces with the increase of family income up to a level. Then the expenditure as house rent increases again. The household whose monthly income range in between Tk. 20,001 to 25,000 spent 34.4% as house rent that is 29.39% whose monthly income ranges between Tk. 31,001 to 40,000. This percentage increases to 31.16% for those families whose monthly income ranges between Tk. 40,001 to 50,000 (Appendix D: Table D-4).

Figure 4.28 reveals percentage of households that spent certain percentage of income as house rent. This figure shows that 38.89% respondents expense in the range between 31 to 35% of the monthly family income for paying house rent. 4.44% sample respondent spent more than 40% of the monthly income for this purpose. Only 7.78% sample households expense in between 20 to 25% of monthly income for accommodation (Appendix D: Table D-5). This indicates the high percentage of monthly income spent for house rent. This represents high price of house as presented with house rent.

Chapter 05
Criteria for Residential Location Choice

Chapter-05: Criteria for Residential Location Choice

5.1. Introduction

The middle-income tenants who are nuclear families consider a number of attributes to decide on the residential areas for renting the apartment. It is assumed that importance of the attributes may vary according to the family composition. It is a matter of fact that all of the households cannot afford to rent a house in the most preferable housing environment all times. This chapter attempts to address comparative importance of the selected attributes like distance from workplace, school, market, bus stop, plan of neighborhood, condition of municipal services, road width, social status, proximity of relatives or colleagues, and proximity of open areas. The study reveals that relative magnitudes of these indicators vary with respect to the family structures in the existing housing environment and the preferred housing environment. Three types of nuclear families are selected to study, these are: families without school going child, families with school going children and families with children above than school going age.

5.2. Criteria of Present House Location Choice

The study determined the aggregated profile of present house location preferences by different types of middle-income families. Location choices by sample households are aggregated by arithmetic mean to avoid bias to any variables. This subsection shows aggregated profile of different variables for selecting the locational quality of housing environment in Dhaka City by different family types. The study opens up the possibilities to show the relative importance of attractiveness of different residential areas in Dhaka.

5.2.1. Criteria of Present House Location Choice by Family Type A

Sample family type A are young couples with no child or have children younger than school going age. This part of the chapter determined the relative weight of the house location criteria to the sample that are shown by the pair-wise comparison matrix in the Table 5.1. The comparison matrix clearly shows in ordinal scale that distance to workplace is evaluated more important than distance to school. This criterion is 3.67:1 more important than distance to market, 3.33:1 more important than distance to bus

63

stop. This is also 2.98:1 more important than planning of neighborhood, 2.71: 1 more important than municipal services, 2.62:1 more important than road width. Furthermore, this indicator is 3.33:1 more important than social status, 3.2:1 more important than proximity to relatives. The sample family type A considers this determinant 2.22: 1 more important than open area. In the same way, the pair-wise matrix gives the aggregated importance of each factor compared to all other factors in an ordinal scale.

Table 5.1: Pair-wise Comparison Matrix of House Location Choice by Family Type A

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Distance to workplace	1	7	3.67	3.33	2.98	2.71	2.62	3.33	3.2	2.22
2. Distance to school	0.14	1	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
3. Distance to market	0.27	7	1	2.89	2.64	2.02	2.28	3.02	2.44	2.22
4. Distance to bus stop	0.3	7	0.35	1	2.63	1.99	2.44	2.58	2.5	2
5. Planning of neighborhood	0.34	7	0.38	0.38	1	2.32	2.09	2.29	3.43	1.76
6. Municipal services	0.37	7	0.5	0.5	0.43	1	3.58	3.58	3.2	2.56
7. Road width	0.38	7	0.44	0.41	0.48	0.28	1	1.62	2.44	2.13
8.Social status	0.3	7	0.33	0.39	0.44	0.28	0.62	1	2.69	2.64
9. Proximity to relatives	0.31	7	0.41	0.4	0.29	0.31	0.41	0.37	1	3.31
10. Open area	0.45	7	0.45	0.5	0.57	0.39	0.47	0.38	0.3	1

Source: Field Survey, 2009

Table E-4 (Appendix E) shows relative importance of each factor by normalizing the comparison matrix in Table 5.1. The relative importance of distance to workplace as well as other house location criteria is presented in Figure 5.1.
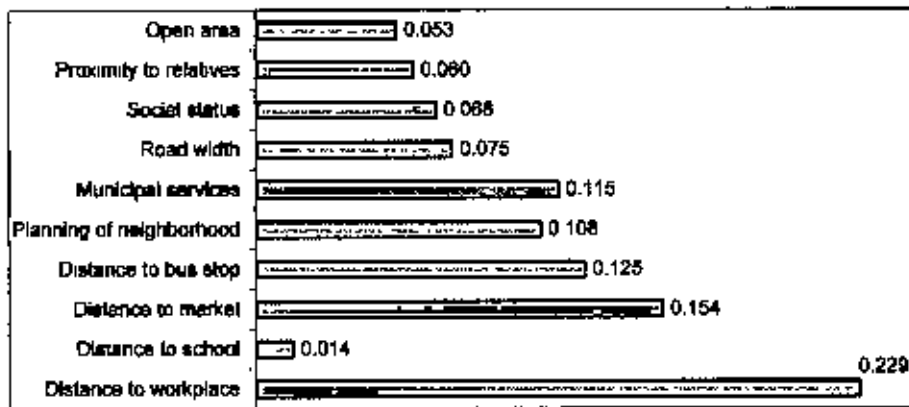
Figure 5.1: Weight of House Location Attributes by Family Type A

Source: Field Survey, 2009

Figure 5.1 reveals that distance to workplace is turned to be most important attribute to sample type A families for selecting the present house location. Generic analysis of occupational pattern of this family type shows the fact that 33% family type A have two earning members. As a result, they prefer to live close to the working place or close to the area where they can get locational advantages to access to work place. A number of researchers pointed out the importance to workplace for location choice (Abraham and Hunt, 1997; Romani et al., 2003; White, 1998, Freedman and Kern, 1997, Khatun, 2003). The tenants want to live close to office to avoid the nuisance of time loss due to traffic congestion. The importance of locating close to market place becomes the second most important criteria. Closeness to grocery shop, kutcha bazaar, shopping center or departmental shop is relatively important to this family type. Among the ten factors distance to bus stop that represents the level of accessibility also urges one of the strongest decisive factors in house location selection. After then municipal services have higher weight than planning of neighborhood. This is apparent that planning of neighborhood and municipal services are important for comfortability of civic life in a residential area. Road width, social status on prestige of area, proximity to relatives or colleagues, and open areas carries less weight than the attributes related to accessibility to workplace, market, bus stop and planning of neighborhood. To this type of families, distance to school is very insignificant for having no school going family members.

The pair-wise comparison matrix of the factors shows importance of the factors in ordinal scale that can be converted in ratio scale after normalization of the matrix. Form the weight of the criteria it can be measured that distance to workplace is 1.48 (= .229/. 154) times than distance to market, 1.83 (=.229/.125) times than distance to market. This criterion is 2.12(=. 229/. 108) times more important than planning of neighborhood, 1.99 (=. 229/. 115) than municipal services, 3.05(=. 229/. 075) times than road width. Furthermore, it is 3.37 (=. 229/. 068) times more important than social status, 3.82 (=. 229/. 06) times than proximity to relatives. Finally this factor is 4.32(=. 229/. 053) times more important than open area. In the same way, distance to market is 1.48(=.229/.154) times less important than distance to workplace and 1.23(.=.154/.125) times more important than distance to bus stop that is 1.15(=.125/.108) times more important than planning of neighborhood. Municipal service is 1.53 (=.115/.075) times more important than road width. Proximity to relatives is 1.13 (=.068/.06) times less important than social status and 1.13 (=.060/.053) times more important than open area. In the same way ratio scale of each criterion compared to each criterion can be determined (Appendix G: Table G.1)

5.2.2. Criteria of Present House Location Choice by Family Type B

The study determined the relative weight of ten locational factors for choosing residential area by the nuclear families who have at least one school going child. The comparison matrix in Table 5.2 clearly shows weight of each pair of attribute in ordinal scale. It is observed from the matrix that the number of comparisons is equal to number of combination of the criteria. Since, there are ten criteria, there are ten comparisons for each criterion.

In the first row in the Table 5.2, it is found that distance to workplace is comparatively more important than all other location factors. Second row is showing that distance to school is 0.59: 1 less important than distance to workplace and more important than all other criteria. In the way, each row of the table shows the evaluation of all factor compared to other factors. The Table E-4 (Appendix E) is showing the relative weight of all the locational factors. The relative weight is representing the aggregated weight of each house choice factor by the sample respondents of family type B.

Table 5.2: Pair-wise Comparison Matrix of House Location Choice by Family Type B

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Distance to workplace	1	1.69	3.09	3.07	2.67	2.39	2.49	3.4	3.18	2.31
2. Distance to school	0.59	1	3.59	3.26	3.04	2.82	2.98	3.71	3.98	2.84
3. Distance to market	0.32	0.28	1	2.42	2.43	2.22	2.09	2.44	2.97	1.53
4. Distance to bus stop	0.33	0.31	0.41	1	2.77	2.29	2.07	2.71	2.59	2.31
5. Planning of neighborhood	0.38	0.33	0.42	0.36	1	1.67	1.95	1.9	2.73	1.74
6. Municipal services	0.42	0.35	0.45	0.44	0.6	1	3.0	3.57	3.13	2.68
7. Road width	0.4	0.34	0.48	0.48	0.51	0.33	1	1.87	2.73	1.79
8.Social status	0.29	0.27	0.41	0.37	0.53	0.28	0.57	1	2.58	2.64
9. Proximity to relatives	0.3	0.25	0.14	0.39	0.37	0.32	0.37	0.39	1	2.63
10. Open area	0.43	0.35	0.67	0.43	0.57	0.37	0.56	0.38	0.38	1

Source: Field Survey, 2009
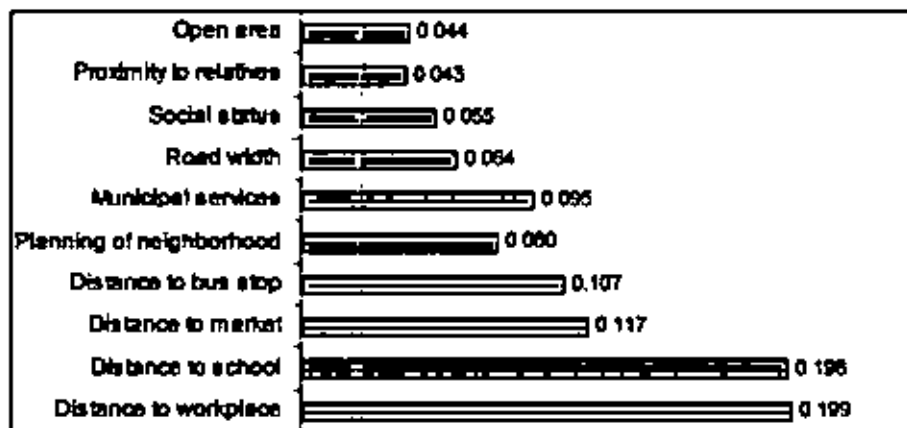
Figure 5.2: Weight of House Location Attributes by Family Type B

Source: Field Survey, 2009

Figure 5.2 graphically depicts the weight of housing area choice factors to attain the goal locational advantage. Among the selected factors distance to workplace and distance to school of the family type B seems to have highest and almost same importance. It indicates that this type of families normally put highest and almost

67

same priority for living close to workplace as well as children's schools. A number of researches comply with this requirement for selection of house location (Abraham and Hunt, 1997; Romani et al., 2003; White, 1998, Freedman and Kern, 1997, Khatun, 2003). These two decisive factors find almost double importance than the other factors. The respondents want accessibility to work and school with minimum time and cost. The study also shows that 50% of the school trips are with rickshaw, where only 6.67% are with bus (Figure 4.11). That means the preference of the distance to school is the distance to travel with rickshaw. Distance to market holds the third position that has slightly more important than distance to bus stop. Figure 5.2 represents these types of family consider accessibility as the most important criteria than any other factors. It is obvious that closeness of workplace, market school and bus stop increases the convenience of the dwellers' life. For the proper distance to bus stop as well as the availability of public bus service are taken into account. The study found 24% job trips are with bus. Availability and quality of municipal services comes next in the line of ranking. The figure represents municipal services are relatively more important than planning of neighborhood, road width. This type of family gives very less weight to social factors like social status or prestige of residential area and proximity of relatives compared to different factors. Closeness of park, playground, lake or the other open areas and closeness of relatives find least and almost similar priority to family type B.

The comparative importance of pair-wise attributes in ordinal scale can be transformed in ratio scale by using the weights of the attributes. Most important criteria are distance to workplace and distance to school that are almost 1.7 (= .199/.117) times more important than the closer important choice factor distance to market. On the contrary, this criterion is 2.77(=.119/.043) times more important than the most less important factor proximity to relatives to this type of families for house location choice.

5.2.3. Criteria of Present House Location Choice by Family Type C

The aggregated values of pair-wise importance among the house location criteria to the nuclear families Type C (who have children older than school going age) are shown in the Table 5.3.

Table 5.3: Pair-wise Comparison Matrix of House Location Choice by Family Type C

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Distance to workplace	1	7	3.62	3.02	2.62	2.53	2.84	3.04	2.82	2.19
2. Distance to school	0.14	1	0.14	0.14	0.15	0.14	0.14	0.14	0.14	0.14
3. Distance to market	0.28	7	1	3.13	3.76	2.48	2.6	2.58	2.88	2.51
4. Distance to bus stop	0.33	7	0.32	1	3.16	2.73	3.18	2.8	2.62	2.77
5. Planning of neighborhood	0.38	7	0.27	0.32	1	1.52	1.79	1.75	2.6	1.96
6. Municipal services	0.39	7	0.4	0.37	0.66	1	2.78	2.91	3.04	2.73
7. Road width	0.35	7	0.38	0.31	0.56	0.36	1	2.49	3.22	2.76
8. Social status	0.33	7	0.39	0.36	0.57	0.34	0.4	1	2.91	2.62
9. Proximity to relatives	0.35	7	0.35	0.38	0.38	0.33	0.31	0.34	1	3.31
10. Open area	0.46	7	0.4	0.36	0.514	0.37	0.36	0.38	0.3	1

Source: Field Survey, 2009

The information from the pair-wise comparison matrix shows that distance to workplace hold very high importance compared to other factors. First row of the table shows that distance to workplace is mostly important than the factors distance to school, market and bus stop. The sample family type C evaluates this factor more than the factor social status for locational choice of house. For this way, each row shows the relative importance of respective criterion based on subjective judgment compared to other factors. Table E-4 (Appendix E) shows the relative importance of all factors for house location choice by the sample family type C. This is also found here that principal weight is for the factor distance to workplace.

Attribute	Weight
Open area	0.049
Proximity to relatives	0.058
Social status	0.069
Road width	0.084
Municipal services	0.105
Planning of neighborhood	0.090
Distance to bus stop	0.142
Distance to market	0.171
Distance to school	0.014
Distance to workplace	0.218
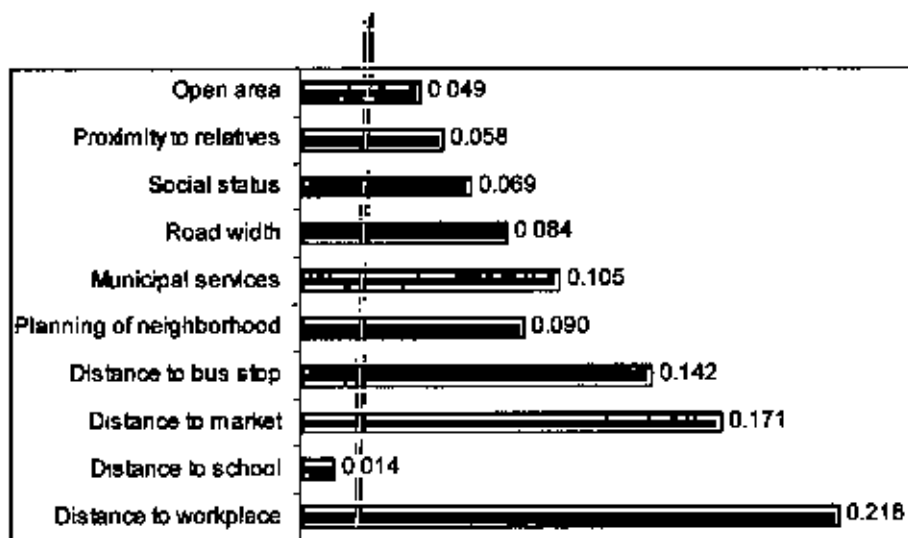
Figure 5.3: Weight of House Location Attributes by Family Type C

Source: Field Survey, 2009

The relative weight of each location choice factors is depicted in the Figure 5.3. The figure graphically signifies the comparison of different factors for selecting existing apartment location by the sample family type C. The figure shows the relative importance of ten location choice criteria of apartment location selection on a 'zero-to-one' scale where higher value represents the higher preference of the criterion. This type of families considered the closeness to workplace mostly comparing to other factors for selecting exiting apartment location. The difference of relative weight for distance to market and bus stop are not too much important compared to closeness to workplace to these types of families. Living close to market is more important than bus stop to them. Then they provided priority of comfort of life with availability and quality of municipal services. After then these families give priority to planning of neighborhood. Furthermore, the Figure 5.3 shows that the importance of road width, social status, proximity to relatives and closeness to open areas come respectively. As these families have no school going member, the closeness to school is apparently insignificant.

