

Human Spatial Behavior in a Public Housing Project at Amman, Jordan

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ABSTRACT This study is an example of a neighborhood scheme that much has been altered in appearance after its initial construction due to the lack of building regulations. The residents changed, added and altered its architectural characteristics without paying much attention to other social and behavioral factors. Our case study presents an empirical study of human spatial behavior in Prince Rashed Housing scheme located in Amman, the capital of Jordan, where the concept of neighborhood in its original design, is not followed at all. It is similar to many other modern housing schemes in Amman and throughout Jordan, where the concept of neighborhood is neglected and changes in its architectural appearance after building it took place. This is reflected directly in wayfinding and human behavior in neighborhoods. This research is going to assess the quality of the housing scheme through studying human behavior and how people orient themselves inside large-scale schemes. This study covers a range of development concerns such as people's cognitive mapping of the built environment used in wayfinding and the people's behavior and social interaction. The spatial layout and perception of the housing scheme is also studied. Research methods incorporate a variety of interactive methodologies, such as visual analysis of the spatial ability of the area within the housing scheme, and utilize a survey to both the residents and non-residents of the housing. Observational categories include information on users' different age groups and environment. Finally a study to the signage system and landmarks inside Prince Rashed housing is examined side-by-side to the studies of navigation system and the experience of maneuvering. The results emphasize the importance of the spatial organization of the setting, the circulation system or paths, the architecture, and the signage system in wayfinding. The complex interaction of physical environment and social behavior is also stressed. A number of recommendations are suggested at the end to improve the spatial environment and to help people find their way inside this housing scheme.

1. INTRODUCTION

Housing schemes in Jordan are divided into two main groups: The first is built by the public sector, which constitutes only 10.36% of the housing schemes. Public sector includes several institutions such as the Housing Institute, the Department of Urban Development, the Military Housing Institute, the Jordan Valley Authorization, the Housing Bank and the Saving Funds of Public Institutions. The second group of housing is built by the private sector that constitutes 89.64% of the housing schemes in Jordan. This research will examine the Prince Rashed Housing (PRH) Scheme built by the Military Housing Institute in 1979, which is considered one of the more well-designed schemes in Jordan (Hiyasat and Jacob, 1989).

The concept of the neighborhood as it started in Britain; at the beginning of the 20th century is a group of residential houses with a population around 7,500 serviced by an elementary school, with a civic center and clear boundaries. This city center may contain recreational, commercial, educational, governmental or healthful activity

that can be considered as the public area of the neighborhood. A group of neighborhoods should construct a garden city that should be surrounded by a green belt at its boundaries. The Reith Report, published in 1945 in London, laid down the principles of neighborhoods and land use planning. It emphasized the importance of topography and principle roads as a major element in grouping houses into a single neighborhood. The Reith Report also stressed the existence of a primary school and some commercial or perhaps religious buildings as a center for such a neighborhood. The Reith recommendations were applied in the New Towns of England such as Harlow, Stevenage, Crawley and others, all circa 1947 (Houghton-Evans, 1978).

The concept of neighborhood is associated with the concept of the Garden City and New Towns. Sir Ebenezer Howard developed the Garden City Concept in 1898. He proposed the ideal town as limited in size to a population of 50,000 at the beginning and 250,000 at later stages. It's planning used open internal layouts, dead-end and curved roads and a wide use of gardens for almost every house. The definition of the

Garden City as adopted in 1919 by London's Garden Cities and Town planning Association was: "A Garden City is a town designed for healthy living and industry; of a size that makes possible a full measure of social life but not larger; surrounded by a rural belt; the whole of the land being in public ownership or held in trust for the community." (Osborn and Whittick 1977). The garden cities of Britain are distinguished by an elegant road network, a harmonious architecture and a generous ration of open space to buildings. Raymond Unwin and his partner Barry Parker built the first Garden City in England between 1904 and 1906 at Letchworth in Hertfordshire, north of London. It has a radial road pattern with intersecting roads at certain distances. It uses dead-end roads with no sharp corners to avoid accidents, and ease vehicular movement. This design will be compared with our case study at a later stage of the research. The garden city movement and the neighborhood concept left their mark in cities all over the world. It started in Britain in 1901, moved to France in 1903, then to Germany in 1904, to Italy and the United States in 1906, and to Jordan during the 1930s (Cherry, 1974).

