

Enhancing Security in Affordable Housing Projects: The Case of Prince Fawaz Project

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Abstract

According to socio-economic changes, the Saudi communities are experiencing accelerating rates of crime; and affordable housing is not an exception. The present study argues that the urban form of affordable housing projects can support or eliminate safety and security. The study aims at examining the extent to which the urban form of Prince Fawaz affordable housing project advocates security or crime. Theories and approaches concerned with enhancing security and reducing crime in residential areas are initially discussed. Urban and architectural features of Prince Fawaz project are reviewed as well as crime rates and patterns. Car and home theft is found the most prevailing type of crime. Trace and behaviour observation is then carried out. The observation monitored resident's actions with regard to crime, fear of crime and security. Levels of satisfaction with security and fear of crime in different areas of the project are extracted through a questionnaire. A space syntax analysis is processed and linked with the questionnaire outputs. Results are found in line with some theories while contrary to others. Enhancing security and eliminating crime in Prince Fawaz affordable housing project require enclosing open spaces directly connected with peripheral roads to become private and semi-private entities and reformulating movement network to achieve more integration and natural surveillance for different parts of the project. However, lack of data on crime statistics and locations puts some limitations on the outcomes.

Keywords: Security, crime, affordable housing, Saudi Arabia, space syntax

ملخص

أدى التغيير في الظروف الاقتصادية والاجتماعية والتي طرأت على المجتمعات في المملكة العربية السعودية إلى تنامي معدلات الجريمة، ولا يستثنى من ذلك تجمعات الإسكان الميسر. وتناقش هذه الورقة أن التكوين العمراني لمشروعات الإسكان الميسر قد يعضد أو يحد من الشعور بالأمان في هذه المشروعات. وتهدف هذه الدراسة إلى اختبار مدى مساهمة التشكيل العمراني لمشروع الأمير فواز في تعزيز الأمن أو توفير بيئة ملائمة للجريمة. وتبدأ الورقة بمناقشة النظريات والمناهج التي تهتم بتعزيز الأمن وتقليص فرص الجريمة في التجمعات السكنية، ثم تتناول بالتحليل الخصائص المعمارية والعمرانية، وأنماط ومعدات الجريمة في مشروع الأمير فواز. وقد وجد أن سرقة السيارات والمساكن هي أكثر الجرائم شيوعاً بالمشروع. وكذلك تم ملاحظة الآثار والسلوك والتي توضح التدخلات المتعلقة بالأمن أو الجريمة أو الخوف من الجريمة. ومن خلال الاستبيان أمكن تحديد مستوى الرضا بالأمن والخوف من الجريمة في المناطق المختلفة بالمشروع. وقد تم توظيف تقنية البناء الفراغي (space syntax) لتحليل فراغات المشروع وربطها بنتائج الملاحظة والاستبيان. وقد أوضحت النتائج توافقاً مع بعض النظريات في بعض الأحيان، وتناقضت معها في أحيان أخرى. إلا أن تعزيز الأمن في مشروع الأمير فواز يتطلب التحكم في الفراغات المفتوحة التي تتصل بالطرق الخارجية لتتحول هذه الفراغات من فراغات عامة مهمة إلى فراغات خاصة أو شبه خاصة يمكن السيطرة عليها. كما يتطلب تعزيز الأمن إعادة صياغة محاور الحركة لتحقيق درجات أعلى من التكامل والذي يسمح بتوفير إشراف ومراقبة طبيعية لمناطق المشروع. وقد تأثرت مخرجات البحث سلباً بسبب ندرة توفر المعلومات المتعلقة بالجريمة وأماكن حدوثها.

الكلمات المفتاحية: الأمن، الجريمة، الإسكان الميسر، السعودية، البناء الفراغي.

1. Introduction

As a result of the economic boom of the mid-seventies, the Saudi communities have experienced a shift from the simple native settlements to new urban ones. The growing number of population, and the heavy immigration from villages to cities forced the Saudi government to provide a number of affordable housing projects in a short period of time (Al Hazza', 2001). Affordable housing was occupied by low and mid-income Saudi families of different backgrounds causing looser social relationships and new forms of social values. In addition, the recruitment of labour from different nationalities and religions led to noticeable social changes. As a result of the new socio-economic conditions, the rate of crime in affordable housing has increased and new types of crime have emerged (Eben Saleh, 1999). Notably, crime in residential areas is a critical issue where fear is an engrained feeling in the minds of people. Safety and security is an essential component upon which residential communities depend. Yet, in many instances, the urban form contributes to making a settlement an attractive point for crime or a refuge for outlaws (Lorenc et. al., 2012).

The relationship between crime and urbanism has been a subject of study that attracted the attention of architects, planners, sociologists, criminologist and policemen. Reviewing previous efforts indicates that there are some theories, approaches and tools that aimed at promoting the feeling of security and reducing opportunities for crime and risk in the built environment. These were evolved depending on the experiences of each other concurring in some instances and contradicting in others. Theories include the defensible space and crime prevention through environmental design (CPTED) (Adel, et. al., 2015). New urbanism is an urban design approach that advocates enhanced safety from crime (Congress for the New Urbanism, 2001). While, space syntax is an urban analysis tool that, among other applications, seeks to find explanations for the places in which crime incidents occur (Hillier and Sahbaz, 2008). Through these efforts, many issues such as the type of the dwelling, density, mixed uses, and through movement constitute points of dispute.

The present research aims at studying the impact of urban design on providing security and reducing crime in affordable housing, focusing on Prince Fawaz project in Jeddah as a case study. The research raises four hypothetical propositions to be tested. First, the decline of security in affordable housing projects refers to a deficiency in the urban form which provides opportunities for crime. Second, inconsistency in theories concerned with security in housing projects reflects the absence of general bases that can be agreed on in this regard, and clarifies that the issue is still a fertile area of study. Third, the problem of assessing the relationship between the urban form and its corresponding impact on crime lies in the complexity of measuring this relationship. Fourth, although it attracted the attention of researchers in many countries, security in housing projects is not receiving adequate interest in the Saudi context.