Simply dividing the weight of a criterion by that of the other factors, the rational important criteria can be obtained for family type C. The estimated weight represents that family type C prefer distance to workplace 1.28 (.218/.171) times more compared to distance to market that is second choice to the respondents for selecting existing

house location. Moreover, this most preferred option is 4.44 (=.218/.049) times more important than the least important factor open area to family type C.

5.2.4. Comparison of Criteria for Present House Location Choice according to Family Structures

Comparison of relative weight among the criteria for present house location choice by different types of families in Dhaka City is summarized in Figure 5.4.

Figure 5.4: Comparison of Weight of Present House Location Attributes by Different Family Types

Source: Field Survey, 2009

As explained above the relative importance of the factors are derived from elicitation of different types of nuclear families. As shown in the Figure 5.4 the comparative importance of the factors by different family structures vary slightly. The most important element for all sample family types is distance to workplace. Generic analysis shows that the percentage of working member is high in the household of respondents. The sample family type A considers this factor comparatively more important than other two family types. Housing location near to school is apparently important to family type B as they have school going members. Family type C provides importance to live closer to market compared to type A and B, where family type B turn least importance for the element. The position in the line of importance among the family types is almost same for distance to bus stop and road width. On the

other hand, distance to work place, planning of neighborhood, municipal services, proximity to relatives and open area are comparatively more important to family type A than the other two family types. From the figure, it is noted that to provide importance to distance to school family type B give less importance to all other factors than the other two family types. The criterion social status is equal important to family type A and C.

5.2.5. Present Location Criteria by Overall Attributes Type

The locational choice variables used in the study are grouped in four categories to overall attribute types: spatial, physical, social and environmental. The aggregated result of relative importance of criteria for present house location choice showed that it varies according to the criteria and family types. It indicates that relative weight also vary according to the overall attributes type that is represented in the Figure 5.5.
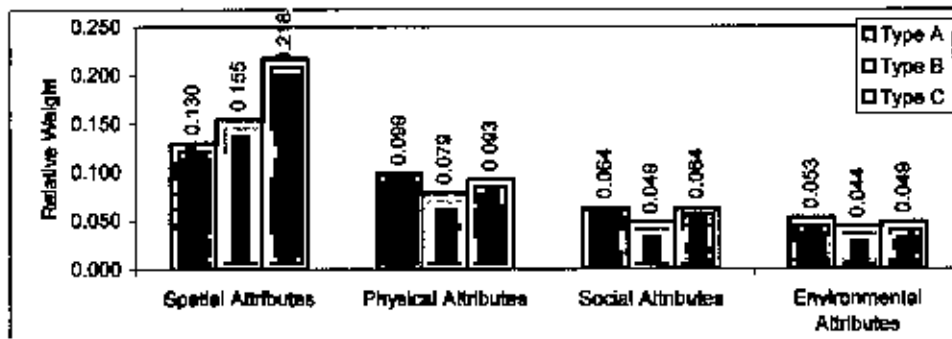
Figure 5.5: Present Location Criteria by Overall Attributes Type
Source: Field Survey, 2009

The figure shows that the relative weights of spatial attributes (average of distance to workplace, school, market and bus stop) are surprisingly higher compared to the other types of attributes. Family type C evaluates these attributes with high priority compared to type A and B. Moreover, transportation problem due to time loss for traffic jam as well as travel cost encourage the tenants to consider spatial attributes. Then comes the importance of physical attributes (average of planning of neighborhood, municipal services and road width). It may happen that these physical attributes that increase the convenience of civic life, increase the comparative importance to all family types. Social attributes (average of social status and proximity to relatives) turned less weight than physical attributes. On average the

72

residents of the city give least weight for environmental attribute (open area). This is increasing the risk of crisis of physical and mental well being of the dwellers.

The figure shows that to family type C, spatial attributes are 1.4 (=.218/.155) times more important than family type B and 1.68 (=.218/.13) times more important than family type A. To family type A physical attributes are a little important than type C and 1.25 (=.099/.079) times more important than to type B. Furthermore, social attributes got same importance to family type A and C that is 1.3 (=.064/.049) times more important than family type B. The environmental attribute is somewhat same important to family type A, type C and type B respectively.

5.3. Criteria for Preferred House Location Choice According to Family Structures

The housing environments that fulfill preferences and requirements of the families by considering affordability of the families are preferred house location. A number of attributes interact with the preferences and requirements of the household to choose house location. Most of the time people want to rent an apartment in the residential area where they can live with comfort. The families almost have not achieved all the locational options altogether at required level in the selected present house location. The preferred house location is such that where the tenants can achieve all required indicators in expected level. However, it is ironic; most of the time there remains some gap between the attributes of preferred and rented apartment's location.

5.3.1. Criteria of Preferred House Location Choice by Family Type A

Figure 5.6 reveals that distance to workplace is turned to be most important attribute to type A families who have no school going children in their preferred house location. They prefer to live close to the working place to reduce travel time and cost. The importance for locating close to market place holds second priority. Closeness to grocery shop, kutcha bazaar, shopping center or departmental shop is relatively important to this family type. Distance to bus stop and municipal services are evaluated to equal important to this family type. Then comes the importance of planning of neighborhood. Road width as a decisive factor follows the earlier factors.
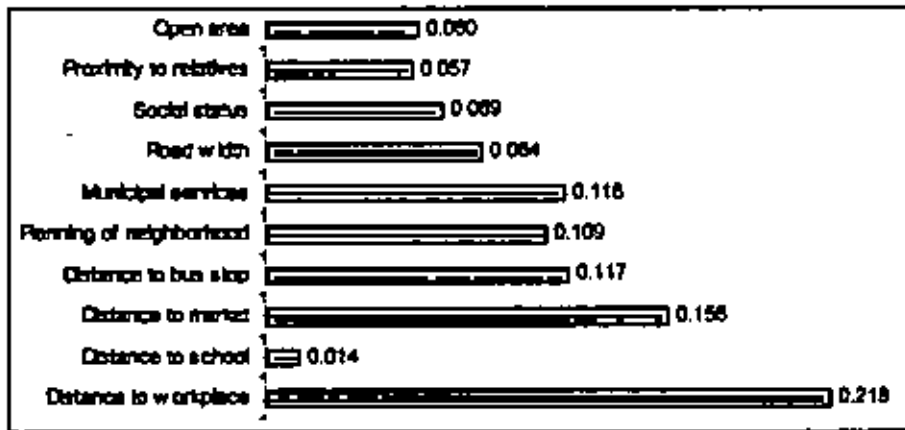
Figure 5.6: Weight of House Location Attributes by Family Type A

Source: Field Survey, 2009

Open areas carries more weight than the attribute proximity to relatives or colleagues. To this type of families, distance to school is very insignificant, as they have no school going family members.

5.3.2. Criteria of Preferred House Location Choice by Family Type B

The study found that the relative weight of ten locational factors for preferred residential area by the single families who have at least one school going members (type B) varies. Figure 5.7 graphically depicts the weight of housing area choice factors to attain the goal locational advantage. Family type B evaluates distance to workplace and distance to school with highest and same importance compared to others. Distance to market comes to third priority that has more importance than municipal services. Distance to bus stop comes next in the line of ranking and represents it is relatively more important than planning of neighborhood, road width, social and open area. This type of families gives least weight to social factors like social status or prestige of residential area and proximity of relatives.
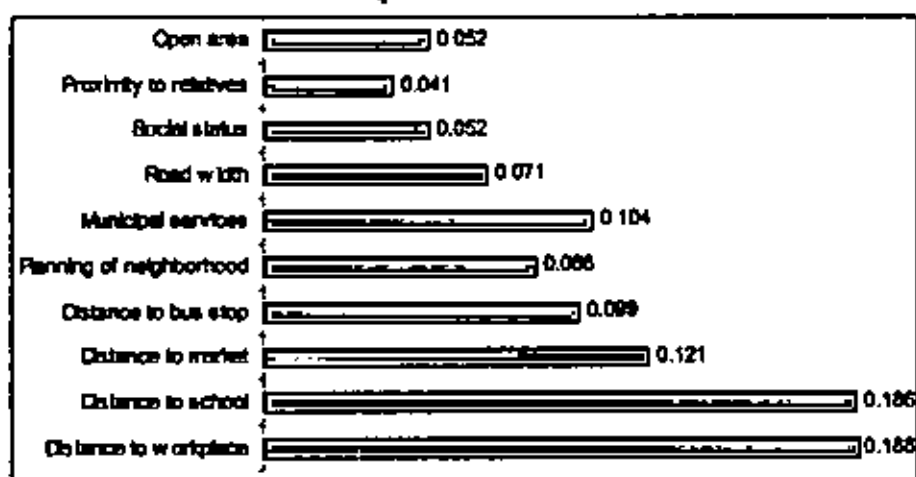
Figure 5.7: Weight of House Location Attributes by Family Type B

Source: Field Survey, 2009

5.3.3. Criteria of Preferred House Location Choice by Family Type C

The relative magnitudes of each location choice factors in preferred house location are depicted in the Figure 5.8. The figure graphically signifies the comparison of different factors for preferred apartment location by the family type C.
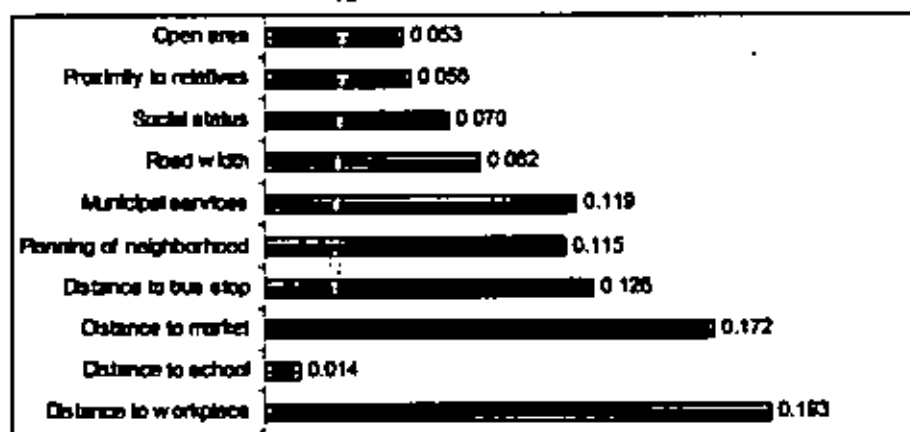
Figure 5.8: Weight of House Location Attributes by Family Type A

Source: Field Survey, 2009

The figure reveals that this type of families considered the closeness to workplace mostly compared to other factors. The difference of relative weight for living close to market is less important compared to closeness to workplace to these types of families. Living close to bus stop, availability and quality of municipal services and planning of neighborhood are more or less similar important to them. The importance

of road width, social status, proximity to relatives and closeness to open areas come respectively for the preferred house location. As these families have no school going member, the closeness of home to school is apparently insignificant.

5.3.4. Comparison of Criteria for Preferred House Location Choice According to Family Structure

It is obvious that residential location choice varies according to the purposes of the families. The purpose of the families varies with the family structures and number of family members. The study has the scope to compare the relative importance of house location choice criteria in preferred house according to family organization. The study shows these weights for existing and preferred house location are different. By aggregating the elicitation of the sample respondents of different types of families, it is found the comparative picture of the most preferred options for selecting housing location. There is more or less difference among the relative importance of the options and priorities of the options among the target groups.
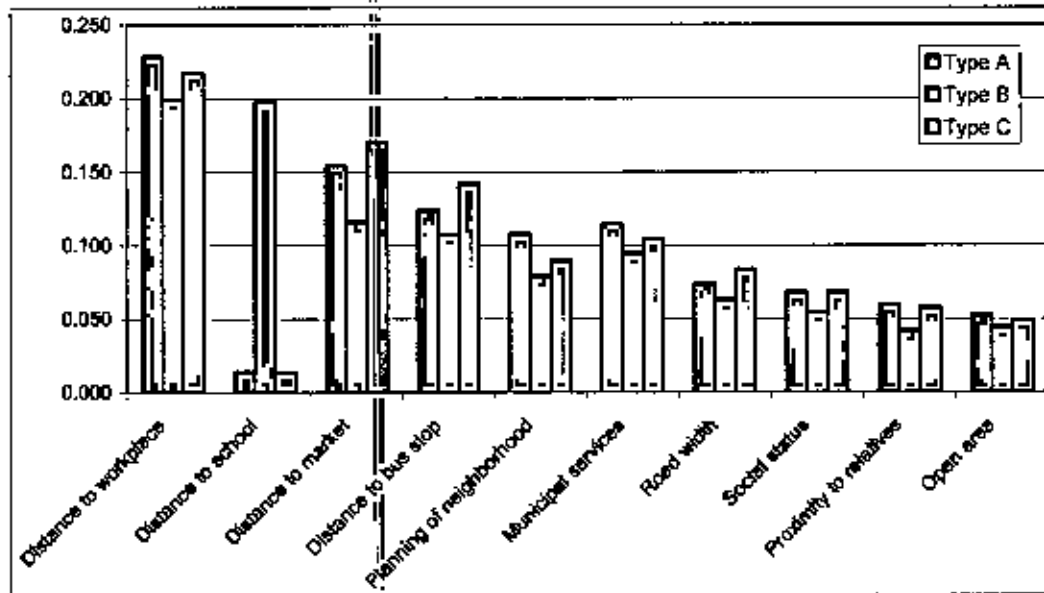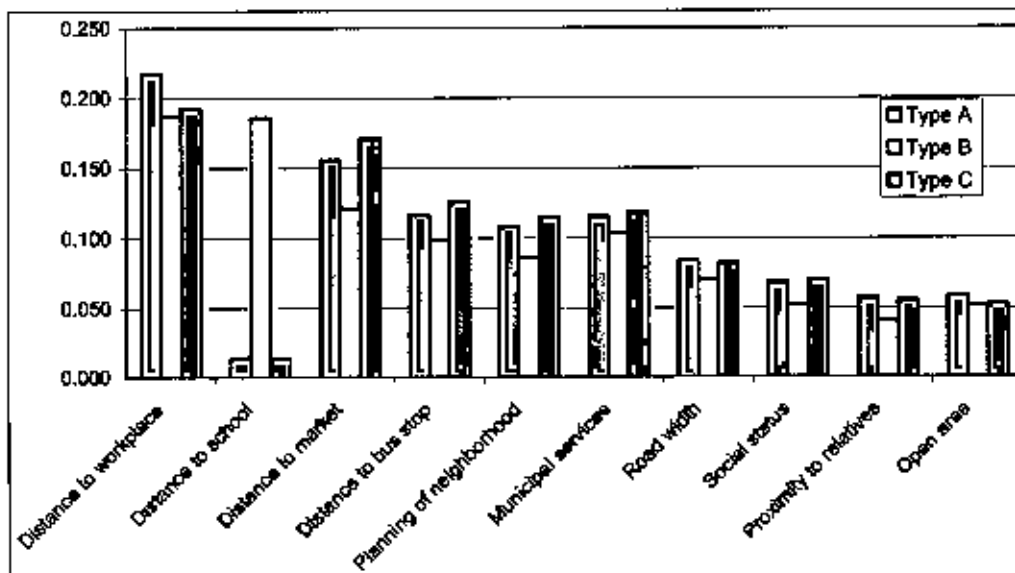

Figure 5.9: Comparison of Weight of Preferred House Location Attributes by Different Family Types

Source: Field Survey, 2009

Figure 5.9 shows that the factor distance to workplace is significantly important for all of the sample families. This is more important to family type A compared to other two family types. It is normal that family type A and type C found the factor distance

76

school very insignificant, as they do not have any school going members. The figure represents that distance to market is highly important to family type C that is followed by type A, and then to type B. The comparative picture shows that the relative importance for the criteria distance to bus stop and planning of neighborhood is almost same. The factors municipal services, road width, social status are important to family type A and type C that are slightly highly preferred than family type B. Proximity to relatives and Open area is least important to all of the family types. It is slightly more important to family type A than family type B and type C.