The site of PRH scheme is located to the western section of the city of Amman next to Al-Madina Al-Tibiyya Street, a major one that connects south Amman to the north. (Fig. 1) It consists of 165 units to accommodate nearly 1,000 inhabitants, with no public use except for a few shops scattered inside the housing area. The number of inhabitants is less than that of ordinary neighborhood and there is no civic center for public use. The overall planning of the scheme is a mixture of street designs that vary in width from 8 to 20 meters. There is a major large roundabout located near the middle of the neighborhood with a width of 20 meters. The main streets have a perpendicular layout with some dead-end roads or cul-du-sac. There is a semi circular road around part of the boundaries of the housing with 12 meters width. The boundaries of the housing are not distinct in the eastern part of the scheme, where a street exists. They even do not exist at all at northern and southern parts of the housing scheme as seen in figure one. Boundaries and edges of any housing scheme are so important in defining the scheme, as described by many planners and architects. The housing scheme is not surrounded by green belt. The land subdivision has a grid layout. There is no green area or playing field space inside the housing

scheme except for that at the roundabout. Children use the dead-end roads for playing activities and social gathering, which is relatively not considered dangerous by parents if compared to other types of streets. The original layout of the housing does not follow the general principles of neighborhood concept discussed before. The height of the houses varies from one to two storeys, and in some cases, the addition of a third floor has occurred at later stages (Fig. 2). As time passed, people started to change the overall design of the housing scheme, especially in the height of the houses. People started to add more floors and in some cases the old buildings were replaced by completely new buildings. According to a study made in 1997 the one-storey buildings constitute 53.4%, the two storeys 29% and the three storeys 17.6%. Before that, 100% were one-storey buildings (Bijawi, 1997). Another change was in adding more public buildings within and next to the housing. This study will examine wayfinding in the recent situation of the housing after all changes took place, and will try to explain the effect of absence of proper neighborhood design on wayfinding.

2. WAYFINDING IN LARGE SCALE PROJECTS

Wayfinding is a very important issue, especially in large-scale projects such as our case study. It is an integral part of our everyday life. We usually rely on our memory to find our way in which meaningful and recognizable patterns of visual information are stored (Lam, 1977). We usually pick out a particular pattern which enables us to find our way, as the built environment contains so much visual information that we cannot remember it all. This is called the spatial cognition, which depends on the knowledge representation people learn in childhood and through time. People navigate from one place to another using their knowledge, mediated by categories of understanding their experience (Johnson, 1987). Wayfinding is a spatial problem that involves identifying a current location, then maneuvering through a route to reach the desired place or building. It consists of a behavioral attitude to find a destination. If the desired location is not reached, this means there is a problem in the design of the scheme and the environmental stress is increased on the user. The difficulties may be due to several factors, among