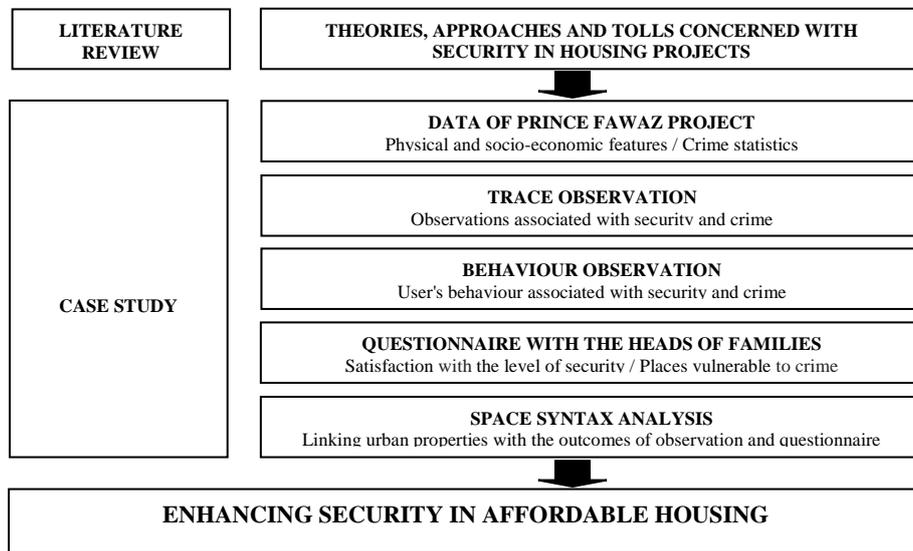
2. Methodology

The research reviews theories and literature concerned with the relationship between the urban design of residential areas and security, crime and fear of crime. The review extends to cover crime types and rates in Saudi Arabia, while, in the case study, many techniques are utilized. First, data related to Prince Fawaz affordable housing project is gathered including project location and context, number and types of housing units, architectural features and urban pattern. Rates and patterns of crime over the last two years are tabulated and

compared with those of the city of Jeddah. Second, a trace observation is tackled to notice user's behaviour in spaces and record impacts associated with security and crime such as fences, protection iron and visual obstacles. The observation aims at monitoring the relation between the intended and the actual use of spaces. Third, a questionnaire with the heads of families is conducted to explore the degree of satisfaction with the level of security in different spaces of the project, places and times in which they feel more vulnerable to crime, previous experience with crime, and prevailing types of crime. A sample of 360 questionnaires is distributed to cover about 27% of the total number of the project' units which amount 1318. According to the privacy of Saudi families, questionnaire was randomly conducted with residents while returning from prayers. The sample realizes a confidence level of 95%. The questionnaire form includes a number of closed-ended questions with bilateral answers; while, others are formulated in a Likert-type scale. Questions try to acquire information pertaining to the whole family members. At the end of the questionnaire, in an open-ended format, residents are asked about any proposals for enhancing security in the project.

Data acquired from the questionnaire are statistically analysed in an attempt to obtain the relationship between physical properties and crime or fear of crime. The urban pattern of Prince Fawaz project then is analysed with the aid of space syntax. Within Depthmap programme, many measurements can be derived, and data obtained from observation and questionnaire can be correlated. An interpretation of concluded results accompanied by recommendations for enhancing security and reducing crime in affordable housing projects are then discussed.

Figure (1) Research Methodology



3. Crime in Saudi Arabia

Saudi communities were dramatically affected by the rapid economic changes converting from the simple way of life to the urban one. The new situation and its impact on crime are argued below.

3.1 Factors affecting crime in the Saudi residential communities

During the last decades, many factors have affected crime in the Saudi residential communities. The traditional structure of extended family has changed into smaller

independent ones undermining the binding social relationships. On the scale of one family, fathers were used to absence outside the home for long hours, women went for work relying on foreigner nannies and maids in raising children, and sons acquired more freedom. The economic boom has played a similar role in changing the traditional values. The comprehensive changes in jobs, wages, prices and accompanied increase of consumption rates have led to contraction of economic solidarity, rampant of unemployment, competing on jobs and increasing living pressures. In addition, the heavy internal immigration to the cities of modern economic activities and the attraction of a large number of foreign labours of different backgrounds have distorted the relationships among communities. Domestic labours that have direct contact with families for long times made significant impact in such concern. The wide range of broadcasting and social interaction networks which include magnitude ideologies have made the new generations more vulnerable to changes in beliefs, behaviours, customs and traditions, and even the religious values. Media has become a major factor that changed the Saudi society towards modernization with its negative impacts especially vandalism. Finally, a considerable part of the efforts of security agencies has shifted towards confronting terrorism affecting their ability at the level of local crime (Al Beshr, 2000).

3.2 Types and rates of crime in the Saudi communities

The prevailing types of crime in the Saudi communities can be monitored in self-molesters (murder, manslaughter, attempted murder, death threat, assault leading to death and suicide), money molesters (theft of homes, cars, motorcycles, shops and money), moral (adultery, indecent assault, rape and drinking alcohol), juveniles (impiety of parents and escape from home), drug (dealing, smuggling and distribution) and foreigners crimes which are mostly financial (Za'zo', 2001).

However, Crime rate in Saudi Arabia is generally low compared with other countries. In 2005, the number is significantly raised to about 90000 crimes, with a rate of one crime per 255 people. Theft crimes came on top with 43489 cases or about 50% of the total number of crimes, followed by self-molesters (14040 crimes or 15.6% of the total number of crimes), then moral crimes (10738 crimes or 11.9% of the total number of crimes). By the year 2006, the number of criminal offenses dropped to 88609 crimes, but the number of deliberate murders significantly rose to reach 15492 crimes representing 17.5% of the total number of crimes (Abu Shama, 2007).

In his declaration to newspapers, the official spokesman of the Ministry of the Interior states that the number of crimes in Saudi Arabia reached 96000 during the year 1435H. The number of self-molesters crimes increased by 7% of the previous year; meanwhile, money molesters' crimes decreased by 15.25%. Within the self-molesters crimes, the number of stab crime rose by 11.7% (11.4 crimes per 100,000 people), and the number of aggression and brawl rose by 9.3% (90.4 crimes per 100,000 people). While, other sorts of self-molesters crimes like murder, shooting and attempted murder decreased by 17.7%, 7%, and 9% respectively (El-Torky, 2015).

However, statistics show that crimes in Saudi Arabia are mostly committed by men who committed about 99% of the crimes, while only 1% refers to women. Nevertheless, the number of women crimes is increasing since 2000 where the number of female prisoners was 54 versus 11465 of males, by the year 2001, the number of female prisoners reached

209 versus 14980 of males. However, crime in Saudi Arabia is characterized by the multiplicity of motives, methods and means leading to the crime, the change of crime pattern with time, the emergence of new types of moral crimes, the use of violence in robberies, the evolution of juvenile crime, the increasing of foreigners' participation in crime especially moral ones, and the increase of drug crimes (Abu Shama, 2007).