5.3.5. Preferred Location Criteria by Overall Attributes Type

As different family types have different purposes, the relative importance of different types of families differs for preferred house location. This difference in relative importance is reflected at overall attributes accordingly the family types in Fig 5.10.
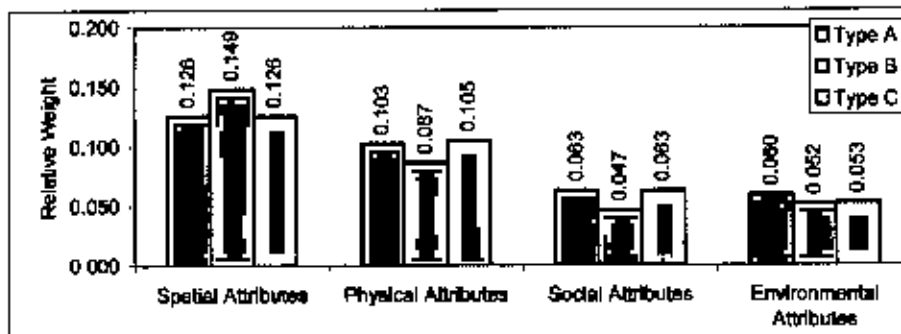
Figure 5.10: Preferred Location Criteria by Overall Attributes Type
Source: Field Survey, 2009

The figure shows that the relative weights of spatial attributes (distance to workplace, school, market and bus stop), physical attributes (planning of neighborhood, municipal services and road width), social attributes (social status and proximity to relatives) and environmental attribute (open area) are important for preferred house location to the families respectively. The bar diagram depicts that the spatial attribute is mostly important to family type B compared to two other family types who put same importance. Family type B that have school going children and incorporated the distance to school as spatial attribute causes the overall importance of the broad group. These attributes are 1.18 (=.149/.126) times less important to family type A and C than family type B. Physical attributes are almost same important to family type A and C, and about 1.2 (=.105/.087) times more important than family type B.

77

This sort relation of the relative importance is identical for the social attributes. In respect to family type A and C this factor is 1.34 (=.063/.047) times more important than family type B. Only to family type B environmental attribute is to some extent important than social attributes. For environmental attribute relative importance is respectively important to family type A, C and B.

5.4. Gap between Present and Preferred House Location

House location preference modeling based on target group's opinion proves a valuable support for assessment between present and preferred location of the rental apartment. Specifically, while referring to the target group questionnaire approach for determining locational value, a distinction can be drawn between elicitations of the respondent That represent trade off of choice profiles by them. The study shows that there is gap between the existing preferences of house and its location than the preferred options in Dhaka City for the target groups.

5.4.1. Comparison of Present and Preferred House Location by Family Type A
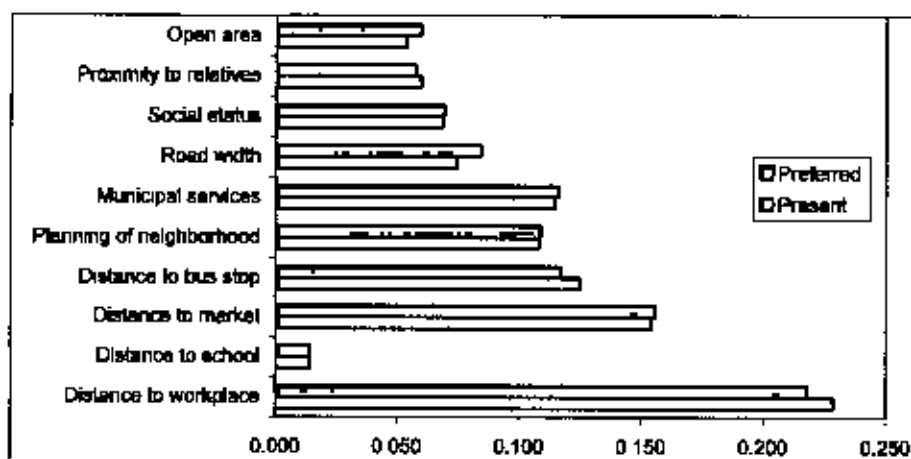
Figure 5.11: Comparison of Weight of Present and Preferred House Location Attributes by Family Type A.

Source: Field Survey, 2009

For different reasons there is a gap between the present and preferred house location by family type A. This gap is reflected to the differences between the weight of the house location choice criteria for the existing house location and the most preferred options. As the values of the criteria are aggregated, the overall differences for the

78

group of all families of type A is not reflected so notably. Figure 5.11 shows that distance to workplace is less evaluated as preferred option than present house by Type A. this means, the family type A have not compromised to live close to work place compared to other options to select the present house location. Even same picture is found for the criteria distance to bus stop, and proximity to relative that got importance to choose present house location. On the other hand, this type of families compromised the factors distance to market, planning of neighborhood, municipal services and social status slightly. Moreover, they trade off the width of road and open area mostly from preferred house for attaining the other factors. The factor distance to school is insignificant for house location.

5.4.2. Comparison of Present and Preferred House Location by Family Type B

For choosing rental house, all families try to get the high quality of all the locational criteria. Nevertheless, in a number of times they need to compromise some factors to gain the relatively preferred options. The study is advantaged to determine the comparison of the relative importance values of the different criteria of the present house and the preferred house location.
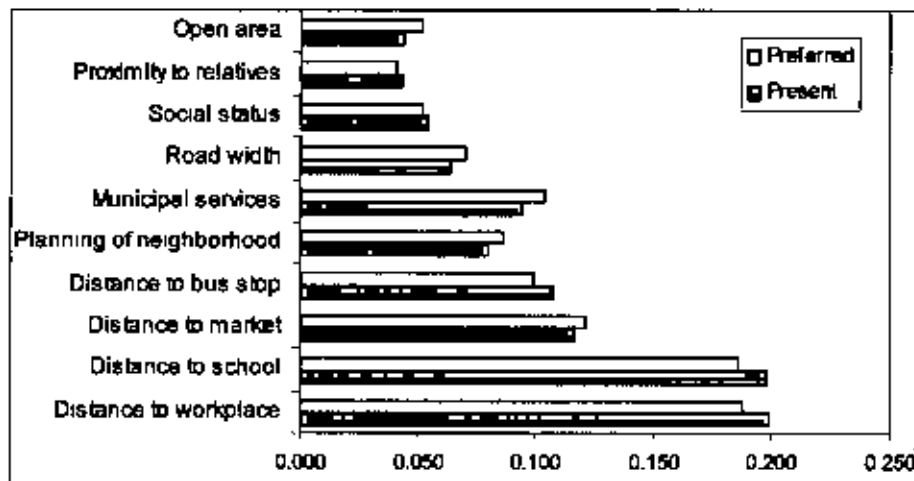
Figure 5.12: Comparison of Weight of Present and Preferred House Location Attributes by Different Family Type B

Source: Field Survey, 2009

This fact is graphically depicted in the Figure no 5.12. The figure shows that family type B have not compromised living close to workplace, school, bus stop and for other criteria in the present house. Furthermore, the criteria of social status of

residential area and living close to relatives get priority to achieve in present house location. This indicated that the families type B have got the locational facility of these mentioned criteria for renting their present home. On the other hand, the figure shows that this family type trade off the factors municipal services and closeness open area greatly. Moreover, they compromised distance to market, planning of neighborhood and road width to some extent for selecting the present house location. This indicates that the family types compromised the later mentioned criteria for achieving the earlier options.

5.4.3. Comparison of Present and Preferred House Location by Family Type C

All families try to rent the house in such a location where they can find comparatively more locational advantage. For fulfill this purpose, sometimes they become forced to do negotiations for some options by comparative judgments among the criteria.
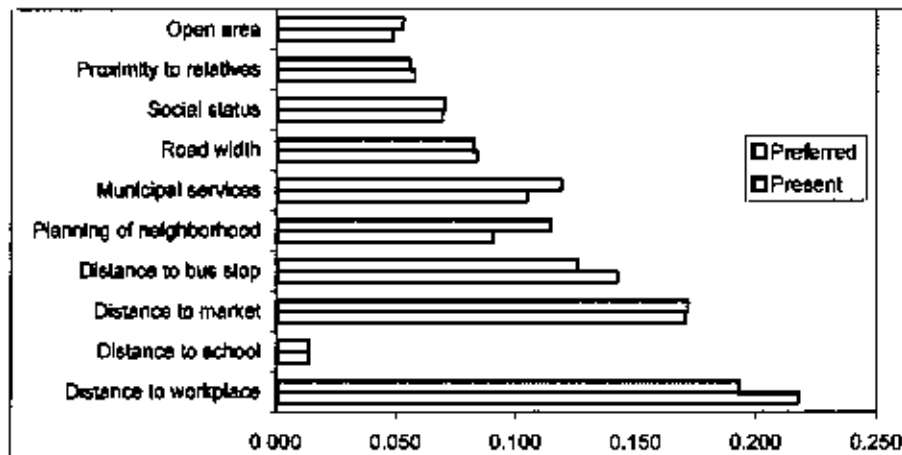
Figure 5.13: Comparison of Weight of Present and Preferred House Location Attributes by Different Family Type C

Source: Field Survey, 2009

This is true for family type C for selecting the rental house location that is presented in Figure 5.13. Normally families give more priority to proximity to workplace and most of the times do not want to compromise this option. That is proved in the figure for family type C. Distance to bus stop is so much rational for this family type that they attained the advantage in present house. There is insignificant gap between the present house location criteria and preferred location criteria for road width and proximity to relatives. On the contrary, for attaining the mentioned locational

advantage, family type C have compromised the factors availability and quality of municipal services and planning of neighborhood decidedly than the preferred weight. Moreover, they have compromised distance to market, social prestige of the residential area and closeness to open area somewhat. The picture shows the fact of lack of planning of the neighborhoods in Dhaka City and problem of availability and quality of municipal services. It demonstrates about awareness of the people about the advantage of planning of neighborhood. However, lack of planning in the neighborhood enforces the people to live in unplanned neighborhoods.

5.4.4. Overall Criteria of Location Preference

Any family prefers to hire a house in such a location that have most locational advantages and accomplish the preferred options at expected level. However, for different causes the situations go up against to fulfill all preferred options by the households. In this situation, aggregated preference of the entire targeted sample groups negotiate to select the house location.
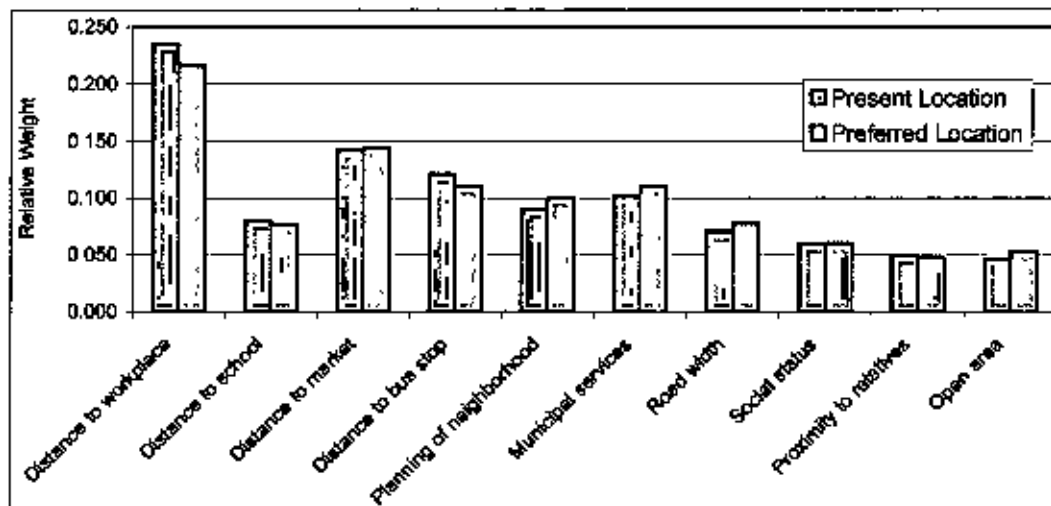
Figure 5.14: Comparison of Overall Weight of Present and Preferred House Location Attributes

Source: Field Survey, 2009

Figure 5.14 shows the comparison of the overall importance weight of the sample family types regarding existing and preferred options. The figure make it understandable that the sample families do not want to compromise the criteria distance to workplace, distance to school and distance to bus stop. This indicates the utmost meaning of the spatial factors to the sample families. It is also found that there

81

are some other factors that the families obtained more or less in their present house location such as distance to market, social status and proximity to relatives. However, they have to compromise the physical attributes like planning of neighborhood, municipal services, road width, and environmental factors like closeness to open area. This situation indicates lack of planning practice for community development in Dhaka City. The people are aware of the importance of planning of the city. However, due to lack of implementation of planning principles, people are not getting the locational advantage of a planned neighborhood. On the other hand, the municipal authorities and concern public authority failed to provide sufficient municipal services like street light, garbage disposal, sewerage facilities, storm water drainage and so on. However, people are not getting the services in a satisfactory quality in a number of residential areas (Figure 4.24-A, Figure 4.24-B). Even, there are a number of residential areas where people do not get any open area like park, playground, garden, lake or any green areas for recreation (Figure 4.15). This indicates that people are required to manage some locational facilities by considering some other facilities.

5.5. Consistency Arguments for Locational Attributes

The study estimated the relative importance of the criteria for housing locational preference on the basis of elicitation of different nuclear-family structures. The study is sub- divided into two major sections.

Table 5.4: Consistency of Relative Importance of the House Location Attributes

Household type	Option	δ	CI	CR= CI/RI	Consistency
Type A	Present	11.34284	0.134284	0.08893	Consistent
	Preferred	11.34522	0.149469	0.098986	Consistent
Type B	Present	11.06687	0.118541	0.078504	Consistent
	Preferred	11.08023	0.120026	0.079487	Consistent
Type C	Present	11.40056	0.151087	0.100058	Consistent
	Preferred	11.44294	0.151267	0.100177	Consistent

Source: Field Survey, 2009

Firstly, to determine the relative importance criteria for selecting the present house location and the preferred house location for renting apartment. Secondly, the study

also estimated the Consistency Ratio (CR) by comparing Consistency Index (CI) to the Random Index (RI) that represents the consistency of the AHP calculation. Table 5.4 shows that relative weight derivate through AHP for all sample family types have expected level of consistency, as all CR is less or equal to 0.1.

5.6. Conclusion

All types of sample middle-income families give priority to proximity to workplace for selecting the existing residential areas. A number of empirical studies determined the importance and preference of accessibility and proximity to workplace (Abraham and Hunt, 1997; Romani et al., 2003; White, 1998; Freedman and Kern, 1997, Khatun, 2003). In Dhaka City, a large number of people are migrated for job. So they prefer to reside close to the workplace or to the residential areas that have easy accessibility to the work place. Requirement of regularity to office also influence to inclination to live close to workplace by the dwellers. Zahur (2008) explains that about 28% middle-income families want to reside close to workplace in Dhaka. Loss of time for travel to workplace due to extreme traffic congestion (due to lack of proper transport) and travel expenditure encourages the middle-income people to reside close to workplace. In Dhaka City, lack of proper transport facilities as well as lack of proper transport planning aggravated the transport problem and create extreme traffic jam. If the people live long away from office, traffic jam kills a lot of time. Other matter is that transport fair is increasing day by day and it is going beyond affordable level to travel regularly long distance by middle-income families. It is also apparent that closeness to workplace reduces travel cost, travel time as well as physical labor.

The study found the middle-income households who have school going children prefer closeness to school equally to the closeness to workplace for renting apartment. According to Zahur (2008) about 33% middle-income families prefer to live close to children's school. Middle-income families most of the time give importance to educate their children. Transport system is not so much friendly and social system is not so much secured that children can travel alone to school. Most of the time, the guardians of the children accompany them on the way to school. So to avoid nuisance of travel long distance regularly, a number of families consider proximity to school of their children while considering the locational aspects of a rental house. The

difference of the comparative importance for selecting the existing apartment location verses the preferred apartment location is predominant for planning of neighborhood and municipal facilities.

According to Khatun (2003) selected the principal reasons for selecting destination by the *Dhakaiya* (original residents of old Dhaka). She determined that 30% destinations were selected for good neighborhood environment, 23% for economic reasons. Moreover, respectively 16% and 14% destinations were selected for dwelling space and familial opportunity. Furthermore, 12% destinations were selected for proximity to school and work and remaining 5% for other factors.