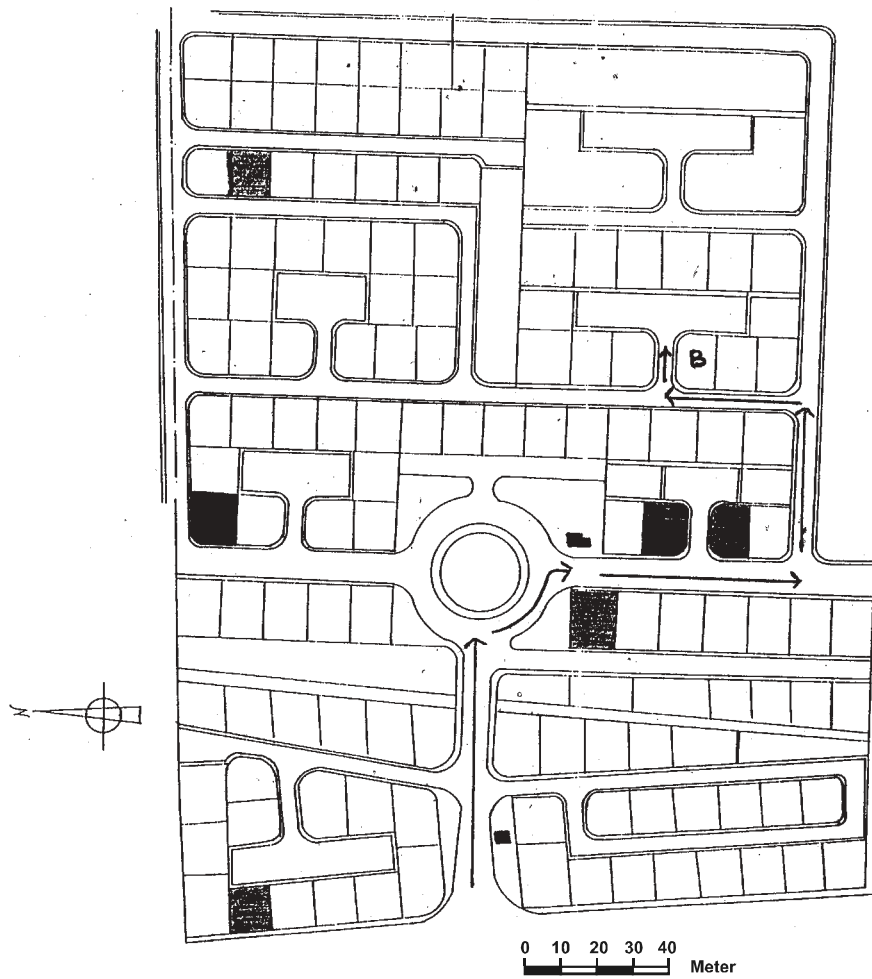


Fig. 1. The site plan of PRH scheme
Source: Amman Municipality 2002. Scale; 1:400

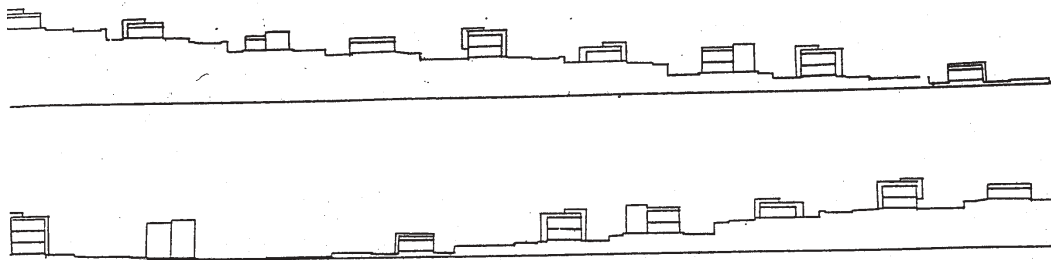


Fig. 2. Section of PRH scheme
Source: Amman Municipality 2002. Scale; 1:1500

them the inaccessibility to the location, or to the complexity of the circulation pattern or to the inefficiency in the design of layout, or due to safety problems and security (Gluck, 1991). People develop a cognition map in their heads to navigate through space. As they use the space more frequently a better image is developed in their minds, and an easier way to find their desired location is achieved. In order to design a real space that is easy to navigate, it is necessary to know how people understand spatial environment (Kitchen, 1996).

Wayfinding in housing schemes depends greatly on a number of items: the signage system used in the scheme, the route names and characteristics, the mapping, house numbers, building characteristics and design, nodes and landmarks, etc. It depends on the spatial perception of the built environment, which is verified by our senses; vision, hearing, touching and others (Freska, 1991). Wayfinding facilitates movement through the built environment, which is determined by the architecture and open space (Unger and Wandersman, 1985). Human behavior in wayfinding depends on the spatial perception of the environment, which depends on vision, hearing and touching (Stokols, 1981). Psychologists studied the human behavior and the

wayfinding in housing schemes for several decades in order to design a better space and place for humans (Golledge, 1992). Wayfinding is defined as “the process of orientation and navigation. The overall goal of wayfinding is to accurately relocate from one place to another in a large-scale space” (Gluck, 1991).