4. Crime and the built environment

The relation between crime and the built environment has been an area of interest since the eighties in what is known as environmental criminology which puts emphasis on contextual factors that can influence criminal activities (Brown and Altman, 1983; De1 Frate and Norberry, 1993; Cozens, 2002; Yazdanfar and Nazari, 2015). These factors include environment, time, legal framework, offender, and target or victim. The factors are identified based on the idea that criminals take into account geographic factors in deciding where and when to commit crimes (Bartol and Bartol, 2006). Many theories and applications were built on environmental criminology such as rational choice, routine activity and crime pattern. Rational choice focuses on the correlation between criminals and specific places which they consider appropriate for their crimes. Through his information about the site, the criminal identifies locations in which he can attack the target and escape with the least possibility of being caught (Shon and Barton-Bellessa, 2015). Routine activity argues that human activities (such as work, movement, entertainment and education) are in fact thematic in terms of time and location. Criminals know the daily activities which isolate people from their property in certain times and hence create opportunities for crime, likewise, routine activities resulting in crowds such as work time, shopping and entertainment (Wilcox, 2015). Crime pattern combines the two previous theories indicating that geographic distribution of crime is associated with the criminals' accommodation sites. From such sites, criminals proceed to areas which are familiar for them, known as awareness spaces. In such spaces, the routine activities of the victim take place. Criminal can thus identify the appropriate location and time for crime. Crime scene is the area where awareness spaces and areas of routine activities intersect (Malleon and Birkin, 2012).

4.1 Approaches concerned with security in residential areas

Several attempts have been made to derive criteria which can enhance security and reduce opportunities of crime and risk in housing communities. These attempts have begun and evolved supporting each other sometimes, and conflicting in others. But the fact that should not be overlooked is that none of these attempts has reached its goal, and a lot of issues are still under study, experiment and analysis. The approaches are discussed below.

Defensible Space:

Oscar Newman's 'Defensible Space' in 1972 was essentially an approach to solving the problem of designing multi-unit public housing. Four physical design elements were introduced including territoriality, natural surveillance, image and milieu. It was emphasised that apartment blocks could be redesigned so that areas in public use would be under better surveillance at all times. The theory advocates the consensus between a homogeneous group of inhabitants in a specific urban context which includes a hierarchical system of open spaces, with the maximization of private and semi-private spaces on the account of public and semi-public ones. According to the theory of defensible space, strangers are believed to be the source of danger. Defensible space, thus, adopts the separation of residents from

strangers, whether by physical or symbolic means, to protect them from crime (Newman, 1972). However, defensible space was criticized for the following reasons (Hillier, 2004):

- It focuses on public housing projects while neglecting other types of housing.
- The idea of the hierarchical spaces appeared to be affected by the urban trend prevailing in that time.
- It is likely that Newman saw hierarchical spaces as an opposite direction for the increasing liberation of modern societies which reduced communities' ability to confront crime.
- If the idea could succeed on a limited scale, it will be difficult to be replicated at the level of the city which will transfer into isolated islands.

Crime Prevention Through Environmental Design (CPTED): CPTED approach is affected by defensible space in terms that the safe community has to enjoy a sort of control on danger, personal threat and crime. The concept then linked with sustainable development with the consideration that a sustainable environment has to be safe. An unsustainable environment will deteriorate over time and hence becomes a haven for crime. CPTED relies on environmental criminology to understand crime types, locations and motives and tries to treat them through design. This principle does not identify specific solutions but connects urban configuration with social, economic, demographic and cultural factors that influence criminal motives (Katyal, 2002). Compared with defensible space, CPTED is inclusive and more relying on the community. The approach utilizes four strategies including the ownership, natural surveillance, consolidated activities, and controlled accessibility. Further, there is the sustainable maintenance and good management of spaces and activities (Ha, et. al., 2014).

People protect spaces they own where strangers can be easily determined. Natural surveillance of hot spots, where crime is heavily monitored, is believed to be an important dimension in the prevention of crime. The configuration of live urban spaces which are usually occupied by activities will thus discourage crime. Meanwhile, assigning clear functions for spaces accompanied by sustainable maintenance and management is expected to leave limited chance for crime. Therefore, the principle of CPTED is embodied in the Three-D Approach which includes "Designation" concerned with the uses and activities assigned for spaces, "Definition" concerned with the physical boundaries of spaces, and "Design" concerned with the practice of desired uses in a safe manner (Marvi and Behzadfar, 2015). However, CPTED relies on the official statistics of crime and corresponding locations in order to deal with them by design. But, inaccurate data, as a result of non-reporting, means that the picture is not real. CPTED would then introduce inappropriate alternatives (Sakip and Abdullah, 2012).

New Urbanism: The failure of defensible space in practice paved the way for an opposite approach known as New Urbanism. The approach is based on the observations of Jacobs (1961) on what is known as Safespace. New Urbanism tried to avoid the criticism of urban design for its lack of humanity, responsiveness and sensitivity. It is discussed that the built environment must provide users with the human framework which enriches the opportunities for choice, or what is called responsive spaces. Unlike defensible space, New Urbanism adopts expansion in public spaces to encourage interaction between users and strengthen the sense of affiliation, the mixture of uses to support the vitality and increase

the presence of people in the streets, encouraging pedestrian movement by utilizing grid pattern of streets, allocating buildings adjacent to streets to enhance natural surveillance, and finally increasing densities. Safespace, therefore, believes that large scale development is safer than small scale ones (Elshater, 2012).

The approach realizes its objectives within five topics including permeability, variety, legibility, robustness and personalization. Permeability considers the number of access points for places to stay in or to move through. A heavily used space is a good one, while, poorly used space is often used against the community. Physical and visual permeability are affected by public open space system. Small blocks, thus, allow a higher level of permeability and increase awareness and alternatives of movement but lead to the presence of strangers and increase the vulnerability to crime, unlike large blocks, which allow a less degree of permeability and a lower level for the presence of strangers. Variety is concerned with the diversity of uses in the space which will be reflected on the configuration, style and type of buildings, people and times of their presence. Density of pedestrian movement and the integration of uses are believed to support security in the region. Legibility confirms the relationship between public and private spaces, defines the type of users, and identifies the character and relative importance of paths. Robustness features spaces that can be utilized for more than one use or those limited to one specific use. Activates in public spaces support each other; while, assigning a specific use for a space loosens its vitality. People enjoy living spaces and frequently visit them to meet each other. Density plays an import role in the sense of security and reducing crime. Personalization identifies areas of distinctive personal character where people draw the borders for their properties that strangers are not allowed to touch (Bently et. al., 1998).