The tenants of Dhaka City give more importance to spatial attributes to avoid transport related problem. The sample households spend 31.88% of the monthly income for accommodation that is higher than the standard. So for adjust with the high expense due to accommodation, it is clear that the middle-income families attempt to minimize the transport expense by residing close to workplace, school of children, market and bus stop. All the family types put less importance to environmental quality of living. As a result, the physical and mental well being of the residents are being disturbed.

Chapter 06
Criteria for Apartment Standard Choice

Chapter-06: Criteria for Apartment Standard Choice

6.1. Introduction

The tenants want to rent a desirable house by comparative judgments of the apartment standards and attaining the goals of the families. The weighting function derivate through AHP provides information regarding the importance of the options of the qualities in the present and preferred apartment. This subsection is an endeavor to explain the comparative importance of the apartment selection criteria like affordability, condition of utility services, number of bedroom, number of toilet, availability of air and sunlight, and number of floor of the apartments. The study determined these for the present apartment as well as the preferred one in respect to the family composition. This also provides a better understanding regarding the deviance of relative weight of house selection qualities for present house compared to preferred one in Dhaka City by the middle-income families.

6.2. Criteria of Present Apartment Choice

The quality of rental apartment can be evaluated by a number of attributes. The relative importance of the attributes varies accordingly preferences of individuals or family members jointly. As family purpose differs some what on the basis of family structure, the family composition interact with the choice of the households to select rental apartment. As a result, different types of families evaluate same criteria differently. The study is privileged to represent the relative weights of the criteria according to different forms of families on the basis of the elicitation of the sample groups. This chapter focuses to provide a picture of relative importance of different attributes for apartment selection by the types of families. This also attempts to determine the gap between the present apartment where families are currently living and most preferred apartment. Consisting arguments of estimated relative importance of the variables by family types are provided in this part.

6.2.1. Criteria of Present Apartment Choice by Family Type A

Satisfaction level of apartments' standard is judged on the basis of parameters. The sample families type A are young couples without children or the couples who have very young children below school going age. This category of families is one of the

common typology of family in Dhaka City. AHP analyze the relative weight of the criteria that is represented in a comparison matrix. The aggregated importance of house selection attributes by the elicitation of the family type A are represented in Table 6.1. The table shows the relative importance of six house choice criteria for apartment selection on a 'zero-to-one' ordinal scale. It represents higher value for higher preference of the criterion. Every row represents comparison value of each attributes compared to others. For example, first row shows the magnitude of affordability as house selection criteria compared to other criteria. According to the sample respondent of family type A, this factor is 2.8 times more important than utility services, 3.44 times than number of bedroom, 2.45 than number of toilets, 2.37 times than availability of air and sunlight and 3.15 times than number of storey of the apartment. Table F-4 (Appendix F) shows the relative weight of each criterion that represents the aggregated magnitude of them by normalizing the comparison matrix. This presents that affordability that is presented as willingness to pay as house rent by the household is evaluated to be very much important to select the rental house.

Table 6.1: Pair-wise Comparison Matrix of House Preference Family Type A

	1.	2.	3.	4.	5.	6.
1. Affordability	1	2.8	3.44	2.45	2.375	3.15
2. Utility service	0.36	1	3.29	3.3	2.501	3.05
3. No. of bed room	0.29	0.3	1	2.09	1.61	2.17
4. No. of toilet	0.41	0.3	0.48	1	1.03	1.03
5. Availability of air, sunlight	0.42	0.4	0.62	0.97	1	2.62
6. No. of storey	0.32	0.33	0.46	0.97	0.38	1

Source: Field Survey, 2009

The magnitude of different criteria in the Table 6.1 shows that affordability has turned to be most important criterion for selecting a house. The study shows that family type A spent on an average 32.63% of their household income for house rent. Increased house rent compel the tenants to spend more than the standard to rent a decent apartment to live with family members. Utility services, number of bedroom, availability of air and sunlight, number of toilet, and number of storey follow this criterion respectively.

Figure 6.1: Weight of House Quality Attributes by Family Type A

Source: Field Survey, 2009

The relative magnitude of the criteria for choosing present rental apartment by family type A is shown in Figure 6.1. The figure shows that these types of families have given emphasis to the criterion affordability. The middle-income family's monthly income is limited and they pay major part of their monthly income as house rent. They want to make a balance between the income and expense on the purpose of accommodation. The bar diagram (Figure 6.1) illustrates that this factor is 1.34 (=335/.250) times more important than utility services in ratio scale. Moreover, it finds 2.48 (=.335/.135) times more weight compared to number of bed room, 3.68(=.335/.091) times than number of toilet, 2.89 (=.335/.116) times than availability of air and sunlight and 4.59(=.335/.073) times than number of storey.

6.2.2. Criteria of Present Apartment Choice by Family Type B

Pair-wise magnitude among the house quality criteria to the families who have at least one school going child (type B), are aggregated and presented in the Table 6.2. This is observed in the table that the number of comparisons is a combination of the number of things to be compared. The comparison matrix clearly shows in ordinal scale that affordability is evaluated to be 2.51: 1 more important than utility services, 3.7:1 more important than number of bed room, 3.81:1 more important than number of toilets. This criterion also shows 1.98:1 more important than availability of air, sunlight, and 3.15: 1 than number of storey of the apartment. In the same way, pair-wise matrix gives the aggregated importance of each factor compared to all other factors in an ordinal scale.

Table 6.2: Pair-wise Comparison Matrix of House Preference by Family Type B

	1	2	3	4	5	6
1. Affordability	1	2.51	3.7	3.81	1.98	3.15
2. Utility service	0.4	1	2.87	3.82	1.83	3.62
3. No. of bed room	0.27	0.35	1	2.46	1.91	2.53
4. No. of toilet	0.26	0.26	0.41	1	1.13	1.48
5. Availability of air, sunlight	0.5	0.55	0.52	0.89	1	2.63
6. No. of storey	0.32	0.28	0.4	0.68	0.38	1

Source: Field Survey, 2009

Table F-4 (Appendix F) shows relative importance of each apartment quality factors to family type A by normalizing the comparison matrix. The relative importance of each house factors compared to all other is represented in Figure 6.2.
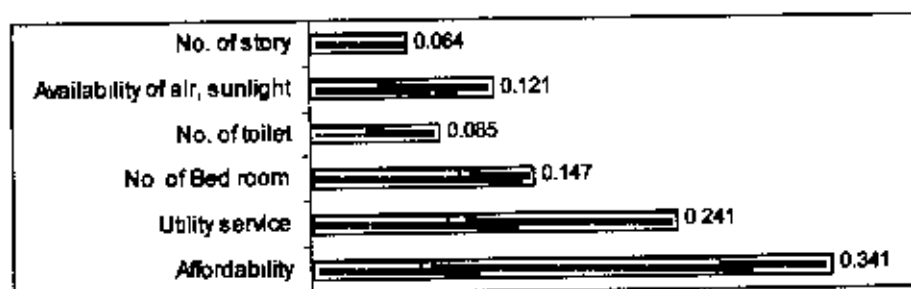
Figure 6.2: Weight of House Quality Attributes by Family Type B
Source: Field Survey, 2009

Table F-4 (Appendix F) and Figure 6.2 reveals that affordability is turned to be most important attribute to family type B for selecting the present rental apartment. The study found sample family type B spends average 31.57% of their household income for present house. Per square feet house rent is very high in Dhaka City. As a result, they are compelled to spend more than the standard house rent to find minimum standard of the rental apartment. The magnitude of availability and quality of utility services represents second most importance. Number of bedroom is relatively less important to the family type B compared to the earlier two factors. This is reasonable as the household size is not too high. This is only 3.77 that are very less compared to city's average household size. Among the six factors, availability of air and sunlight urges as one important decisive factor in house selection. After then the sample

88

families evaluate the importance of number of toilet. Number of storey of the apartment carries least importance among the other apartment selection criteria. Whenever, the pair-wise comparison matrix of the factors shows importance in ordinal scale, the weight of the attributes assist to convert this in ratio scale. It can be measured that affordability is 1.41 (= .341/.241) times more important than utility services, 3.32 (=.341/.147) times than number of bed room, 4 (=.341/.085) times than number of toilet. Moreover, this factor is 2.82 (=.341/.121) more important than availability of air and sunlight, 5.33 (=.341/.064) times than number of storey. Utility services is 1.64(=.241/.147) times more important than number of bed room. Availability of air and sunlight is 1.42 (=.121/.085) times more important than number of toilet that is 1.33(=.085/.064) times more important than number of storey. In the same way, ratio scale of each criterion compared to each other criterion for apartment location selection can be determined.

6.2.3. Criteria of Present Apartment Choice by Family Type C

The intensity of aggregated values of the house location criteria according to the nuclear families who have older children above than school going age (type C), are shown in the Table 6.3. The matrix shows pair-wise comparison values among all attributes. Each row shows the relative importance of a criterion based on subjective judgment compared to other factors. The first row shows that the sample respondents of type C have been evaluated affordability highest for present house selection.

Table 6.3: Pair-wise Comparison Matrix of House Preference by Family Type C

	1.	2.	3.	4.	5.	6.
1. Affordability	1	1.94	3.81	2.85	2.8	2.86
2. Utility service	0.51	1	2.37	3.26	2.73	2.98
3. No. of bed room	0.26	0.42	1	2.62	2.95	3.15
4. No. of toilet	0.35	0.31	0.38	1	1.68	1.88
5. Availability of air, sunlight	0.36	0.37	0.34	0.6	1	3.11
6. No. of storey	0.35	0.34	0.32	0.53	0.32	1

Source: Field Survey, 2009

Table F-4 (Appendix F) shows the relative weight of every factor for house location choice by normalizing the matrix. This is found that principal is for affordability that represents the higher importance of the factor. The relative importance of the attributes is represented graphically in the Figure no. 6.3. Not surprisingly, the factor affordability is the single most important attribute for selecting rental apartment by the sample family type C. The study shows that they spend 31.44% of their household income for house rent that is higher than the standard. However, it is a matter of fact that house rent in Dhaka City is extremely high compared to other metropolitan areas in Bangladesh (Sharmeen, 2007). The tenants are compelled to pay more that standard for hire a decent apartment with minimum quality. The utility services are also very important. The figure depicts that the family type C tradeoff the factors number of bedroom, number of toilet, availability of air, sunlight and number of storey for the earlier factors. The study found that for this type of families, number of storey is least important.
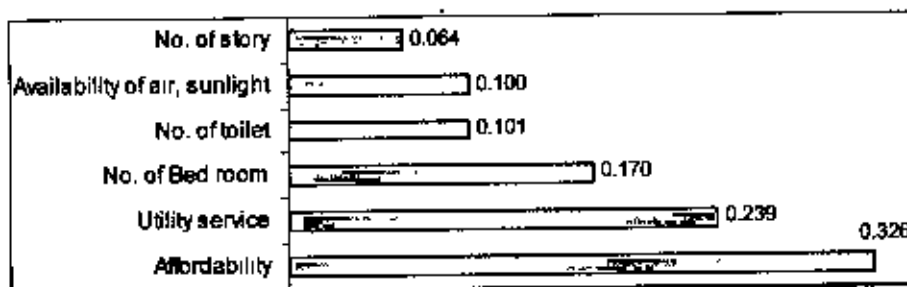
Figure 6.3: Weight of House Quality Attributes by Family Type C
Source: Field Survey, 2009

Figure 6.3 represents the comparison of different factors for selecting existing apartment by the family type C. The figure shows this type of families evaluate affordability mostly compared to other factors for selecting exiting apartment. It is highly predicted that the families do not prefer to cross certain percentage of the monthly income as house rent. This type of families currently spends 31.44% of their monthly income as house rent that is comparatively lower than other two types of sample families. Availability and quality of utility services the next important factor to this family type. This estimated magnitude of the house selection attributes represents that family type C prefer the factor affordability 1.36 (.326/.239) times more compared to utility services in ratio scale. After then these family types give

priority to number of bedroom. It is 1.7 (.17/.1) times more important than both attributes number of toilet and availability of air and sunlight.

6.2.4. Comparison of Criteria for Present Apartment Choice according to Family Structures

This part of the study shows variation of preference of the factors that leads to choose present house by different types of middle-income nuclear families living in some selected middle income areas in Dhaka City. It is a matter of fact that the house rent in Dhaka City is growing up continuously. There is no control on private house rent and protection of tenant's right. Fixing the house rent is subject to the whims of the house owners and it increases every year. As a result, it is apparent that in Dhaka City the house rent covers a major part of the tenant's monthly income.
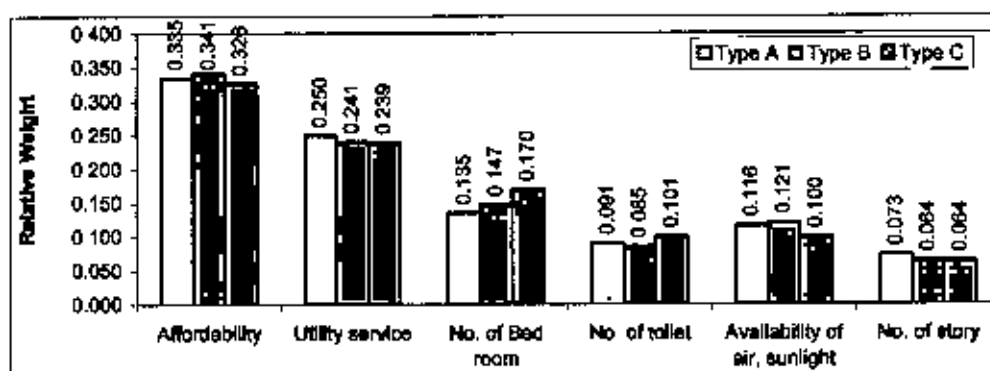
Figure 6.4: Comparison of Weight of Present House Attributes by Family Types
Source: Field Survey, 2009

Affordability that is expressed in willingness to pay percentage of monthly income for paying house rent is scored highest magnitude to all of the middle-income nuclear families. This picture is depicted in the Figure 6.4. Family type B consider this factor mostly that is followed by respectively family type A and C. A number of tenants in Dhaka City are suffering by misery for lack of utility services and unsatisfactory quality of them. As some of the utility services are in government control like water supply, electricity and gas, there is less control on the quality on the house owners. However, sometimes the house owners have some responsibility such as on water management. The problems of utility services especially water supply may vary within the same area, even within different holdings. This is due to the attitude of the house owners. Better quality of utility services deserves higher house rent. Even

though, as utility services are important for convenient life, households turn a higher rate for utility services. The figure shows that family type A evaluates this factor mostly than type B and C, though there is no very significances.

The requirement of bedroom depends on the household size. The study only targets the nuclear families that have less household size compared to the average household size of the city. The average household size of the family type A, B and C are accordingly 2.5, 3.77 and 4.05. The higher relative weight of the factor (number of bedroom) for the growing number of family members is reflected in the study for present house selection. Moreover, the figure depicts the relative importance of number of toilets according to the family structures. The family type C considered this factor highly compared to the other family types. The family type B who have school going children preferred availability of air and sunlight for selecting the present apartment and type C considered this factor with least importance compared to other factors. Furthermore, number of storey of the apartment is most important to type A considered to family type B and C who evaluate the factor likewise.

6.3. Criteria of Preferred Apartment

There are a number of factors or features that derives the decisions of the household to choose rental house. The study explored that rental house choice varies according with purposes of the families. The purpose of the families varies with the family structures and number of family members. Most of the time people want to rent a spacious apartment where they can live with comfort. The preferred house is that apartment where they can achieve all preferred and required indicators in expected level on the whole. However, it is ironic; most of the time there remains some gap between the preferred apartment and rented apartment. The families almost not achieve the entire house choose options altogether at required level for selecting the present apartment.