3. CONCEPTUAL APPROACH AND RESEARCH METHODOLOGY

This study is investigating wayfinding in a housing scheme which has no planning theory in its design. PRH did not follow the concept of neighborhood or any other planning theory as seen in the introduction, and this has affected wayfinding greatly, as will be demonstrated. In PRH scheme much has been changed in the appearance of its houses after building it in absence of building legislation, which made the situation of wayfinding more difficult. The residents altered, added and changed its architectural characteristics without paying much attention to other social and behavioral factors. In this study an evaluation of one of the public sector housing schemes is carried out through studying the following: 1. The spatial layout and perception of the housing scheme (mapping). 2.

Table 1: Evaluation of the PRH Project objects and questionnaire for the user both residents and non-residents, where the total for each cell is 100 participant.

Object	Resident in PRH		Non-resident in PRH	
	Yes %	No %	Yes %	No %
1. Do you like the approach to PRH Project?	35	65	48	52
2. Do you like the open space inside the roundabout?	5	95	12	88
3. Can you find your house within the housing easily?	84	16	Not applicable	Not applicable
4. Can you find your friend's house easily?	78	22	28	72
5. Do you like the planning outlook of the streets?	65	35	27	73
6. Do you like the dead-end or cul-du-sac streets?	97	3	91	9
7. Do you see a landmark in PRH Project?	5	95	2	98
8. Do you consider the height of the buildings appropriate?	94	6	88	12
9. Do you see any signage system?	7	93	3	97
10. Do you consider the high voltage electric tower a landmark?	52	48	61	39

Table 2: Examination of the age of residents on human behavior and wayfinding in PRH Project, where the total for each cell is 100 participants.

Object	Age from 7-12		Age from 13-16		Adult	
	Yes %	No %	Yes %	No %	Yes %	No %
1. Do you find your way to your home easily?	55	45	78	22	92	8
2. Do you find the way to your friend's house easily?	38	62	65	35	87	13
3. Can you plan your way mentally before entry?	18	82	38	62	56	44
4. Do you find a pleasant place for gathering or playing?	5	95	8	92	12	88
5. Do you like the roundabout open space?	14	86	9	91	13	87
6. Do you think the high voltage electric tower dangerous?	37	63	53	47	64	36
7. Do you think signs will improve your ability in wayfinding?	34	66	48	52	73	27

The visual study to the spatial ability of the space within the housing scheme where a number of photographs will be analyzed accordingly. 3. A study to the signage system and landmarks inside PRH will be examined side by side to the studies of navigation system and the experience of maneuvering. 4. Finally the wayfinding through this housing will be studied through conducting a survey using a questionnaire to both the residents of the housing and non-residents. This research utilizes a survey of public opinion from both residents of PRH and non-residents.

The research methodology depends on integrating the social and physical variables through questionnaires and visual observation. Both will be dealt with for several types of users; residents and non-residents of PRH as seen in table 1, and for different ages, ranging from children of 7 to 12 years old, to teenagers of 13 to 16 years, and to adults, as evident in table 2. The local environment as seen by residents of PRH is different from the view of the others. A standard procedure is followed in administering the questions in numerical order to achieve rational results. The flow of questions depended mainly on the problems that might arise during wayfinding and maneuvering through the

housing scheme. The sample of table 1 consists of 100 residents and 100 non-residents, who were randomly selected, with an equal percentage of males and females. The sample presented in table 2 also consists of 100 participants from each category and represents various educational levels varying from pre-school students to post graduates in order to assess the cultural background value of participants. The questionnaire took almost two weeks to complete, where two trained researchers in addition to the author helped in its distribution and analysis. The survey was conducted during June 2005. Participants voluntarily agreed to take the interview and fill out the questionnaire as presented in tables 1 and 2, and were thanked at end. To assess the hypotheses of the study, Chi-Square Test is conducted and the equation of: $\chi^2: \Sigma(f_o - f_e)^2 / f_e$ is applied. Where χ^2 : is the calculated critical value of Chi-Square. f_o : observed counts. f_e : expected counts. X' : Tabled critical value of Chi-Square.