Space Syntax: Space syntax is an expanding set of analytical techniques and measures that are used to test a growing number of specialized hypotheses about the functions and effects of spatial networks. Therefore, the techniques add up to a common framework for describing how spatial environments enable or impede users' behaviours. At the same time, each specialized research inquiry (like crime prevention) is examined based on its own merits rather than as a part of an overarching theory (Hillier and Sahbaz, 2005). Crime is one of the main interests of space syntax studies that seek to find explanations for the places in which crime incidents occur, and expect places more vulnerable to crime in existing and proposed development.

Space syntax facilitated linking geographic information systems (GIS) with the reported locations and types of crime. The outcomes of research conducted with the aid of space syntax do not totally accord with defensible space, safespace nor New Urbanism ideas. The reference usually is the results of the analysis. Space syntax supports many trends of new urbanism and some suggestions of defensible space. For instance, studies prove that when cul-de-sacs interfere with streets network they become safer with regard to house theft, but excessive use of cul-de-sacs gives the opposite effect. Studies also show that in residential areas, the most integrated streets, which enjoy a higher rate of movement, are often more secure than the others (Hillier and Shu, 2000).

Space syntax enabled to study crime patterns on the city level, but with the sensitive analysis of each street segment. Where the full database of crime and its location is available, space

syntax analysis can link spatial structure of the region with social and demographic data available. The unit of analysis adopted by space syntax is the street segment between two intersections. However, understanding the relationship between urban form and crime is not limited in measuring the properties of spaces in relation with the levels of crime. The city has different types of space systems, with different levels of movement and activities which inevitably affects crime rates from one area to another (Cozens and Hillier, 2012).

4.2 Fear of crime in residential areas

Fear of crime is affected by three factors including inhabitants' characteristics, past exposure to crime and the neighbourhood conditions (Austin, et al, 2002). With regard to inhabitants' characteristics, it is argued that fear of crime is related to gender, age and socio-economic situation. Women, for instance, suffer a higher level of fear than men although men are exposed to crime at higher rates. Similarly, elderly express higher levels of fear of crime although the crime rates of the elderly are lower than those of the younger ages. While, there is a direct correlation between the level of education and the sense of security (Austin, et al, 1994). Fear of crime is higher among those who were previously exposed to crime. Being a victim, or in contact with a victim, of previous crime greatly contributes to the feeling of danger in the neighbourhood (Breetzke and Pearson, 2014). However, the quality of neighbourhood is an indication on the quality of life. Signs of urban degradation in a residential area activate the interest about fear. Fear of crime raises in areas characterized by deteriorated buildings, spread of garbage, misbehaviour of youth, darkness and narrowness (Swatt, et. al., 2013). Adjacent context has similar impact on conceiving safety. Moreover, communities of same ethnic background are found to enjoy a higher level of safety and security than heterogeneous residential areas (Lane and Meeker, 2000).

5. The case study

Data and analysis concerning Prince Fawaz project are discussed below including the urban and architectural features, crime rates and patterns, trace observation, behaviour observation, questionnaire and space syntax analysis.

5.1 Urban and architectural features of Prince Fawaz project

The project is located about 10 Km from the centre of Jeddah on Jeddah-Mecca highway which intersects with Prince Fawaz road dividing the project site into four distinctive zones A (602 units), B (200 units), C (314 units) and D (202 units) (Fig. 1). The project area is characterized by a rough topography which is penetrated by a torrent stream and a network of curved roads. Each of the four zones is divided into blocks including a number of private detached dwellings. A typical prototype consisting of two floors is replicated across the four zones of the project. The project enjoys many public services such as mosques, open spaces, shops, a sport centre and primary, middle and secondary schools. The project is dedicated to mid-income Saudi families only.

Figure (2) Location and layout of Prince Fawaz project, Jeddah



Source: Google earth, edited by the author

Figure (3) The urban configuration of Prince Fawaz project



Source: the author

Figure (4) A typical dwelling of the project



Source: the author

Figure (5) Different types of services (above) and open spaces (below) available in the project



Source: the author

5.2 Crime rates and patterns in Prince Fawaz project

Despite the difficulty of obtaining data due to security reasons, a number of statistics on crime rates and types in Prince Fawaz project during the last three years could be gained (1433, 1434 and 1435H); those are summarized in Table (1). Unfortunately, the information does not include the location of crimes. The table indicates that crimes in the project are classified into four types: money molesters, self-molesters, moral and juveniles.

Table (1) Numbers and types of crime committed in Prince Fawaz project 1433-1435H

Classification	Crime type	1433H		1434H		1435H	
		Rate	Time	Rate	Time	Rate	Time
Money molesters	Car theft	16	2 am -12 pm	27	1 am - 10 pm	22	1 am - 10 pm
	Shop theft	1	10 am - 12pm	0	8 am - 10 pm	0	8 am - 10 pm
	Home theft	5	2 am - 12 pm	13	2 am - 12 pm	10	2 am - 12 pm
	Theft	1	10 am - 4 pm	2	1 am - 8 pm	1	2 am
	Theft attempt	0	-	5	9 am - 9 pm	1	7 am
	Ravage	1	10 am - 11 pm	2	1 am	1	1 am
	Sorcery	2	8 am -10 pm	7	7 am - 11 pm	2	7 am - 11 pm
Self-molesters	Fraud	7	1 am - 10 pm	7	5 pm - 12 pm	8	5 pm - 12 pm
	Brawl	2	6 am - 11 pm	1	3 am - 10 pm	1	3 am -10 pm
	Scrimmage	8	1 am - 12 pm	11	1 am - 11 pm	3	1 am - 12 pm
Moral	Weapon possession	2	2 am - 12 pm	5	4 am - 10 pm	4	4 am - 10 pm
	Sexual offenses	5	1 am - 12 pm	7	1 am - 12 pm	4	1 am - 12 pm
Juveniles	Drinking alcohol	12	4 am - 12 pm	25	4 am - 10 pm	16	5 am - 11 pm
	Absent	1	6 am - 12 pm	3	5 pm - 12 pm	2	5 pm - 12 pm
	Embezzlement	0	-	1	11 am	1	10 am
Total		63		116		77	

Source: Figures were obtained from Prince Fawaz Police Office, classified and arranged by the author

Data in table (1) show that, during the year 1433H, the number of money molesters crimes reaches the figure 33 i.e. 52% of the total number of crimes. Car theft, with the number of 16 crimes, is the highest on the list representing 25.3% of the total crimes. Moral crimes, including sexual offenses and drinking alcohol, has reached 17 crimes, i.e. 26.9% of the number of crimes which makes them come second. Drinking alcohol topped the list of moral crimes with the number of 12 representing 19% the total crimes. The number of self-molesters crimes reaches 12 i.e. 19% of the total crimes. However, comparing the number of crimes in the project with the number of crimes in Jeddah in the same year indicates that crime in the project represents 3.7% of the total number of crimes in Jeddah which amounts 1659.