6.3.1. Criteria of Preferred Apartment by Family Type A

The magnitude of relative importance of different criteria in the Figure 6.5 shows that affordability have turned to be most important criterion for preferred house. Utility

92

services, availability of air and sunlight, number of bedroom, number of toilet, and number of storey follow this criterion respectively (Appendix E: Table E-5).
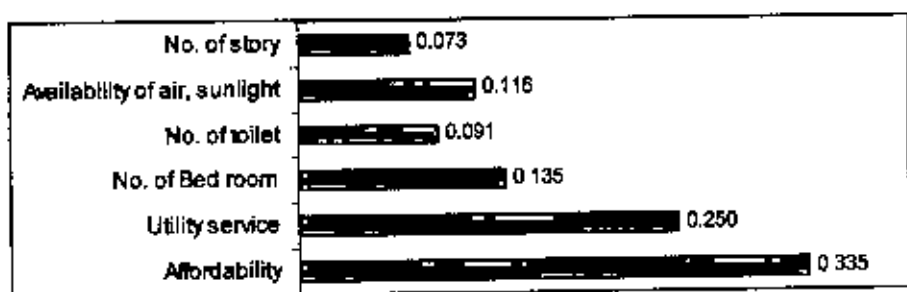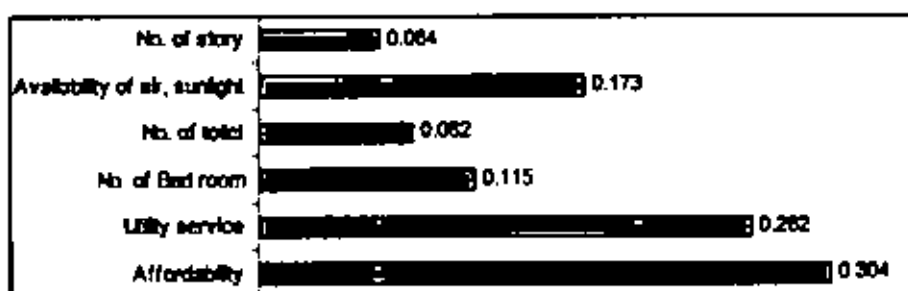

Figure 6.5: Preferred House Quality Attributes by Family Type A

Source: Field Survey, 2009

6.3.2. Criteria of Preferred Apartment by Family Type B
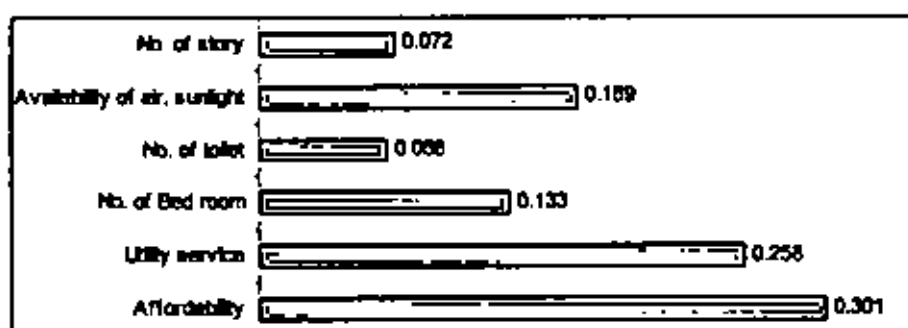
Figure 6.6: Preferred House Quality Attributes by Family Type B

Source: Field Survey, 2009

Figure 6.6 reveals that affordability is turned to be most important attribute to family type B in the preferred rental apartment. Then comes the magnitude of availability and quality of utility services. Among the six factors availability of air and sunlight urges one of the strongest decisive factors in preferred rental apartment. Number of bedroom is relatively less important to the family type B compared to the earlier three factors. Then comes the importance of number of storey. Number of toilet of the apartment carries least importance among the other preferable apartment selection criteria (Appendix E: Table E-5).

6.3.3. Criteria of Preferred Apartment by Family Type C

The relative importance of the house selection attributes for most preferred apartment by family type C is represented graphically in the Figure 6.7.
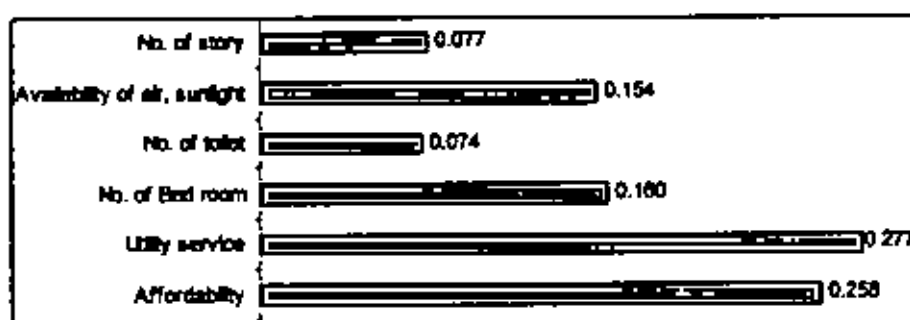
Figure 6.7: Preferred House Quality Attributes by Family Type C
Source: Field Survey, 2009

The figure illustrates that this family type evaluates mostly utility services. The factor affordability is the second most important attribute for choosing rental apartment by the family type C. Moreover, the figure depicts that they turn the factors number of bedroom and availability of air, sunlight more or less equal importance. Meanwhile, number of toilet and number of storey are provided lowest and similar importance (Appendix E: Table E-5).

6.3.4. Comparison of Criteria for Preferred Apartment Choice according to Family Structures

By aggregating the elicitation of the respondents of different types of families the comparative picture of the most preferred options for selecting house is found. The Figure 6.8 is graphically presenting the relative importance of house selection criteria by different types of families for most preferred apartment.
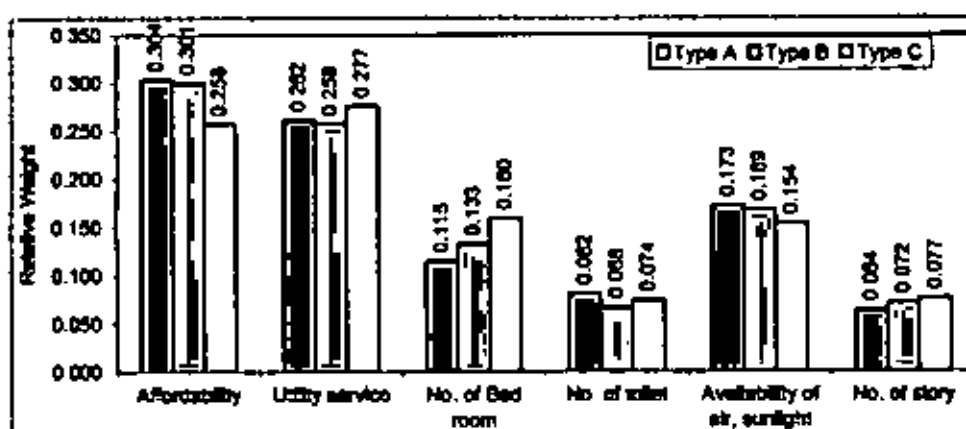
Figure 6.8: Comparison of Weight of Preferred House Attributes by Family Types
Source: Field Survey, 2009

94

Figure 6.8 shows that family type A and B turns more and equal emphasis on affordability. The figure shows that family type C evaluates the factor utility services more important compared to affordability, this is unusual than other two family types. It indicates that this type of families is most aware for the factor utility services. Generic analysis found that Family type C has higher income range than family types A and B. It may happen that better economic condition of these families represents that they deserve better utilities that is higher compared to family type A and B. This type family also prefers the attribute number of bedroom higher compared to family type A and B. As family type A has lower household size, they consider number of bedroom lowest than other family types. Family type A, C and B prefer number of toilet accordingly. Availability of air and sunlight find higher rating as preferred option of house selection. Family type A give more priority to the parameter than other two family types. Family type C considers the factor number of storey more than other two family types. As this type of families have older people, this may happen, and they prefer lower levels of apartment. The figure shows that number of toilet and number of storey of the apartment is least significant to all of the family types. Family type A prefers the options affordability, number of toilet and availability of air and sunlight more compared to other families. Family type C prefers the rest factors more than family type A and B.

6.4. Gap between Present and Preferred Apartment

The study has a scope to estimate the house preference based on target group's opinion. This provides a valuable support for assessment between present and preferred apartment according to the sample groups. They study estimates a distinction that is drawn between elicitations of the respondent based on a tradeoff of choice profiles. The study shows the matter of fact that there is more or less difference among the relative importance of the options for selecting present house compared to the preferred options among the target groups.

6.4.1. Comparison of Present and Preferred Apartment Location by Family Type A

For choosing rental house like all families family type A tries to get the high quality of all criteria. Even though for a number of times they need to compromise some

factors to gain the relatively preferred options. The study is advantaged to determine the comparison of the relative importance values of the different criteria of the present house and the criteria for preferred house standard by family type A.
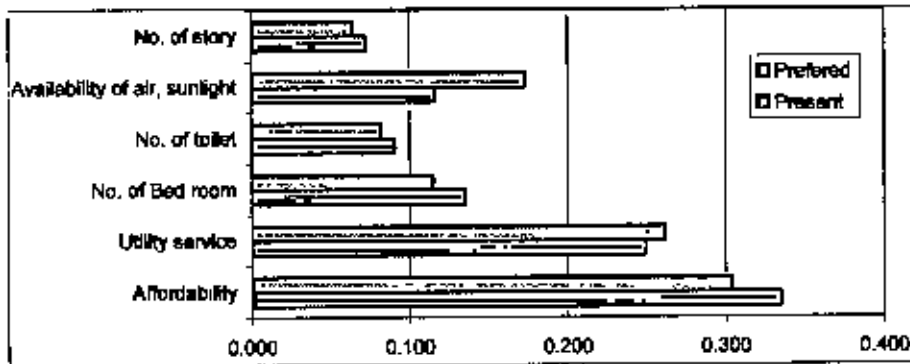
Figure 6.9: Comparison of Weight of Present and Preferred House Attributes by Different Family Type A

Source: Field Survey, 2009

Figure 6.9 shows the comparative picture of magnitude of the house selection criteria for present rental apartment and preferred apartment. The figure shows that family type A has gave more emphasis on affordability. They mostly did not wanted to compromise affordability for selecting present apartment. The figure shows that the criteria of number of bedroom, number of toilet and number of storey of apartment get priority in present apartment to rent. On the other hand, the figure shows that this family type trade off the factors utility services to some extent for selecting the present house location. Surprisingly, availability of air and sunlight found very high weight to this family type in preferred house than the existing house. This indicates that the family types compromised availability of air and sunlight for achieving the earlier options. The figure shows this family considered availability of air and sunlight 1.5 times less importance for choosing the present house compared to preferred house.

6.4.2. Comparison of Present and Preferred Apartment Location by Family Type B

Like all families, family type B tries to rent a house that comparatively has more quality of the options. The study shows that for renting apartment sometimes they become forced to negotiate by comparative judgments among the criteria.
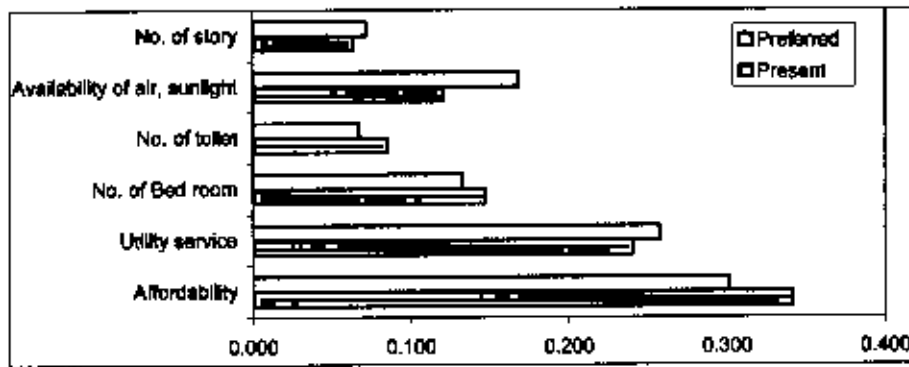
Figure 6.10: Comparison of Weight of Present and Preferred House Attributes by Different Family Type B

Source: Field Survey, 2009

Figure 6.10 shows the comparison of importance weight of present and preferred house attributes by family type B. The figure shows that affordability is more evaluated for selecting present house by Type B. Even same picture is found for the criteria number of bedroom and toilet that they have achieved in present house. On the other hand, this type of families compromised the factors utility services, and number of storey slightly for renting present house. Furthermore, they compromised availability of air and sunlight in the present apartment mostly from preferred house considering the other factors. In Dhaka City, apartments are being constructed by not maintaining set back rules and Floor Area Ratio (FAR). As a result, it becomes a problem of lack of air and sunlight for the apartments.

6.4.3. Comparison of Present and Preferred Apartment Location by Family Type C

The study found that there is a gap between the present and preferred house location by family type C. This gap is reflected to the difference between the magnitude of the house choice criteria for the existing house and the most preferred options.
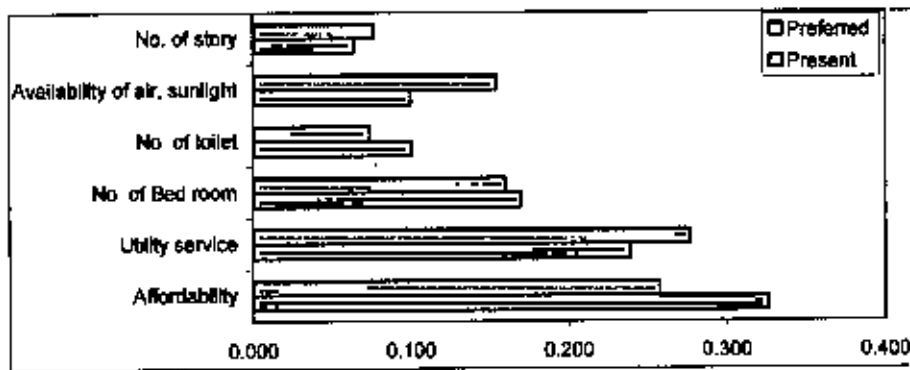
Figure 6.11: Comparison of Weight of Present and Preferred House Attributes by Different Family Type C

Source: Field Survey, 2009

Figure 6.11 graphically shows that family type C compromised better quality utility services, air and sunlight greatly in the present apartment. It indicates the lower quality of utility services and lack of sunlight in the present apartment of the sample family type C. They also compromised number of storey in the present apartment. However, they achieved affordability at expected level that represents willingness to pay as house rent. The gap between relative weight of number of bedroom for the present and preferred apartment is not too high. The figure depicts that sample family type C have achieved the criteria number of bedroom and toilet at expected level in present apartment.

6.5. Overall Criteria of Apartment Quality

It is obvious that any family want to hire a house that accomplishes the preferred options. However, the study found that sample families could not fulfill all preferred options. Most of the time affordability stands against attainment renting the preferred apartment. Moreover, they hardly find all of the preferred option altogether in the level they desire. In this situation, aggregated preference of the sample target groups negotiate to select the house. Figure 6.12 represents the comparison of the overall magnitude to all of the sample family types regarding existing and preferred apartment attributes.
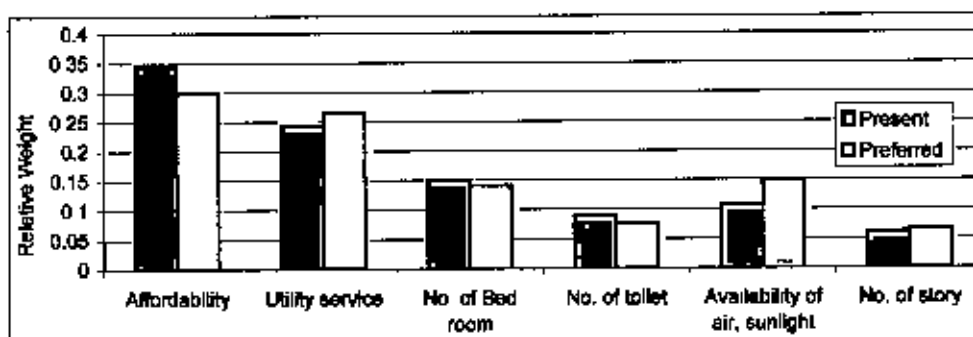
Figure 6.12: Comparison of Overall Weight of Present and Preferred House Quality
Attributes

Source: Field Survey, 2009

Figure 6.12 reveal that the sample families do not compromise the affordability in the present apartment. This indicates the sample families tried to rent house according to their monthly income. The figure shows that in Dhaka City middle income families need to put high magnitude for affordability for renting present house. Furthermore, they also need to give less weight to other attributes of the present house to trade off with affordability. The figure also depicts that all of the sample tenants achieved the attributes number of bedroom and number of toilet more or less in the present house. This indicates for attainment of the preferred number of bedroom and toilet in the apartment and to adjust with affordability level they compromised utility services, availability of air and sunlight and number of storey of the apartment for selecting present house.

6.6. Consistency Arguments for Apartment Quality Attributes

The study determined the relative weight of different attributes of rental apartment choice by middle-income families varies according to the forms of families. The study attempts to estimate the relative magnitude of the criteria on the basis of family structures by the elicitation of the sample household. The study is consists of two major sections. Firstly, it determines the weight of the selected criteria for choosing the rental apartment by the target group tenants. Secondly, the study estimated the Consistency Ratio (CR) that determines the level of consistency of the AHP calculation. For attaining expected level of consistency in AHP calculation, CR is not more than 0.1. Table 6.4 shows consistency of different options for apartment selection by different types of families.