4. SPATIAL PERCEPTION OF PRINCE RASHED HOUSING SCHEME

Spatial perception makes use of different senses to orient and direct people through space.



Fig. 3. Main approach to PRH scheme.
Source: Author, 2005.

Fig. 4. The roundabout that contains the only open space and park at PRH scheme.
Source: Author, 2005.

Fig. 5. A dead-end road at PRH scheme.
Source: Author, 2005

Perhaps the sense of vision is the most important to this end, but this is most effective when added to other senses of hearing, touching, and talking. People can spatially perceive large-scale projects

by using language through asking questions (Arthur and Passini, 1992). Spatial perception is an important mediating element between man and his built environment. The visual experience

Fig. 6. The only landmark at PRH scheme, the high voltage electricity.
Source: Author, 2005.



PRH scheme, the vision sense will not help us much in reaching our desired destination, especially for non-residents. The perception of space inside PRH is weak because people require

lots of reference that could stand out. There could be also landmarks, which are not all in our case study as table 1 shows. The only landmark that people may think of is the high voltage electric tower located at the entrance of the scheme as seen in figure 6. If we examine the second sense of hearing, we find ourselves in PRH because of the noise level on the main street next to it. If we examine the dead-end roads we can not distinguish our space because of the similarity in the surroundings. The lack of landmarks would allow us to identify certain features in the setting and perceive some landmarks (Cornell et al., 1994).

The most common way of wayfinding inside PRH is map, which is a large spatial layout that is used at a high level of abstraction. However, as we all know, not everyone has the skills necessary to effectively use a map. A professional may find this even difficult. The large development done around PRH in recent years. Large scale developments such as hospitals, various small and large shops, schools and several other uses are planned next to PRH and only a highly skilled person can distinguish by map his location and

find his way through. The absence of boundaries from the beginning stages of planning the PRH made this problem even worse, where there is no clear separation between the houses and other new commercial and public uses that went up later. The signage system in PRH is neglected and poor. A person can hardly find a sign that leads to public space or to a street name. A poor signage system adds more difficulty in wayfinding as table 1 shows. The signage system is important for different age groups as table 2 shows. Even children between the ages of 7 and 12 see this as important matter in wayfinding. Children find more difficulty in locating their friend's house or to maneuver from open space to another, as seen in table 2, questions 2 and 3. Table 2 deals with residents of the PRH only and the questionnaire is according to the age group. As children grow to be teenagers and finally adults the problem of wayfinding diminishes, where the percentage increases from 38% of the children to 65% of the teenagers to 87% on adults for finding the way to a friend's house.

The last thing to find your way inside PRH is by using language and asks local residents about your desired destination. This might prove useful, but it may take you more than 15 minutes to find the right person to ask about the required destination. People usually have a very rich vocabulary to describe environments and spatial relations from which the observer can construct a mental image of the space through description. Visual perception using language is possible because the description draws spatial images in our minds that lead to spatial perception (Darken, 1997). The description depends on the cultural background, the level of education and the particular language used. Our languages provide words that are related to the built environment such as: to the left, next to, to the right and so on (Edgenhofer and Mark, 1989). As the boundaries of the PRH are not precise, navigation by using language becomes more difficult. The inter-locking objects between PRH houses and the other new buildings make the situation even worse. The absence of sufficient landmarks makes the person lose direction inside this scheme. If PRH is isolated with a green buffer zone surrounding it, an easier method of wayfinding will be found.