During the year 1434H, the number of reported crimes has doubled reaching 116 crimes. Again, money molesters' crimes come in the first place with a number of 63 criminal offenses, i.e. 54% of the total number of reported crimes. Car theft topped the list followed by home theft with the numbers of 27 and 13 crimes respectively. Moral crimes reached 32 crimes, i.e. 27.5% of the total number of crimes, mostly like the previous year. Although the number of self-molesters crimes rose to 17, its percentage of the total number fell to 15% of the total crimes. Comparing with the number of crimes in Jeddah which amounts 1520, the number of crimes in the project which amounts 116 crimes represents 7.6%, i.e. double of the previous year.

In the year 1435H, the number of crimes in the project declined to reach 77 crimes, i.e. 66% of the number of 1434H, and slightly exceed the record of 1433H. Still, money crimes, which amount 45, represent about 58% of the total number of crimes. Car theft topped the list followed by home theft with 22 and 10 crimes respectively. Moral crimes, reached the number of 20 representing 26% of the total crimes. While, self-molesters crimes dropped to 8 representing about 10% of the total crimes.

The above figures indicate that although the total number of crimes varies among the three years, the number of money molesters crimes is the highest followed by moral crimes and self-molesters ones. The rate of money molesters is rising (52%, 54% and 58%); and car theft is always on the top of records representing quarter of the crimes along the three years (25.3%, 23.3% and 28%). Home theft, which comes in the second place of money molesters, is alarming as its rate is increasing (7.9%, 11.2% and 13%); it is almost doubled along the three years. However, the rate of moral crime is steady along the three years (26.9%, 27% and 26%); while, the rate of self-molesters is decreasing (19%, 15% and 10%).

5.3 Trace observation

Open spaces: Most spaces are setbacks dedicated to dwellings, and accordingly surrounded by fences. But there are quite a few open spaces permeating residential units, these spaces are characterized by dereliction, so they are mostly transferred to dump areas where domestic, gardens and construction waste are dumped. However, many of these spaces are connected to both exterior and interior roads which makes them uncontrolled access points into the project site. In response, some residents have surrounded these spaces with fences, annexed them to the private gardens, or arranged them as playing areas (Fig. 6).

Parking areas: Parking areas are located in front of dwellings in the streets. Residents used to park on the sidewalks in areas they covered with shades. Most of the parking spaces are protected by iron fences, strings or chains. However, parking areas are directly overlooked from the dwelling or from the guard room (Fig. 7).

Fences: Fences are heavily utilized everywhere in the project. They are used to achieve visual privacy, so they are raised in many instances to more than six meters. In many instances, high fences isolate residents from viewing outside. Other objectives like protection and identifying properties are obviously demonstrating (Fig. 8). Even public buildings like mosques are surrounded by high fences.

Protection iron: The heavy use of protection iron is monitored in all of the dwellings on both windows, and air-conditioners (Fig. 9).

Visual obstacles: Many visual obstacles are monitored in the project such as water tanks, electric transformers, garbage containers and enclosed parking areas, which have heights that outweigh the rise of an adult person. The location of those elements and their impact on visual scopes does not follow any criteria. Moreover, trees and shrubs planted by residents to offer privacy for the dwellings enhance the visual isolation. Visual obstacles, however, create places in which the criminal can hide and surprise the victim (Fig. 10).

Figure (6) Open spaces either neglected or seized by adjacent units



Source: the author

Figure (7) Parking areas in front of the dwellings are exposed or protected by fences



Source: the author

Observations indicate, in a way or another, that inhabitants do not enjoy a satisfactory level of security. The heavy use of protection iron on windows, air-conditioners, parking areas and open spaces reflects the fact that there is a fear of theft. High fences are mostly provided to screen the dwelling and ensure the privacy of families, but, in many instances tall transparent iron fences are detected (Fig. 9) which likely to be for protection. However, utilizing protection tactics could be justified by figures of theft crimes illustrated in table (1). The deteriorated situation of the neglected open spaces seems to support that feeling of fear as argued in (4.2). The decline quality of public spaces may have negative effects ranging from dissatisfaction, abuse, abandonment or utilizing the spaces in an inappropriate use. Likewise, ambiguous or screened areas created by visual obstacles could generate similar feelings.

Figure (8) High fences are utilized to achieve privacy and protection



Source: the author

Figure (9) The intensive use of protection iron



Source: the author

Figure (10) Different types of visual obstacles



Source: the author

5.4 Behaviour observation

Behaviour observation concentrates on the type of activities that might have a direct or indirect relationship with crime or fear of crime. Some activities and behaviours among different categories of users could be recorded including:

- The scarcity of children or adults in the open spaces or streets; their presence is focused in better-off spaces utilized as gardens or playing areas.
- The presence of non-Saudi non-resident persons, especially of Asian and African ethnic groups. The majority of them work for residents as drivers, porters or servants. They used to gather on sidewalks outside the dwellings in places they prepared for this purpose.
- Some residential areas are more crowded than the others (D, A), while some areas enjoy a well socio-economic level (C, B).
- The intensity of pedestrian movement is rather low except during prayer times when some residents go to, and return from, the mosques.

5.5 Questionnaire analysis

The questionnaire contains questions concerning crime experience and security of family members in different spaces of the project during day and night including:

- Family structure, type of work, and the ownership of car and dwelling.
- Security of children while playing in different spaces of the project.
- Security of women in different spaces of the project.
- Sense of security in different spaces of the project.
- Previous exposure of family members or neighbours to crime.
- Prevailing types of crime, their places and times.
- Proposals for enhancing security.

Table (2) Number of questionnaires conducted in each zone of the project

Zone	Frequency	Percent
A	114	31.67
B	94	26.11
C	59	16.39
D	93	25.83
Total	360	100

The questionnaire outputs are argued below:

- About 49% of the respondents do not allow their children to play in outdoor spaces, while 51% of them do. Whereas, 73% of the respondents do not feel worried about their children while playing outdoors. In spite of this, only 71% of them allow their children to play in the region while 29% of them do not do so. Being worried then does not prevent families allowing their children to play outdoor, which means that they do not consider the area unsafe to the extent that requires preventing children from playing outside, while preventing children refers to reasons unrelated to security. No significant differences among the four zones of the project were detected.
- Residents consider their dwellings very safe during day and night with a median of 4.59 and 4.41 (on a scale from 1 to 5) respectively. A less degree of satisfaction was

however detected in the western clusters (C, D) during day with a median of 4.21 and 4.38 for clusters C and D, and during night with a median of 3.96 and 4.14 compared with clusters A and B that recorded a median of 4.73 and 4.78 during day and 4.43 and 4.73 during night (Fig. 11.1).