99

Table 6.4: Consistency of the Relative Importance of the House Selection Attributes

Household type	Option	δ	CI	CR= CI/RI	Consistency
Type A	Present	6.341034	0.068207	0.055005	Consistent
	Preferred	6.361743	0.072349	0.058346	Consistent
Type B	Present	6.345808	0.069162	0.055776	Consistent
	Preferred	6.359662	0.071932	0.05801	Consistent
Type C	Present	6.462268	0.092454	0.074559	Consistent
	Preferred	6.519645	0.103929	0.083814	Consistent

Source: Field Survey, 2009

6.7. Conclusion

Analysis of the apartment selection criteria by different types of families reveals that affordability turned to be most important among different parameters of apartment standard, to all of the family types for selecting the apartments. Number of empirical studies suggested consideration of affordability for house choice for purchase and rent. This is evaluated mostly important by family type B for selecting present house, though family type A consider it mostly in preferred apartment. According to Nabi et al. (2003), it is expected that house rent should not exceed 23 percent of monthly income i.e. one week's salary. However, the sample households spend 31.88% of the monthly income for accommodation that is higher than the standard. Increased house rent of the apartment compels the tenants to compromise expected level of other standards of apartment to adjust with the affordability. According to Chauhan et al. (2008) affordable cost is always an important goal in the residents' housing selection.

The magnitude of availability and quality of utility services holds second position to all of the family types. This urges one of the strongest decisive factors in house selection, as that is very important for convenience of the tenants. Number of bedroom rank third preferred option for the present apartment to all of the family types. The higher relative weight of the factor for the growing number of family members is reflected in the study for apartment selection. This is also true for number of toilet. Among the six factors, availability of air and sunlight is an important decisive factor in house selection. This is more important to all of the family types than number of toilet and number of storey of the apartment. Number of storey of the

apartment carries least importance among the other apartment selection criteria in the present apartment to all of the family types.

The computation of the weight shows that there is variance of preferences of the house selection criteria between the existing apartments with preferred one. The tenants compromise the quality of utility services and availability of the air and sunlight largely for selecting the present rental house. The study found that though almost all households of the study have water supply, gas supply, electricity supply and sewer and garbage disposal system in their apartments, a number of household have not got the service quality in an acceptable level (Figure 4.24-B). As a number of building are constructed without maintain proper Floor Area Ratio (FAR), the respondents are not getting sufficient air and sunlight. In one hand, this is affecting comfortable living of the residents; on the other hand, this is reducing the visibility of the city. Number of storey of the apartment turns least importance as an apartment choice criterion. This provides the opportunity to build high-rise apartments. The people prefer to reside close to the facilities and in most promising residential areas. As a result, high-rise apartment with maintain proper FAR and providing sufficient and well-managed elevator can reduce accommodation problem to some extent. This can increase the flow of air and sunlight to the apartments as well.

Chapter 07
Recommendations and Conclusion

Chapter 07: Recommendations and Conclusion

7.1. Introduction

The research is aimed to estimate tangible magnitude of housing area as well as house selection attributes by the middle-income families. It is ironic that there are not sufficient researches on the private rental-housing market in respect to the tenant choices in Dhaka City. The housing market analysis requires clear understanding about the preferences of the target groups of people. This chapter summarized the major findings of the study and recommendation.

7.2. Summery of the Findings

The approach Analytical Hierarchy Approach (AHP) has been applied to find out the magnitude of the housing selection criteria perceived by the middle-income nuclear families resides in Dhaka City. Findings of the study through primary survey are presented in the following sub-sections.

7.2.1. General Observations regarding Study Area Profile and Socio-economic Condition of the Sample Households

This study is an endeavor for the analysis regarding the choices of locational quality of the residential areas as well as the apartments in respect with family structures. This sub-section explained the condition of the study areas and the apartments of the sample respondents.

Average household size of the sample families is 3.44. The literacy rate of the sample household is prominently higher than the education level of the country. Almost half (40%) of the members of the family type A are service holder that is comparatively lower for type B (16.81%) and C (26.45%). The study found that most of the rental apartment dwellers are upper-middle income families. Most of the sample families have two earning members. Most of the respondent's mode of travel to workplace is on foot that consists 32%.

The study areas are considered middle-income residential areas on the basis of land price. Some respondents are not satisfied with the condition of the access road to their

apartments. About 27% of the family types A and C's apartment front roads are bad in quality that is 13% for the family type B. About 40 % of type A families suffer from water logging during rainy season that is almost 23% and 27% for type B and type C respectively. The study shows that all of the community facilities are not situated in walking distance from their apartment location and a number of households need long time to reach to the community facilities. This situation is most critical for less access to recreational facilities.

Generally, the tenants choose the floor except ground and top floor, however the rent is higher to these floors compared to ground and top floors. The study shows that type A whose household size is smaller than type B and type C, stay in smaller apartment than other two types. About 25% type A families live in less than 1000 sq ft sized apartment. The study found 20% percent of all household's apartment do not get sufficient air and sunlight in their present apartment as neighboring establishments are located within 3 feet at least one side. Larger families have more bedroom and toilet in number. The study also shows that a number of households are suffering from lack of sufficient utility services. The study attempted to present the severity of problems to the middle-income tenants suffering in their existing apartments.

The respondents pay on average monthly Tk 8.77 per sq ft as house rent for their apartments. The study represents that the smaller households pay higher average house rent. Moreover, the study is evident that average house rent is higher for smaller apartments. Family type A spend average 32.63%, type B 31.57% and type C 31.44% of their household income. That means the sample households spend 31.88% of the monthly income for accommodation that is higher than the standard. Smaller families spend comparatively more as house rent from the other families. The study reveals that percentage house rent expenditure reduce with the increase of income up to a level. Then the expenditure as house rent increase again.

7.2.2. General Observations regarding the House Location Choice
The study determined the relative importance of selected ten location choice criteria of apartment location scale by applying AHP. It has been found that there are more or less differences among the decisions of the three types of middle-income nuclear families. The study found that distance to workplace is evaluated to be most important

to family type A who are young couples without child or have children who are younger than school going age. After that distance to market importance that is followed by respectively distance to bus stop, municipal services, planning of neighborhood, road width, social status, proximity to relatives and open area. Distance to school is insignificant to this type of family. In the same way, the pair-wise matrix gives the aggregated importance of each factor compared to all factors in an ordinal scale by family type B. Among the selected factors distance to workplace and distance to school seems to have almost same and highest importance to them. Then they evaluated respectively distance to market, bus stop, municipal services, planning of neighborhood, road width, social status, open area and proximity to relatives. This ranking for prioritizing by the family type C is almost same for present apartment location selection attributes.

The study also determined that there is gap between the relative magnitude existing apartment locations compared to the preferred options in Dhaka City to the target household groups. Family type A have compromised the attributes road width and open area significantly. The family type B traded off the factors municipal services and closeness open area greatly and distance to market, planning of neighborhood and road width to some extent for selecting the present house location. For attaining the mentioned locational advantage family type C compromised the factors availability and quality of municipal services and planning of neighborhood decidedly for attaining the advantage of proximity to market, social prestige of the residential area and closeness to open area somewhat. It is found that among the sample family types family type A have larger gap of the relative importance for present and preferred apartment location. By summing up the relative importance of the attributes by all of the family members, overall picture demonstrates that the respondents give more importance to spatial attributes. They have to compromise the physical attributes like planning of neighborhood, municipal services and road width, and environmental factors like closeness to open area.

Kauko (2007) noted that CBD accessibility carries less weight than the attributes related to the prestige and environmental attributes of the neighbourhood, and image of the district in Budapest. Using expert judgements through the AHP and a hedonic approach Kryvobokov (2006) found out that in Donetsk, Ukraine the most important

value influencing factor is prestige, followed by proximity to positive environmental externalities with scarcity value (in this case parks and water), and only after that by the traditional variable CBD accessibility.

According to Ahsan (1996) economic reason (job opprtunity) accounted for the highest number of residential move, followed by marriage, then inconvenience of housing and inconvenient location in Dhaka City. Khatun (2003) selected the principal reasons for selecting destination by the *Dhakaiya* (original residents of old Dhaka) and determined that 30% destinations were selected for good neighborhood environment. Zahur (2008) determined that the middle-income dwellers in Dhaka City consider work place, children education institution, communication system, security etc most importantly to selecct an area to buy apartment. She estiamted that the surveyed people give most priority to security. According to Hossain et al. (2008) most requirement of better housing that represents a well designed, well-constructed and well-finished house, is the most influential factor for changing rental house by middle-income tenants in Dhaka City.

7.2.3. General Observation regarding the House Choice

The quality of rental apartments can be evaluated by a number of attributes. The attributes influence the decisions of apartment selection. Relative importance of the determinants varies according to family structures. The study found that all of the family types evaluated the factor affordability mostly for apartment selection. This is most important to family type B compared to family type A and C. This indicates that affordability interact with other attributes with dominance for preference by the dwellers. Utility services get the second priority and number of bedroom get the third rank. Number of bedroom has relatively more importance to the families that have higher household size. Even number of toilet as well as number of bedroom are also important to family type C who has higher household size compared to the other target sample groups. To family type B and C availability of air and sunlight is important than number of toilet. Number of storey of the apartment is comparatively less important to all of the target middle-income nuclear families.

The study gave an idea about the comparison of the relative weights of the house selection attributes between the present house as well as the preferred house to the

middle-income nuclear families. It was found that there is somewhat gap with preferred apartment compared to selected apartment for all of the family types. All of the target families trade off the qualities of utility services and availability of air and sunlight to attain other apartment qualities. Moreover, family type C compromises the number of storey for selecting the present house.

7.3. Recommendations

Housing market in Dhaka City is almost failed to provide affordable, habitable housing environment to the residents. Housing market inefficiency occurs only when there exists an imbalanced between demand and supply. Rent for the private houses up-rise when the demand increases more than the supply. Moreover, housing quality deteriorates.

For sustainable housing plan, the requirements and choices of the tenants should be recognized. Public housing as well as the private housing should consider the preferences of the dwellers. Government should take necessary steps to create habitable residential environment considering the choices of the people. The private house owners also need to maintain the qualities of the rental houses that are preferred by the dwellers in the city.

The study reveals that middle-income single families prefer to stay close to workplace. Construction of mass level public and private housing close to major administrative and commercial areas could fulfill the requirement of the people to live close to workplace to some extent. Building high-rise apartments close to these areas could accommodate large number of families in small area by densification. For instance, construction of studio type residential apartments in the upper floors of the commercial building in the Central Business Districts (CBD) and other administrative and commercial important areas could accommodate a number of families. Furthermore, large private companies and industries can construct employee quarters within or close to industrial districts. Mixed land use can provide housing for the jobholders close to the workplace. However, proper planning is needed to implement mixed use to avoid other civic crisis of mixed land use. The families having school going children try to adjust with the distance of workplace as well as distance to

school of the children. Mixed land use can increase the opportunity of the middle class families to live close to school.

It is evident from the study that people give major emphasis to workplace while choosing house location. This indicates that outward expansion of the city will not reduce population pressure in the inner city. Proper housing planning along with land use planning the families can get easy access to workplace, markets, bus stop and other facilities. The preference to walk to workplace as well as other destinations is certainly encouraging. Necessary steps for improving the pedestrian ways and providing pedestrian services will facilitate to go to workplace and other areas on foot by the residents of the city. Moreover, reducing the problem of water logging in some ways can increase the will of the pedestrians to walk.

Planning of neighborhood can increase habitable housing environment. The study shows the middle-income people are aware about necessity of planning of neighborhood for decision making of housing location. However, they have to compromise the preferences of planning of neighborhood for lack of residential planning in the city. Concerned authority should take necessary actions for improvement of unplanned residential areas. The actions of decision makers, planners, builders and developers should be incorporated for proper neighborhood planning. Furthermore, public responsible agencies should be aware to provide and increase the quality of the municipal services that are needed for comfortable and secured life of the residents.

For a child growing up, a quality environment of the residential environment is very important where (s)he can safely and progressively conduct more responsibility and develop other life skills. Proper neighborhood planning to provide sufficient community parks, play ground and other recreational areas can ensure physical and mental well-being of the residents of the city. Moreover, it is necessary to provide community facilities within the residential areas so that these can put contribution to create a habitable community life. Provision of community facilities and safe roads with streetlights can provide opportunity to the dwellers for interaction among them and building community attachment. Community facilities like shopping facilities, recreational facilities and so on are also very important for increase the attractiveness

of the residential areas to the dwellers. So concerned authorities need to take necessary steps to increase access of community facilities in all of the residential areas.

The study reveals that affordability is the most dominant decisive factor for house choice. It is apparent that improved residential locational quality as well as the house quality increases the house rent. Increased house rent reduce the capability of the residents to achieve the preferred attributes of the housing environment as well as the rental house. So there should be the up-to-date and effective private house rent control approach and this should be incorporated with other housing policies. Proper enforcement of the rent control measures and its proper monitoring can create habitable environment.

The study found most of the middle-income families compromise the availability and quality of utility services and availability of air and sunlight in the rental house. Concerned public agencies should be aware to provide and increase the quality of the utility services. Government should be aware to maintain the setback rule as well as the required Floor Area Ratio (FAR). This will increase the visibility of the residential apartments as well as availability of air and sunlight.

Insufficiency of public rental housing as well as vast dependency of private housing are the major reasons behind house rent increase and reduction of affordability of the tenants for renting good house in the city. Most of the middle-income families of the city are living in private rental house. Mass level public rental house construction for all type of citizens will reduce the monopoly of the private rental house.

The entire private rental house of the city is developed in discrete manner. There is no provision of formal private mass rental housing scheme in the city. Construction of mass level private rental housing through formal way also can keep contribution to meet the demand of rental housing for the people in the city, especially for the middle-income households. Private formal developers could be insisted to construct private rental housing in mass level through necessary incentives from Government. National housing policy and strategies as well as intervention should incorporate and facilitate this sort of private mass rental housing with good habitable environment by

108

private formal companies. Government should take necessary steps to maintain the housing quality of the private housing area. Government can set minimum standard of private apartment to give lease by the owner at feasible rent.

7.4. Prospect for Future Research Work

The study pointed out some potential fields for further researches.

A number of determinants influence decision making for selecting residential areas and house by the middle-income tenants. The study only addressed some spatial, social, physical, and environmental factors as housing location and house choice by the households. There is potentiality to consider the relative importance of all other attributes. Moreover, there is a prospect to determine the variance of choices among the individuals especially among the family members.

Further study could determine the locational advantages of other residential areas in Dhaka City than study areas. Moreover, it is required to determine the level of affordability index of rental houses that could assists development and revision of house rent control ordinance. An extensive analysis on inherent causes of variation for housing choice in accordance to spatial context as well as social-economic condition may be incorporated in further studies.

Data analysis by the Analytical Hierarchy Process (AHP) is not evident for some unavoidable drawbacks. So, further studies can determine the preference of the middle-income nueclear families for housing area as well as house choice by using some other decision support system tools like mixed integer linear programming, simulation and heuristics models, nonlinear programming, multivariate statistics using multidimensional scaling, Quality Function Deployment (QFD) and so on.

The study suggested promoting formal private mass rental housing through Government control. Further studies can determine the feasibility of this type of housing in respect of economic, physical and social situation of the country especially in the urban areas.

7.5. Conclusion

Different attributes insist the middle-income tenants in the city to select the residential areas as well as the type of house. The preferences differ according to family structures. The study determined the relatively important preferences of the criteria by the different types of middle-income nuclear households for selecting rental housing locations and rental houses in Dhaka City. Relative weights of the criteria are determined by applying the decision support system Analytic Hierarchy Process (AHP). Physical attributes like proximity to workplace, school, market and bus stop holds higher weight for house location selection. Affordability turned to be most important determinant for house selection. All of the middle-income tenants are not satisfied with the locational qualities of the residential areas as well as the apartment standards. The tenants do tradeoff among different determinants of residential areas as well as the house selection, to achieve comparative advantage. For sustainable housing planning the housing choices of different types of families should be addressed. The concerning authorities need to be aware to increase the habitable qualities of the residential areas in Dhaka City. Moreover, Government should take sufficient housing policies to maintain minimum standard of the private rental house with affordable rent by middle-income tenants.

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113

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Appendices

Appendix A: Questionnaire for Tenant Household

Bangladesh University of Engineering and Technology, Dhaka
Department of Urban and Regional Planning
Research Title: Criteria of Rental Housing Choices According to Family Structures
in Dhaka City
(Only for research purpose)

Sample no..........Date..........Locality ....Address...........................