Large-scale projects cannot be observed from a single viewpoint. The road network experienced through navigation needs maps and a signage system, which are not seen at PRH. This stresses

the importance of a mapping and signage system (Abu-Ghazze, 2002) and leads us to the concept of a cognitive map, which is a map constructed in our minds enabling us to find our way. This mental representation is essential to success in navigating a real environment. It needs clues within the environment to navigate correctly and precisely (Howard and Kest, 1981). The cognitive map develops from a mental landmark map to a mental route map and eventually results in mental survey map. A route map is created through remembering what has been seen when walking through the environment (Davis, 1990). In other words the human spatial knowledge consists of three levels: landmark knowledge, which is a point of reference in the built environment; path knowledge, which organizes the sequence of landmarks; and the survey of configuration knowledge, which permits the location of landmarks and paths (Siegel and White, 1975). The mental survey map is related to a person's understanding of the environment as a spatial entity, survey and route maps. A cognitive map may consist of different knowledge structures and has to integrate with subjective knowledge. It expresses the way information about his spatial environment is organized. There are three basic frames of reference in the cognitive maps: egocentric, fixed and coordinate. In egocentric frames, elements in the environment are positioned according to the viewer. In fixed frame, elements of environment are related to a particular point of reference in the environment such as in Washington D.C., where the obelisk, the Mall, the Congress, the White House, and the Lincoln Memorial are all landmarks that people can refer to in their minds. In coordinate frame, elements in the environment are positioned in relation to some of the abstract system such as the abstraction of the skyline of the city or a neighborhood (Levinson, 1996). In PRH, only an egocentric frame is seen, which the observer must develop. The fixed frame is difficult to trace due to the poor reference points or lack of landmarks. The third coordinate frame is also difficult to effect due to what little abstraction system can be imagined.

DISCUSSION

To test the results of counts in table one, a Chi-Square Test is applied. The third question is not applicable for non-residents, so it is omitted from the table to calculate our Chi-Square Test, in

order to achieve balanced results. The test shows that χ^2 (calculated) is $> X'$ (tabled) and there is a significant difference between variables. This means that the table is dependent and there is association in the results. In other words, residents of PRH do not see the same problems of non-residents or visitors to the neighborhood. For example, in question number one, 35% of residents like the approach of the housing scheme, while 48% of the non-residents like it. The figures in table 1 have contradiction, which made the table dependent. In Table 2, a different result occurs, where χ^2 (calculated) is $< X'$ (tabled), which means that the table is independent, and there is no significant difference between variables or the residents' ages, or level of study. In other words, the responses to problems mentioned in the questionnaire are the same for different ages of residents, but in various percentages. For example in question number one 55% of the children can find their home easily, while 78% of the teenagers and 92% of adults can do the same. The same conclusion occurs for all other questions, except in question 5, where the percentages follow a different path 14%, 9% and 13% for age group 7-12, teenagers and adults respectively.

Spatial perception is an important mediating element between man and his built environment. The visual experience enables humans to perceive objects and spaces in a three-dimensional manner. Maneuvering in PRH scheme using only the sense of vision is so difficult, as evident in tables 1 and 2, for all examples of groups studied. The improper design of the housing layout and grouping of buildings from the beginning, where no concept of neighborhood or any other planning theory was applied, caused the major problem in wayfinding at the housing scheme. When using other senses to maneuver, such as hearing, the same result occurs, where one cannot distinguish the space due to high noise levels received from the adjacent major roads (O'Neill, 1991).

Using a physical map to find your way in PRH, which is an expansive and highly abstract layout, would be tedious, at best because of the many new developments added to the housing scheme in recent years. Existing large scale public buildings, the absence of boundaries and the poor non-existent signage system adds more difficulty in wayfinding, as table 1 shows. Even using language to ask local residents about the desired