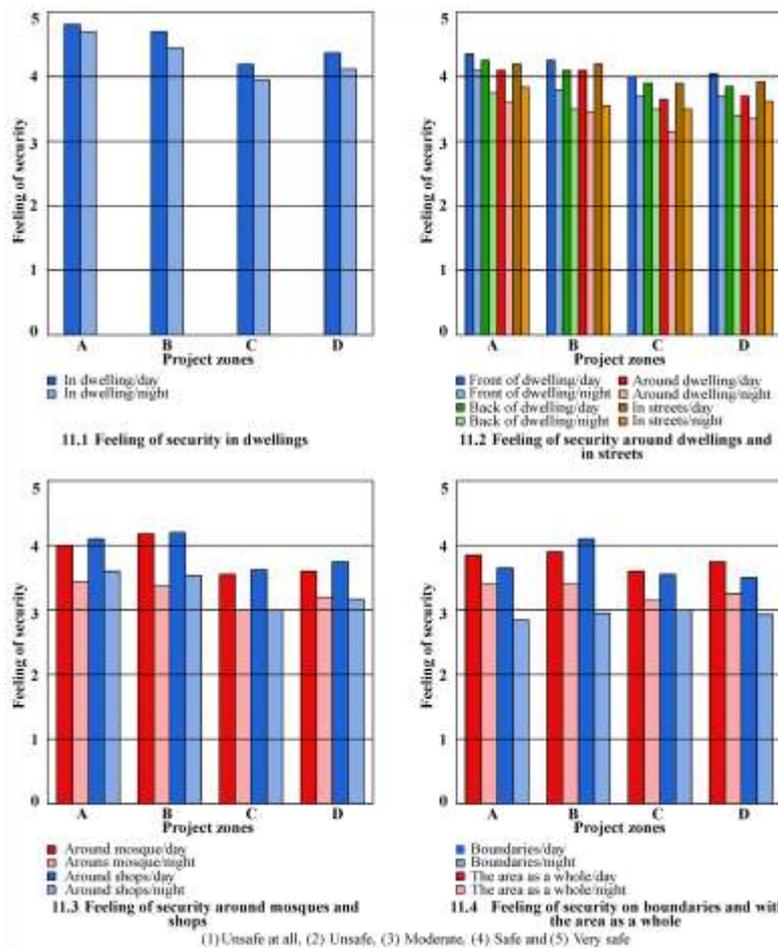
- Residents consider the main roads leading to their dwellings safe during day and night with a median of 4.08 and 3.65 respectively; likewise, frontal streets and spaces with a median of 4.19 and 3.86 respectively, and rear streets and spaces with a median of 4.03 and 3.59 respectively. With that acceptable level of satisfaction, there is no logical explanation for protection fences built around parking areas in front of dwellings unless such satisfaction was achieved after erecting these fences. Again, a less degree of satisfaction was however detected in the western zones in day compared with eastern ones with a median of 3.69 and 4.06 respectively; while no significant difference among the four zones was detected with regard to night (Fig 11.2).
- Residents consider spaces surrounding the mosque safe during day, but this satisfaction decreases during night to a neutral level with a median of 3.65 and 3.31 respectively. Different levels of satisfaction among the four zones were detected with a median of 4.06, 4.21, 3.58 and 3.75 for clusters A, B, C and D respectively. It is noticeable that the satisfaction level in spaces surrounding the mosques is less than those around the dwellings (Fig. 11.3).
- Residents evaluate the commercial area rather safe during day, but less safety to a neutral level at night with a median of 3.96 and 3.39 respectively. Again, a less level of satisfaction was detected in the western zones than the eastern ones with a median of 4.06, 3.75, 3.58 and 3.75 during day, and 3.57, 3.53, 3.0 and 3.19 3.57 during night for clusters A, B, C and D respectively (Fig. 11.3).
- Residents consider the project boundaries safe during day while neutral during night with a median of 3.7 and 2.94 respectively. Residents evaluate the eastern edges as the safer where the eastern zones A and B acquire a median of 4.07 and 3.65 while western zones C and D acquire a median of 3.56 and 3.49 (Fig. 11.4).
- In general, residents give the region a positive evaluation with regard to security without differences between the four zones achieving a mean of 3.79 during day and 3.34 during night (Fig. 11.4).
- In terms of crime rate, the questionnaire clarifies some differences between the four zones of Prince Fawaz project. Respondents indicate that zone A is the top in crime rate where 19.3% of them were exposed to crime. Zone C is in the second place (13.3%) followed by zones B and D (12.1% each). Likewise, 42.2% of the respondents of zone A heard that their neighbours were exposed to crime. While, those who heard about crime in zones D, C and B amount the ratio of 24.2%, 23.3% and 17.2% respectively (Table 3). By adding figures of both who "exposed to crime" and who "heard about crime", the aggregate number of crimes in the four zones can be monitored. Zone A is the highest (61.4%), followed by zones C and D (37.3%, 36.6%); while, zone B is the least vulnerable to crime (28.7%). The total of aggregate indicates that 42.5% of the residents either exposed to crime or heard about crime.
- However, proposals for enhancing security are limited in maintaining the neglected open spaces, and removing garbage regularly.

Table (3) Crime rate indicated by respondents in the four zones

Zone		Exposed to crime			Heard about crime			Aggregate	
		No	Yes	Total	No	Yes	Total		
Zone	A	Count	92	22	114	66	48	114	70
		% per zone	80.7%	19.3%	100%	57.8%	42.2%	100%	61.4%
	B	Count	83	11	94	78	16	94	27
		% per zone	87.9%	12.1%	100%	82.8%	17.2%	100%	28.7%
	C	Count	51	8	59	45	14	59	22
		% per zone	86.7%	13.3%	100%	76.7%	23.3%	100%	37.3%
	D	Count	82	11	93	70	23	93	34
		% per zone	87.9%	12.1%	100%	75.8%	24.2%	100%	36.6%
Total	Count	308	52	360	259	101	360	153	
	% per zone	85.6%	14.4%	100%	71.9%	28.1%	100%	42.5%	

Generally, it can be noticed that residents' evaluation for the project spaces is positive with regard to security. Medians achieved in different spaces are all surpassing the figure 3.39 except for the project boundaries at night. Residents of the eastern zones (A, B) enjoy a better off level of security than the western ones (C, D); while the commercial area and boundaries are the lowest rated. It is noticeable that while respondents listed zone A as the most exposed to crime, they evaluate it the second in terms of security! Likewise, the level of security inferred from the questionnaire is rather contradicting with the reported rates of crime and the observed tactics of protection. Such level of satisfaction could be achieved due to the precautions taken by inhabitants to protect their properties.