Name of respondent................................a)Male   b)Female
Family type: Type A: Single- families with no school going children,
                            Type B: Single-families with school going children and
                            Type C: Single families with elder children

- **Household Socio-economic information**

Codes

No.	Age	Sex	Occupation	Education
1				
2				
3				
4				
5				
6				
7				

Age	Occupation	Education
1.> 10	1.Service	1.>SSC
2.11- 20	holder	2.SSC
3.21-30	2.Business	3.HSC
4.31-40	3.Teacher	4.Bachelor
5.41-50	4.Student	5.Masters
6.51-60	5.Others	6.Other
7.60+		

Total Monthly Family income (TK): 1 10000-15000 2. 15001-20000 3. 20001-25000
                                  4. 25001- 30000 5. 30001-40000 6. 40001-50000

- **Information regarding location**

1. Width of front road (ft)
2. Condition of front road   □ Good □ Moderate □ Bad
3. Occurrence of Water logging: □ Yes   □ No
4. Condition of community facilities

Facility	Distance from house (Time, min)	Mode of travel
Playground		
Parks		
Health care center		
Community center		
Shopping center		
Kutcha bazaar		
Grocery shop		
Religious center		

Facility	Distance from house (Time, min)	Mode of travel
Only for Type B		
Kindergarten		
Primary school		
Secondary school		
High school		
Madrasa		

- **Information regarding Office Travel**

1. What is the mode of travel to workplace?

☐ On foot   ☐ Rickshaw   ☐ Public Bus   ☐ Private Car   ☐Others

2. How much times (Minute) it takes to reach workplace?

☐ Less than 10   ☐ 10 to 20   ☐ 21 to 30   ☐ 31 to 40   ☐ 41 to 50
☐ 51 to 60   ☐ 60 +

- **Information regarding apartment**

1. Number of storey..........
2. Total floor area (sq ft)..........
3. Monthly house rent (Tk.): .....
4. Distance from nearest building (ft):
   Infront:.........Backside............left side ....Right side:.......
5. Number of Bed room:......
6. Number of toilet:
7. Condition of utility services of the apartment

Service	Yes	No		Satisfied	Medium	Not satisfied
Parking						
Escalator/ lift						
Generator			If answer is Yes			
Security						
Water supply						
Gas supply						
Electricity supply						
Sewerage						
Garbage disposal						

- **Location Choice Criteria**

Give the appropriate rating among the attributes to each other between 1-7

For the values the following verbal equivalences are given:

Verbal equivalences	Value
Equal importance	1
More than equal	3
Strongly important	5
Extremely important	7
Less than equal	1/3
Strongly unimportant	1/5
Extremely unimportant	1/7

Example:

Let A and B are two attributes
'A/ B =7' means 'attribute A is extremely important than attribute B'.
or 'A/B= 1/7' means 'attribute A is extremely unimportant than attribute B'

1. Give the appropriate rating **for the present apartment location**.

Attributes	Distance to workplace	Distance to school	Distance to market	Distance to bus stop	Planning of neighbor-hood	Municipal services	Road width	Social status	Proximity to relatives	Open area
Distance to workplace	1	X	X	X	X	X	X	X	X	X
Distance to school		1	X	X	X	X	X	X	X	X
Distance to market			1	X	X	X	X	X	X	X
Distance to bus stop				1	X	X	X	X	X	X
Planning of neighborhood					1	X	X	X	X	X
Municipal services						1	X	X	X	X
Road width							1	X	X	X
Social status								1	X	X
Proximity to relatives									1	X
Open area										1

2. Give rating for **most preferable apartment location**

Attributes	Distance to workplace	Distance to school	Distance to market	Distance to bus stop	Planning of neighbor-hood	Municipal services	Road width	Social status	Proximity to relatives	Open area
Distance to workplace	1	X	X	X	X	X	X	X	X	X
Distance to school		1	X	X	X	X	X	X	X	X
Distance to market			1	X	X	X	X	X	X	X
Distance to bus stop				1	X	X	X	X	X	X
Planning of neighborhood					1	X	X	X	X	X
Municipal services						1	X	X	X	X
Road width							1	X	X	X
Social status								1	X	X
Proximity to relatives									1	X
Open area										1

3. Give the appropriate rating **for the present apartment quality**

Attributes	Affordability	Utility service	No. of Bed room	No. of toilet	Availability of air, sunlight	No. of storey
Affordability	1	X	X	X	X	X
Utility service		1	X	X	X	X
No. of Bed room			1	X	X	X
No. of toilet				1	X	X
Availability of air, sunlight					1	X
No. of storey						1

4. Give rating for **most preferable apartment**

Attributes	Affordability	Utility service	No. of Bed room	No. of toilet	Availability of air, sunlight	No. of storey
Affordability	1	X	X	X	X	X
Utility service		1	X	X	X	X
No. of Bed room			1	X	X	X
No. of toilet				1	X	X
Availability of air, sunlight					1	X
No. of storey						1

(Thank you for your co-operation)

Signature of Interviewer

Appendix B: Socio-economic Characteristics

Table B-1: Household Size

Family Type	Total Member of Household	Household Size
Type A	75	2.5
Type B	113	3.77
Type C	121	4.03
Average		3.44

Table B-2: Age Structure of the households

Age Limit	Type A		Type B		Type C	
	Number	Percentage	Number	Percentage	Number	Percentage
>10	14	18.67	17	15.04	1	0.83
11 to 20	0	0.00	31	27.43	8	6.61
21 to 30	32	42.67	10	8.85	43	35.54
31 to 40	25	33.33	31	27.43	19	15.70
41 to 50	4	5.33	24	21.24	29	23.97
51 to 60	0	0.00	0	0.00	20	16.53
60+	0	0.00	0	0.00	1	0.83

Table B-3: Education Level of the Households

Education Level	Type A		Type B		Type C	
	Number	Percentage	Number	Percentage	Number	Percentage
>SSC	0	0	32	28.32	3	2.48
SSC	0	0	15	13.27	5	4.13
HSC	12	16	14	12.39	33	27.27
Bachelor	25	33.33	21	18.58	49	40.50
Masters	23	30.67	27	23.89	30	24.79
Other	15	20	4	3.54	1	0.83

Table B-4: Gender Distribution of the Households

Sex	Type A		Type B		Type C	
	Number	Percentage	Number	Percentage	Number	Percentage
Male	39	52	65	57.52	72	59.50
Female	36	48	48	42.48	49	40.50

Table B-5: Income Level of the Households

Income	Type A		Type B		Type C	
	Number	Percentage	Number	Percentage	Number	Percentage
20001-25000	2	6.67	1	3.33	0	0
25001-30000	9	30	2	6.67	0	0
30001-40000	11	36.67	12	40	12	40
40001-50000	8	26.67	15	50	18	60

Table B-6: Occupation Pattern of the Households

Occupation Type	Type A		Type B		Type C	
	Number	Percentage	Number	Percentage	Number	Percentage
Service Holder	32	42.667	19	16.81	32	26.45
Business	6	8	18	15.93	24	19.83
Teacher	3	4	3	2.65	4	3.31
Student	0	0	51	45.13	35	28.93
Others	34	45.33	22	19.47	26	21.49

Table B.7: Mode of travel for workplace trip

Mode of Travel	On foot	Rickshaw	Private car	Bus	Others
Percentage of Trip	33	28.57	0.63	23.97	13.83

Table B.8: Travel time for workplace trip

Time (Minute)	10<	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	60+
Percentage of Respondent	11.1	12.3	21.7	36.5	12	5.2	1.2

Appendix C: Physical Characteristics of the Study Area

Table C-1: Condition of Front Road

Condition of Front Road	Type A		Type B		Type C	
	Number of Response	Percentage	Number of Response	Percentage	Number of Response	Percentage
Good	15	50	20	66.66667	10	33.33333
Moderate	7	23.33333	6	20	12	40
Bad	8	26.66667	4	13.33333	8	26.66667

Table C-2: Road Width

Road Width (ft)	Type A		Type B		Type C	
	Number of Response	Percentage	Number of Response	Percentage	Number of Response	Percentage
>10	0	0	0	0	0	0
10 to 20	17	56.66667	15	50	21	70
21 to 30	5	16.66667	6	20	2	6.666667
31 to 40	0	0	3	10	0	0
40 +	8	26.66667	6	20	7	23.33333

Table C-3: Incident of Water Logging

	Type A		Type B		Type C	
	No. of Response	Percentage	No. of Response	Percentage	No. of Response	Percentage
Occurrence of Water Logging	12	40	7	23.33	8	26.67
No Water Logging	18	60	23	76.67	22	73.33

Table C-4: Mode of Travel to Reach Community Facilities

Facility		On foot	Rickshaw	Private car	Bus	Others
Playground	Number	11	18	1	0	0
	Percentage	36.66667	36.66667	60	3.333333	0
Parks	Number	1	28	1	0	0
	Percentage	3.333333	122.2222	122.2222	200	11.11111
Health care center	Number	20	10	0	0	0
	Percentage	66.66667	3.333333	93.33333	3.333333	0
Community center	Number	20	10	0	0	0
	Percentage	66.66667	11.11111	407.4074	407.4074	666.6667
Shopping center	Number	15	15	0	0	0

Facility		On foot	Rickshaw	Private car	Bus	Others
	Percentage	50	66.66667	33.33333	0	0
Kutcha bazaar	Number	20	10	0	0	0
	Percentage	66.66667	222.2222	11.11111	311.1111	11.11111
Grocery shop	Number	30	0	0	0	0
	Percentage	100	0	0	0	0
Religious Center	Number	30	0	0	0	0
	Percentage	100	66.66667	33.33333	0	0

Table C-5: Travel Time to Reach Community Facilities

		>5 min	5 to 10 min	11 to 15 min	16 to 20 min	20+ min
Playground	Type A	0	10	30.00	26.67	33.33
	Type B	0	23.33	0	16.67	60
	Type C	0	23.33	6.67	43.33	26.67
Parks	Type A	0	3.33	43.33	20	33.33
	Type B	0	23.33	0	16.67	60
	Type C	0	23.33	0	10	66.67
Health care center	Type A	26.6666667	40	3.33333333	30	0
	Type B	40	33.3333333	6.66666667	20	0
	Type C	26.6666667	46.66666667	10	16.6666667	0
Community center	Type A	6.66666667	56.6666667	36.6666667	0	0
	Type B	0	63.3333333	10	26.6666667	0
	Type C	0	50	33.3333333	16.6666667	0
Shopping center	Type A	16.6666667	76.6666667	6.66666667	0	0
	Type B	16.6666667	50	33.3333333	0	0
	Type C	16.6666667	56.6666667	26.6666667	0	0
Kutcha bazaar	Type A	20	70	10	0	0
	Type B	16.6666667	83.3333333	0	0	0
	Type C	26.6666667	43.3333333	30	0	0
Grocery shop	Type A	50	50	0	0	0
	Type B	50	50	0	0	0
	Type C	60	40	0	0	0
Religious Center	Type A	13.3333333	53.3333333	0	0	0
	Type B	20	80	0	0	0
	Type C	30	70	0	0	0

Appendix D: Characteristics of the Apartments

Table D-1: Number of Storey

No. of Storey	Type A		Type B		Type C	
	Number	%	Number	%	Number	%
Ground Floor	2	6.67	0	0	0	0
2 to 3	14	46.67	10	33.33	13	43.33
4 to 5	8	26.67	12	40	13	43.33
5+	6	20	8	26.67	4	13.33

Table D-2: Floor Area of the Household's Apartment

Floor Area Range	Type A		Type B		Type C	
	Number	%	Number	%	Number	%
>1000 sq ft	9	30	6	20	6	20
1000-1500	21	70	13	43.33	13	43.33
1501-2000	0	0	8	26.67	8	26.67
2000+	0	0	3	10	3	10

Table D-3: House Rent of the Apartments

Rent (tk) Range	Type A		Type B		Type C	
	Number	%	Number	%	Number	%
>3000	0	0	1	3.33	0	0
3000-5000	0	0	0	0	0	0
5001-8000	5	16.67	1	3.33	3	10
8001-10000	7	23.33	4	13.33	8	26.67
10001-15000	16	53.33	16	53.33	9	30
15000+	2	6.67	8	26.67	10	33.33

Table D-4: Relation with Household income and expenditure for house rent

Income Range	Average (%) Expenditure for House Rent
20001-25000	34.4
25001-30000	32.9
30001-40000	29.39
40001-50000	31.16

Table D-5: Percentage of respondent expense for house rent

Percentage Spent	Number of Respondents	Percentage of Respondents
20 – 25	7	7.78
26 – 30	27	30
31 –35	35	38.89

36 – 40	17	18.89
40+	4	4.44

Table D- 6: Variation of Per Square Feet House Rent With Floor Area

Apartment Size (Square Feet)	Per Sq ft Monthly House Rent (Tk.)
>1000	9.12
1000- 1500	8.93
1501- 2000	8.67
2000+	7.98

Table D-7: Number of Bedroom of the Apartment

No. of Bedroom	Type A		Type B		Type C	
	Number	%	Number	%	Number	%
1	1	3.33	0	0	0	0
2	14	46.67	14	46.67	6	20
3	15	50	16	53.33	24	80
3+	0	0	0	0	0	0

Table D-8: Number of Toilet of the Apartment

No. of Toilet	Type A		Type B		Type C	
	Number	%	Number	%	Number	%
1	1	3.33	1	3.33	0	0
2	23	53.33	16	76.67	18	60
3	6	36.67	11	20	9	30
3+	0	6.67	2	0	3	10

Table D-9: Availability of Utility Services of the Apartment (in number)

	Service	Parking	Lift	Gener-ator	Security	Water supply	Gas supply	Electricity supply	Sewerage	Garbage disposal
Type A	Yes	13	21	12	17	30	30	30	30	30
	No	17	9	18	13	0	0	0	0	0
Type B	Yes	20	23	13	16	30	30	30	30	30
	No	10	6	17	14	0	0	0	0	0
Type C	Yes	23	17	13	15	30	30	30	30	30
	No	7	13	17	15	0	0	0	0	0

Table D-10: Availability of Utility Services of the Apartment (in percentage)

	Service	Parking	Lift	Genera-tor	Security	Water supply	Gas supply	Electricity supply	Sewerage	Garbage disposal
Type A	Yes	43.33	70	40	56.67	100	100	100	100	100
	No	56.67	30	60	43.33	0	0	0	0	0
Type B	Yes	66.67	76.67	43.33	53.33	100	100	100	100	100
	No	33.33	20	56.67	46.67	0	0	0	0	0
Type C	Yes	76.67	56.67	43.33	50	100	100	100	100	100

	No	23.33	43.33	56.67	50	0	0	0	0	0

Table D-11: Satisfaction Level of Utility Services

Family types		Water supply		Gas supply		Electricity supply		Sewerage		Garbage disposal	
		Number	%	Number	%	Number	%	Number	%	Number	%
Type A	Satisfied	16	53.33	15	50	10	33.33	20	66.67	20	66.67
	Moderately satisfied	12	40	3	10	14	46.67	7	23.33	9	30
	Not Satisfied	2	6.67	2	6.67	6	20	3	10	1	3.33
Type B	Satisfied	22	73.33	21	70	20	66.67	23	76.67	22	73.33
	Moderately satisfied	3	10	5	16.67	2	6.67	4	13.33	4	13.33
	Not Satisfied	5	16.67	2	6.67	9	30	3	10	4	13.33
Type C	Satisfied	26	86.67	27	90	20	66.67	29	96.67	20	66.67
	Moderately satisfied	2	6.67	2	6.67	6	20	0	0	4	13.33
	Not Satisfied	2	6.67	1	3.33	5	16.67	1	3.33	2	6.67

Appendix E: Relative Importance of House Location Criteria

Table E-1: Preference Table (pair-wise comparison matrix) of Preferred Apartment Location by Family type A

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Distance to workplace	1	7	3.778	3.578	2.511	2.262	2.306	2.778	3.133	1.844
2. Distance to school	0.143	1	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143
3. Distance to market	0.265	7	1	2.488	2.750	2.124	2.622	2.755	2.840	1.928
4. Distance to bus stop	0.280	7	0.402	1	2.571	1.501	1.888	2.818	2.475	1.415
5. Planning of neighborhood	0.398	7	0.364	0.389	1	1.683	2.310	2.817	2.933	1.861
6. Municipal services	0.442	7	0.471	0.666	0.594	1	3.111	3.489	3.507	2.044
7. Road width	0.434	7	0.381	0.530	0.433	0.321	1	2.729	2.778	2.155
8.Social status	0.360	7	0.363	0.355	0.355	0.287	0.366	1	2.884	2.622
9. Proximity to relatives	0.319	7	0.352	0.404	0.341	0.285	0.360	0.347	1	2.786
10. Open area	0.542	7	0.519	0.706	0.537	0.489	0.464	0.381	0.359	1