destination requires more time than most people are willing to expend. After several observations of non-residents visiting the housing at various intervals, our research found an average of 15 minutes is required to reach the desired destination. For example, to go from the entrance of the scheme to house number "B" shown on figure 1, a visitor asked three persons and one child about the house of Mr. X. The first person answered I do not know him. The second said you should go straight until you reach a large roundabout then turn right and ask somebody there. The child found their answered turn second left. The third person said go straight then turn first left, and first right you will find the place of Mr. X. This procedure took 15 minutes. Cognitive mapping is essential to success in navigating a real environment. It needs clues within the environment to navigate correctly and precisely. The cognitive map is inordinately difficult to develop in PRH from a mental landmark map into a mental route map, which eventually results in a mental survey map. A route map is created through remembering what has been seen when maneuvering through the environment and this is hard to remember in our case study due to the poor design and layout of the housing and the dearth mental landmarks (Ibrahim et al., 2002). Open space is not seen at all in PRH except for that inside the roundabout, which is, too difficult and dangerous to use (see tables 1 and 2). Adequate and comfortable open space should develop a better environment especially for children. Public open space is a basic fundamental ingredient of the built environment. The good interrelation between open space and architecture gives the successful design (Abu-Obeid and Ibrahim, 2002). Open spaces are perceived as areas for social gathering, recreation and interaction in the society (Rapoport, 1982), and in housing schemes (Unger and Wandersman, 1985). Public open space is regarded as an important amenity, which depends on cultural heritage that is expressed in our behavior. Human behavior depends on spatial perception, which relies on vision, hearing and touching (Theil et al., 1986). The identity of open space is stressed by using landmarks. If people can remember a landmark, only then can they remember the space (Garling and Lindberg, 1986). The absence of landmarks (as shown in table 1 and the photographs presented in figures numbers from 3 to 6) in our case study disorients both the residents and non-

residents of PRH scheme and gives no clear identity to the open space. The space should first be recognized either by its landmarks or by other means before a decision can be transformed into behavior or movement into the space (Mac-Minner, 1997). The distinctiveness of open space gives its identity, which is considered a major requirement in wayfinding (Peponis et al., 1990). Landmarks inside PRH are absent simply because there is no public open space. The change of buildings appearance, occurring at present time, does not create the required landmarks because of their continuing change over time and their large number. If someone visits the housing scheme and relates one changed building in his mind to remember, several months later he will not distinguish it because several other buildings have been altered too.

Major changes have occurred in PRH since building it in 1979. People started to add more floors to buildings, thus changing elevations. They have used various finishing materials, built garages for cars, and generally changed the style of their houses by adding different architectural features, such as arches, pitched roofs and etc. According to Bijawi's master thesis conducted in 1997, since 1979 only 8% of the houses did not change anything. These changes are mainly due to three factors. The first is the social factor. As family sizes expanded, adding more rooms or even completely new floors became necessary. Adding more privacy to the existing design by isolating entrances or building new privacy walls that separate public from seeing inside the house. The second factor for making changes is economic. Residents added more floors for the purpose of renting them to increase their financial income. The third factor being the absence of legislation and rules inside PRH scheme, the residents can make changes in housing design without the need for approval or permission from certain authorities or the municipality (Bijawi, 1997). These changes made the situation in PRH scheme even worse. They changed the whole architectural character of the housing. New construction changes might introduce a clue for distinguishing between buildings and in providing some identity to some streets, but residents and non-residents still see a problem in wayfinding, as tables 1 and 2 show.

5. RESULTS

PRH scheme did not follow any planning

theory or neighborhood concept in its first design. This caused the main problem of wayfinding in this housing scheme. The following items represent the major problems for this housing scheme: 1. The absence of a clear street network planning. 2. The various widths of streets that should not exist as such in a small housing schemes, where the width of some streets reaches 20 meters inside the scheme and 32 meters at other parts. 3. The missing and undistinguished boundaries. 4. The missing green belt around the housing scheme. 5. The lack of open space and the absence of playgrounds for children. 6. The absence of a civic center for public use. 7. The absence of building legislation inside this housing scheme encouraged changing its appearance by adding more floors and changing architectural design without integrating social and behavioral needs and demands. 8. The large number of public buildings constructed near the housing scheme.

At its first design PRH contained a limited number of public buildings with only a few shops, one school and one religious building. Afterwards, several shops were located in the housing scheme scattered between the houses without a pre-planned study to their needs and locations. This caused a major problem to the housing, as the need for such type of buildings is necessary, but they should have been located in other areas. A major expansion of public use buildings occurred next to the housing in later stages. In order for a housing scheme to succeed, a good equilibrium between private and public uses should be achieved. The planning design of the road network of PRH did not follow any theoretical background concept, and a mixture of street designs occurred. We can see radiating streets, semi circular streets, dead-end roads a large roundabout, and overly-wide streets that have a capacity larger than required for such a housing scheme. Perhaps the use of dead-end roads is the only successful achievement in PRH.