Figure (11) Satisfaction with security in different spaces of Prince Fawaz project



5.6 Space syntax analysis

In the present research, Prince Fawaz project is analysed with the aid of Depthmap 7.12 software. The software examines the visual relationships of the project spaces reflecting them in coloured maps according to the type of relationship. The maps produce a set of local measures (connectivity, depth, control, controllability and choice) and global measures (depth, integration, intelligibility, agreement, integration core, and entropy). Terminologies used in the research are illustrated herein and further definitions are found on Space Syntax webpage¹.

In a network of potential lines of movement, “connectivity” represents the possible paths that link any two locations. While, “integration” is a measure of closeness-centrality; it identifies the streets that minimize directional or metric distances from all possible destinations. It is a normalised measure of distance from any "a space of origin" to all others in a system. In general, it calculates how close the origin space is to all other spaces, and can be seen as the measure of relative asymmetry (or relative depth). Spaces, thus, are arranged from highly integrated (indicated with red) to highly isolated (indicated with blue). Integrated spaces are those easily accessed from everywhere of the project and vice versa. “Integration core” is a pattern made of the 10%, 25% or 50% most integrating spaces.

“Intelligibility” represents degree of correlation between connectivity and global integration values of the axial lines in spatial configuration analysis. The high correlation between connectivity and integration ensures that the spatial configuration is understandable and predictable for the pedestrian or vehicular movement. Axial intelligibility indexes the degree to which the number of immediate connections a line has is a reliable guide to the importance of that line in the system as a whole. A strong correlation, or ‘high intelligibility’, implies that the whole can be read from the parts.

“Choice” measures how likely an axial line or a street segment it is to be passed through on all shortest routes from all spaces to all other spaces in the entire system or within a predetermined distance (radius) from each segment. While, “depth” exists wherever it is necessary to go through intervening spaces to get from one space to another.

Figure (12.1) illustrates the integration map of the project. It is clear that the north-south axis is the most integrated line in the project. It is also noticeable that lines perpendicular to the north-south axis, and surrounding the four zones, have high integration values too. These lines represent the spine of the project as they connect the four zones. It can be also noticed that the spine surrounds the four zones of the project but does not penetrate any of them. This is illustrated in Figure (12.2) which represents lines that are 25% more integrated in the project (integration core). The majority of integration core lines are located on the borders of zones and a limited number of lines penetrate them. This confirms the fact that each area of the four acts as an isolated entity without any relationship with the others. Moreover, it is clear that zone A is more penetrated than other areas, which means that this area is more accessible than the others.

As measured by the software, the project as a whole is characterized by a low intelligibility value which amounts 0.042 (Fig. 13.1). This value is low compared to the average values

¹ <http://otp.spacesyntax.net/glossary/>

available in residential areas which reach up to 0.7. Intelligibility value in zone A is relatively higher than the rest of the areas reaching the figure 0.123. The high intelligibility encourages strangers to navigate through the area. The low intelligibility value refers to the clear distinction between spaces (streets) that link between regions and the internal spaces in each area.

In spite of the low intelligibility value for the project as a whole, the intelligibility value for pedestrians (diameter 3)² is high with a value of 0.71. The intelligibility value for zone A is also the highest among others with an average of 0.74, making it more accessible for outsiders.

The relationship between integration and choice expresses the degree of compatibility between residents and strangers' movement routs. The chart in Figure (14) illustrates a good relationship expressed by the regression coefficient ($R^2 = 0.421$) for the project as a whole, i.e. streets that are jointly used by both residents and strangers are not few. In addition, the chart clarifies that three out of the four zones enjoy a high regression coefficient ranging between 0.52 and 0.56, while region A has a value of 0.339 only, i.e., the agreement between residents and strangers in this region is the least. This reflects the absence of natural surveillance imposed by the co-existence of both residents and strangers, which provides the opportunity for crime. This can be one of the most important reasons for the high number of crimes concluded throughout the questionnaire in this zone compared with the others.

In the light of the foregoing discussion, the high crime rate educed in zone A can be interpreted, where many factors have led to this situation. First, the high values of both integration and intelligibility. Second, the deep penetration of the core of the integration in the region. This makes the region more accessible by strangers. Third, and most important, the weak coincidence between spaces commonly used by residents and those easily accessible by strangers. The third factor eliminates the residents' control and surveillance of strangers, which seems essential for the security of residential areas.

² The local measure proximity diameter 3 looks at the intelligibility of the 3 closest axial lines from the starting axial line; a distance which is appropriate for walking. A high (diameter 3) intelligibility implies that a line segment and the 3 closest axial lines are important for pedestrian movement through the system; or that the area can be conceived from these parts.