Table E-2: Preference Table (pair-wise comparison matrix) of Preferred Apartment Location by Family type B

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Distance to workplace	1	1.868	3.511	2.355	2.288	1.812	2.311	3.200	3.573	1.732
2. Distance to school	0.535	1	4.044	3.444	2.844	2.573	1.933	3.218	3.644	2.018
3. Distance to market	0.285	0.247	1	2.733	2.635	1.844	2.022	2.644	2.195	2.195
4. Distance to bus stop	0.425	0.290	0.366	1	2.522	1.630	1.746	2.511	2.978	1.337
5. Planning of neighborhood	0.437	0.352	0.380	0.397	1	1.494	1.932	2.368	3.000	1.639
6. Municipal services	0.552	0.389	0.542	0.613	0.669	1	3.284	3.244	3.467	2.311
7. Road width	0.433	0.517	0.495	0.573	0.518	0.305	1	2.444	2.177	2.013
8.Social status	0.313	0.311	0.378	0.398	0.422	0.308	0.409	1	2.684	1.866
9. Proximity to relatives	0.280	0.274	0.456	0.336	0.333	0.288	0.459	0.373	1	1.870
10. Open area	0.577	0.496	0.456	0.748	0.610	0.433	0.497	0.536	0.535	1

Table E-3: Preference Table (pair-wise comparison matrix) of Present Apartment Location by Family type C

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Distance to workplace	1	7	3.318	3.051	1.996	1.716	2.160	2.578	2.747	1.647
2. Distance to school	0.143	1	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143
3. Distance to market	0.301	7	1	3.378	3.000	2.578	2.422	2.662	2.640	2.507
4. Distance to bus stop	0.328	7	0.296	1	2.396	1.878	2.689	2.773	2.551	1.920
5. Planning of neighborhood	0.501	7	0.333	0.417	1	2.089	2.329	2.396	3.089	2.667
6. Municipal services	0.583	7	0.388	0.532	0.479	1	3.844	3.467	3.333	2.489
7. Road width	0.463	7	0.413	0.372	0.429	0.260	1	2.596	2.684	2.578
8. Social status	0.388	7	0.376	0.361	0.417	0.288	0.385	1	3.067	2.751
9. Proximity to relatives	0.364	7	0.379	0.392	0.324	0.300	0.373	0.326	1	2.680
10. Open area	0.607	7	0.399	0.521	0.375	0.402	0.388	0.363	0.373	1

Table E-4: Estimated Relative Weight (Present apartment Location)

	Family Type A		Family Type B		Family Type C	
	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)
Distance to workplace	0.228636	0.239604	0.199112	0.193439	0.217766	0.213083
Distance to school	0.014118	0.13486	0.197789	0.195652	0.013943	0.017094
Distance to market	0.154174	0.142278	0.116784	0.124591	0.170556	0.140121
Distance to bus stop	0.124731	0.109983	0.1069	0.115748	0.142424	0.120577
Planning of neighborhood	0.107955	0.092557	0.079839	0.077196	0.090474	0.067569
Municipal services	0.114643	0.086602	0.094582	0.087983	0.104834	0.085321
Road width	0.074537	0.05846	0.063519	0.066067	0.083809	0.069311
Social status	0.068367	0.056184	0.054564	0.054689	0.069231	0.056143
Proximity to relatives	0.059527	0.043034	0.042794	0.043953	0.057944	0.04334
Open area	0.053313	0.036437	0.044118	0.040683	0.049018	0.033595

Table E-5: Relative Weight (Preferred apartment Location)

	Family Type A		Family Type B		Family Type C	
	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)
Distance to workplace	0.217899	0.221252	0.187591	0.171478	0.193025	0.189682
Distance to school	0.014068	0.014604	0.186164	0.195403	0.013793	0.014512
Distance to market	0.155925	0.141617	0.12144	0.138601	0.171854	0.148395
Distance to bus stop	0.117053	0.096443	0.09917	0.095282	0.125758	0.10888
Planning of neighborhood	0.108752	0.085943	0.085965	0.087716	0.114823	0.112931
Municipal services	0.116108	0.09407	0.103805	0.101391	0.119062	0.096303
Road width	0.084147	0.066226	0.070672	0.067908	0.082458	0.063088
Social status	0.06919	0.05457	0.052247	0.049421	0.07036	0.052662
Proximity to relatives	0.057356	0.043492	0.04106	0.03877	0.055757	0.042585
Open area	0.059502	0.050347	0.051885	0.054029	0.053109	0.040344

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Appendix F: Relative Importance of House Standard Criteria

Table F-1: Pair-wise Comparison Matrix of House standard in preferred apartment
Family Type A

	1.	2.	3.	4.	5.	6.
1. Affordability	1	1.942667	3.208667	3.681	1.282667	3.417333
2. Utility service	0.514756	1	3.866667	3.227667	1.987667	3.087667
3. No. of Bed room	0.311656	0.258621	1	1.662	1.069667	1.821667
4. No. of toilet	0.271665	0.309821	0.601685	1	0.598667	1.438333
5. Availability of air, sunlight	0.779626	0.503102	0.934871	1.670379	1	4.236667
6. No. of storey	0.292626	0.323869	0.548948	0.695249	0.236035	1

Table F-2: Pair-wise Comparison Matrix of House standard in preferred apartment
Family Type B

	1.	2.	3.	4.	5.	6.
1. Affordability	1	2.106667	3	4.31	1.43	2.398
2. Utility service	0.474683	1	3.644667	3.353333	1.963333	3.42
3. No. of Bed room	0.333333	0.274374	1	1.873333	1.56	2.156667
4. No. of toilet	0.232019	0.298211	0.533808	1	0.447333	0.96
5. Availability of air, sunlight	0.699301	0.509338	0.641026	2.235469	1	4.153333
6. No. of storey	0.417014	0.292398	0.463679	1.041667	0.24077	1

Table F-3: Pair-wise Comparison Matrix of House standard in preferred apartment
Family Type C

	1.	2.	3.	4.	5.	6.
1. Affordability	1	1.399	2.505667	3.955333	1.163333	1.985667
2. Utility service	0.714796	1	3.155333	3.755333	2.266667	3.266333
3. No. of Bed room	0.399095	0.316924	1	2.177667	2.371	2.533
4. No. of toilet	0.252823	0.266288	0.459207	1	0.916667	0.816667
5. Availability of air, sunlight	0.859599	0.441176	0.421763	1.090909	1	4.444333
6. No. of storey	0.503609	0.306154	0.394789	1.22449	0.225006	1

Table F-4: Relative Weight (Present apartment standard)

	Family Type A		Family Type B		Family Type C	
	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)
Affordability	0.334934	0.368644	0.341481	0.342617	0.326307	0.354668
Utility service	0.249669	0.229672	0.240592	0.245617	0.239351	0.233762
No. of Bed room	0.135388	0.142945	0.147304	0.164392	0.169888	0.161973
No. of toilet	0.090768	0.093332	0.085456	0.082786	0.100637	0.091136
Availability of air, sunlight	0.116453	0.106354	0.121055	0.103343	0.1001	0.099132
No. of storey	0.072788	0.059053	0.064113	0.061245	0.063717	0.059329

Table F-5: Relative Weight (Preferred apartment standard)

	Family Type A		Family Type B		Family Type C	
	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)	Relative Weight (data prepared by Arithmetic Mean)	Relative Weight (data prepared by Perth Formula)
Affordability	0.303824	0.293098	0.301276	0.338962	0.326307	0.354668
Utility service	0.261927	0.275493	0.257883	0.239375	0.239351	0.233762
No. of bed room	0.11504	0.140101	0.133024	0.144451	0.169888	0.161973
No. of toilet	0.082156	0.085653	0.067575	0.066988	0.100637	0.091136
Availability of air, sunlight	0.173033	0.145339	0.168581	0.147076	0.1001	0.099132
No. of storey	0.064019	0.060316	0.071661	0.063147	0.063717	0.059329

Appendix G: Present House Choice Criteria Derived by Expert Choice 11.5

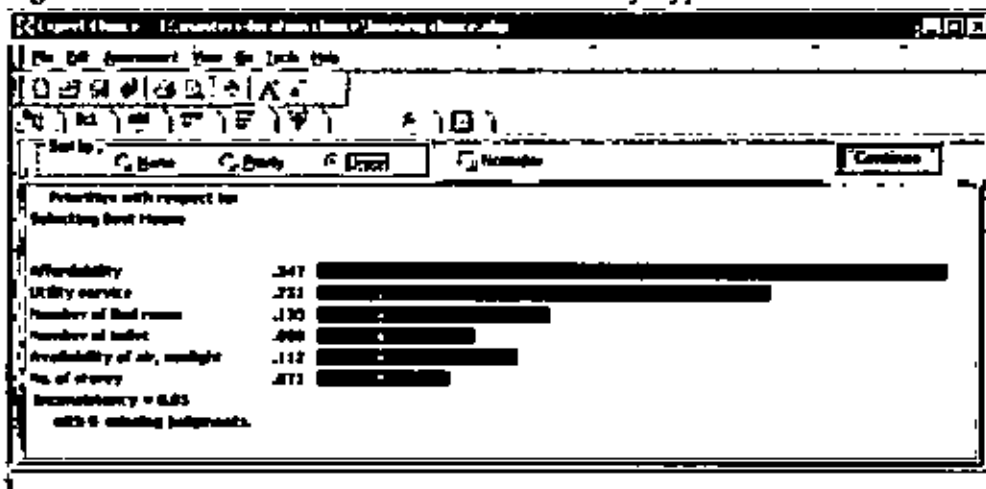Figure G-1: Present House Choice Criteria of Family Type A

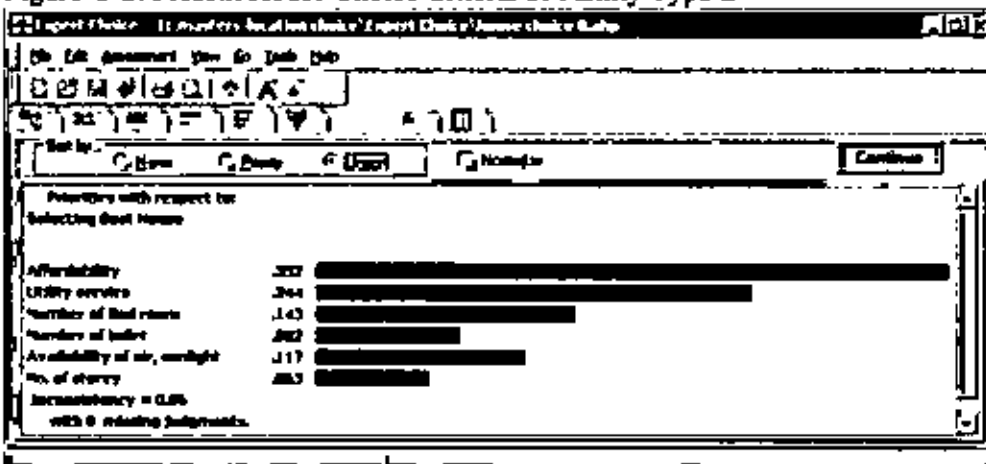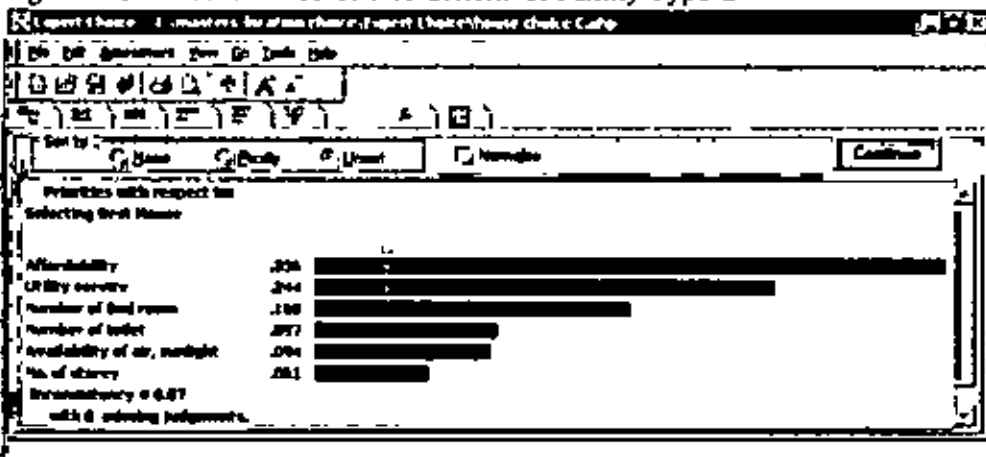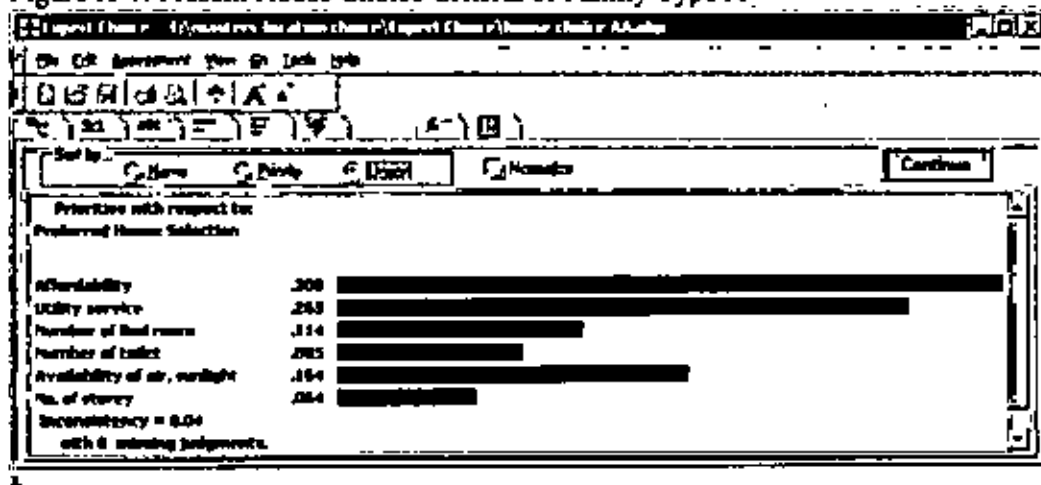Figure G-2: Present House Choice Criteria of Family Type B

Figure G-3: Present House Choice Criteria of Family Type C

Appendix H: Preferred House Choice Criteria Derived by Expert Choice 11.5

Figure H-1: Present House Choice Criteria of Family Type A

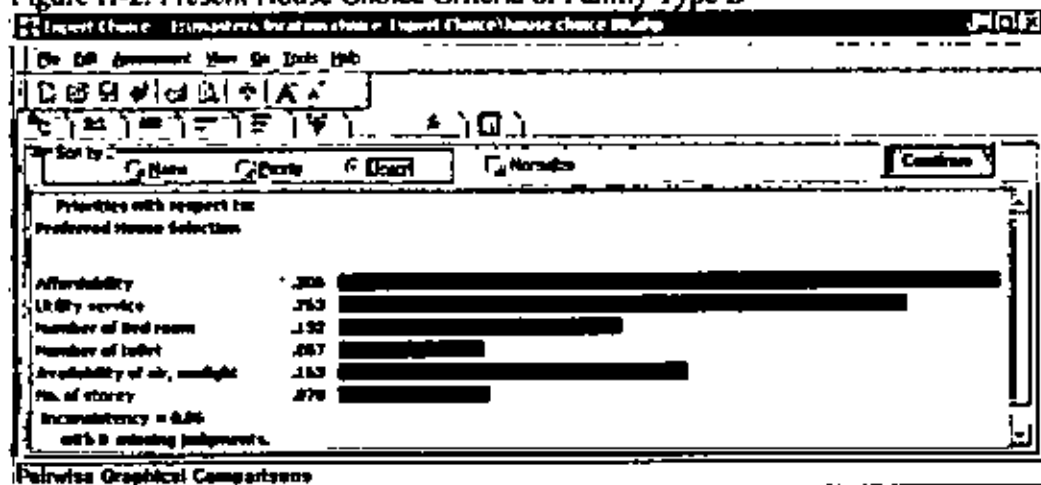
Figure H-2: Present House Choice Criteria of Family Type B

Figure H-3: Present House Choice Criteria of Family Type C