Boundaries, which are missing in PRH, play a major role in housing schemes. They help us in wayfinding and in recognizing spaces, thus defining a territory. Territoriality serves both socially and physically, and is considered an important organizer of human life. It facilitates social activity and permits performance of certain functions. Territory can be made of real barriers such as walls or fences, or from symbolic barriers such as levels, steps, lights or landscaping (Bower, 1988). No real or symbolic barriers exist

in PRH scheme, where a mixture of land use occurs inside and around the scheme. This situation cannot continue. The municipality should start to define a land use plan and construct boundaries with barriers. The space perception is dependent on the distance between users and objects, the orientation, and the movement of users in the space. The environmental space, which is based on the relationship between scale, space and people's experience, is another dimension. Scale plays a central role in the distinction between objects and environments, which are missing in our case study.

The need for a cognitive map for wayfinding in PRH is essential. Cognitive map, which is a map constructed in our minds for reference, can be developed easily if we construct a series of landmarks or clues within PRH environment. Of course, these landmarks need a space in which to be erected, but a redesign to some of the streets may provide such public open spaces. The cognitive map usually develops from a mental landmark to a mental route map and should eventually result in a mental survey map. Remembering what has been seen through movement creates this map and leads us to our goal. Landmarks, which are missing in our case study, orient a navigator to his required destination. They are very important in wayfinding for residents and non-residents, alike. As navigators become more experienced in visualizing landmarks they learn how to identify them from new perspectives (Montello and Pick, 1993). The signage system inside Price Rashed Housing is neglected. People cannot find their way without a signage system, especially if they are non-residents. Several studies emphasized the importance of signage presence in wayfinding. Wayfinding and architecture principles include the signage system as an important issue. Although a signage system cannot overcome architectural and planning failure designs, it can help greatly in wayfinding. A signage system helps us to understand the spatial organization of a setting. People feel disoriented if they cannot situate themselves within a spatial representation and develop a route plan to reach their destination (Mathew, 1992). Passini (1996) concluded in his paper that efficient wayfinding settings require design standards that incorporate all disciplines of design: the architect, the graphic designer, the planner, and the landscape architect. Wayfinding does not limit itself to the cognitive map but

includes all mental processes that are involved in movement. It is a generic concept that incorporates the idea of spatial representation. Wayfinding is an essential requirement in modern design. Special attention should be paid to the physical features inside the open spaces after incorporating them inside PRH scheme. Some spaces are famous because of special features, or because they are adjacent to an appealing scene, such as a water front or green area that overlooks a beautiful landscape. This could be achieved at our case study if a qualified architect participated in the design.

6. RECOMMENDATIONS

Finally, wayfinding can be improved inside PRH if the spatial quality of the environment is adjusted and improved, and this can be achieved through the following recommendations: 1. A study to the overall planning of PRH should be carried out, taking into consideration the previous literature and applying the neighborhood design concept. This can only be achieved after careful study to the existing situation. 2. A design of boundaries to PRH, whether real or symbolic should take place, to isolate the housing scheme from other commercial buildings that heavily exist around the site. Planting a group of tall trees should solve the problem and create the required buffer zone. 3. A redesign to the layout of the street network should be made to improve the environment and minimize wayfinding problems inside the housing scheme. 4. A creation of new open spaces within the housing boundaries and playgrounds should be implemented. 5. Add new landmarks inside the proposed open spaces and at some intersections to improve wayfinding. 6. Develop a completely new signage system that helps a navigator finds his way inside PRH, taking into consideration the location and design layouts of these suggested signage boards. 7. Encourage construction of some public buildings at certain areas inside the housing boundaries. 8. Relocate the high voltage electricity power, seen in fig 6, outside the boundaries of the housing. 9. Develop a local regulation of building code to be adopted inside the housing scheme to control future architectural changes and alterations to its original design. 10. The integration of plantation within the open space is the answer to improve the spatial quality and thus the wayfinding in PRH scheme. A place has to be recognized before a

decision can be transformed into behavior. The distinctiveness of a place gives its identity and eases wayfinding.

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