Figure (13) Intelligibility values of the project

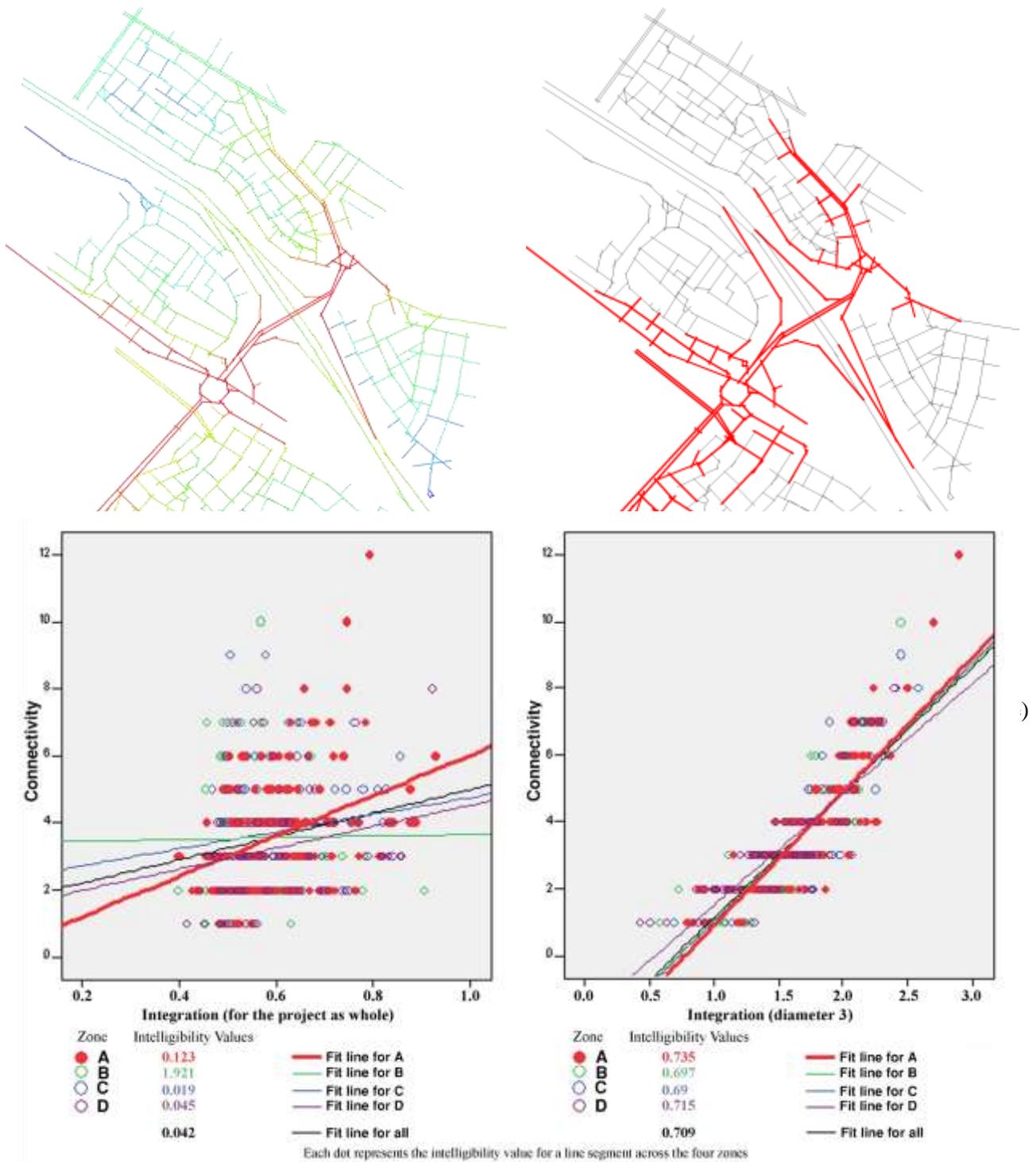
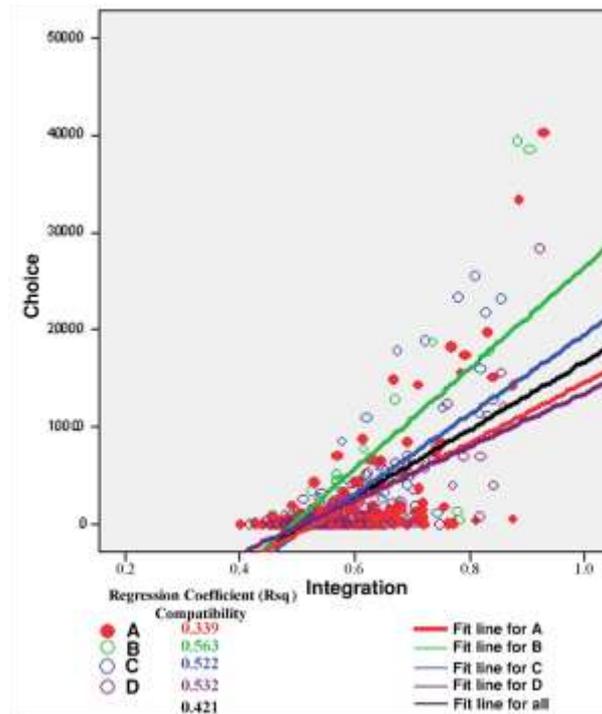


Figure (14) Compatibility between residents and strangers in the four sectors

5.7 Conclusion and discussion

On the theoretical level, the case study indicates that none of the approaches concerned with enhancing security and alleviating crime in residential areas reached up to completion. But, each approach has some aspects that proved to have impact. In compliance with defensible space and CPTED, Prince Fawaz project clarifies that the unidentified uncontrolled open spaces turned into undesirable areas that raise the residents' fear. While defensible space claims that strangers are the source of danger, the case study proves that streets in which residents and strangers' movement matches enjoy a higher level of security. This agrees with New Urbanism and Space Syntax studies.

Therefore, it is recommended to enclose the semi-private open spaces that have direct contact with the peripheral roads; a process which some residents began to do by their own. Because they are unsupervised, such spaces provide uncontrolled access points to the project resulting in a threat for the residents. Meanwhile, spaces of public use like those around shops and mosques which residents of Prince Fawaz project reported as less secure would need allocating activities that brings life to such spaces along the day like youth gathering areas. It is equally important to allocate open spaces to specific entities that would be able to maintain them. As extracted from the questionnaire, organized and clean spaces reflect a sense of security among residents and provide inappropriate environment for criminals. Removing visual obstacles, like water tanks and garbage containers, opens fields of vision offering a better environment for the surveillance of spaces.

Zone A, the highest in crime rate according to the questionnaire, is the most crowded according to behaviour observation and the most accessible and penetrated by through

movement according to space syntax analysis. But, the agreement between residents and strangers movement is the least. The case study emphasizes that the strangers' presence or movement through the residential area has limited influence on crime when they are accompanied by residents. On contrary, the absence of residents provides opportunity for crime in spaces mostly accessed by strangers. It is recommended, thus, to reformulate movement routes by utilizing natural gates that prevent strangers accessing undesirable paths while driving them to spines used by residents. Integration core, the 25% more integrated paths, could be re-allocated to go through each zone passing by the commercial area and mosques. This is expected to enhance intelligibility across the project and its zones encouraging movement on carefully selected spines which are compatible with residents' movement. The rest of areas will turn into controlled private and semi-private entities in which strangers can easily be noticed. The high rate of car and home theft crimes is believed to drop in such case.

Residents' interference by different protection tactics that enhance security is an interesting scope of research. This might justify the level of satisfaction achieved in the project, and zone A in particular, despite the high crime rate. These tactics need to be studied, examined and naturally developed to be provided in similar projects. It is evident that the urban design of affordable housing plays a role in enhancing or eliminating security. Still, more research needs to be done to understand this relationship. Defining locations and times of crimes can dramatically help understanding the impact of urban form on different types of crime especially with the elaboration of the analytical tools like space syntax. A comparative analysis of similar projects can help refining the results.

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