

Impact of In-between Spaces on Residential Environment Quality A Case Study on Public Housing in Kerman*

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ABSTRACT:

Decreasing qualitative aspects of residential environments is a real problem in recent public housing of Kerman. This article is concentrated on surveying the impact of in-between spaces on residential environments quality (REQ), to evaluate different kinds of it and to determine interrelation of two main components: residents' individual characteristics and characteristics of in-between spaces. Levels of in-between spaces include empirical-aesthetic, performance and environmental characteristics to determine degrees of residents' satisfaction (RSAT). Eighteen selected components of in-between spaces quality (ISQ) assess the RSAT degrees in three residential environments of Kerman. Needed data obtained from structured interviews with residents and observation checklists. A direct relationship found between RSAT and ISQ in all three surveyed residential environments. The REQ index is highly and positively correlated with satisfaction of the three levels of in-between spaces and residents' individual characteristics such as ownership and residential period.

Key words: residential environment quality; in-between spaces; residential satisfaction; public housing

INTRODUCTION

Due to the reasons: increasing population growth and their great demand for public housing in Kerman, rapid housing construction problems arose. Therefore, REQ that is the most essential consideration in the residential environments neglected. Now, "the concept of quality has been taken into consideration in high-standard housing, especially in term of: (i) building material used; (ii) development of the surrounding environment (design and services) and (iii) in some applications, provision of kitchen and bathroom electrical equipment" (Ozsoy et al., 1996). Nevertheless, in low-cost public housings, the above cited indexes considered as quality standards in housing and residential environment spaces. Making decisions based on that attitude about current residential environments leads to high range of residents' dissatisfaction. As a result, evaluation of REQ provides the necessary information required for 'feed-back' to apply in current housing and a 'feed-forward' for future projects (Preiser, 1989).

Studies (Francescato et al., 1989, Jagun et al., 1990 and Arangones et al., 2002) show that users' satisfaction is a criterion with broad range of application to assess quality in all types of residential environments.

"For years, architecture has focused on the full – the edificial, the erected. Today, both terms – empty and full – can be combined articulately in more complex structures relating to positive-negative (empty-full) sequences that, well-designed on all scales" (Gausa et al., 2003). In-between spaces including full-empty sequences from the most outer toward the most indoor spaces can improve quality of outdoor spaces in residential environments. Nevertheless, there are not enough studies focused on the relationship between REQ and ISQ.

Therefore, this study attempts to fill this gap by conducting and surveying on ISQ and RSAT to reach four purposes:

1. To assess the most important quality factors that clarifies differences of REQ in those three residential environments.
2. To survey RSAT in those residential environments and assessing REQ in the residential environments.
3. To assess the impact of ISQ on REQ.
4. To determine interrelation of the two main components:

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residents' individual characteristics and characteristics of the levels of in-between spaces.

Approach to Quality Assessment in Residential Environment

Several researchers (e.g. V. Ok) recognized that the concept of building quality depends on performance in building industry. In terms of spatial-physical, measurable standards called performance criteria

(Ok, 1993). But there exists some definitions related to quality that are different and defined on the basis of various characteristics of the things such as:

1. Distinguishing characteristics (property, attribute, feature and trait).
2. Inherent characteristics that are peculiar and essential (nature, kind, sort and type).
3. Interactive characteristics that are emerged in interaction with the others (the properties that depend on quantitative features).
4. Conditional characteristics that related to the other conditions (like determinant standards, user's needs and expectations and specified performance).
5. Relative characteristics that show the degree of superiority in the kind (excellence, status, position and grade).

In the last three above mentioned, this survey shows that the quality is defined as the basic characteristics that related to measurable and comparable factors such as determinant standards, user's expectations and specified performance. These are interactive to quantify features and specify the degree of superiority in the kind of any things and this construes an approach towards specify quality. The acceptable studies have been approached from three main perspectives: recognizing satisfaction as an attitude (Francescato et al., 1989); call it "purposive approach" that is measuring degrees of environment facilitates or restrictions that supply users' goal (Canter and Ress, 1982; Oseland, 1990); and call satisfaction as "aspiration-gap approach" that is conceptualizes residential satisfaction as measuring the gap between users' actual and desired/aspired needs (Galster, 1987). "The implication of the purposive approach is that researchers emphasize on goals or associated activities in relation to the attributes of the physical environment. The purposive approach

which is rooted in a cognitive view is useful. Because it enables researchers to understand the degree to which different facets and roles of users contribute to their satisfaction. However people are not only goal oriented but they have effective relations with the environment too" (Amole, 2009). On the other hand "residential satisfaction defined as the feeling of contentment when one has or achieves what one needs or desires in a house" (Djebuarni and Al-Abed, 2000). The residents' needs and aspirations usually make a basis for their judgments about the conditions of residential environment. In addition, residents' satisfaction of residential environment conditions implies a high degree of congruence between actual conditions and residents' desired situations. Moreover, evaluations of REQ involve comparisons between what the residents have and what they would like to have. According to the viewpoints of (Weidmann & Anderson (1985) and Galster (1987), this is the premise on which the "aspiration-gap" approach is based and the more common conceptual frameworks of residential satisfaction.

In this study, the concept of quality is considerable in residential environment field; therefore, the quality of residential environment can be evaluated with regard to user's satisfaction of that environment and the term quality is regarded as "obtaining a high level of customer satisfaction" (Kano et al., 1984). Users' satisfaction is also defined as a gap between user's actual and aspired needs and expectations. Also, the quality assessment is on the basis of indicators specifying degrees of residential satisfaction through in-between spaces.

Presentation of In-between Spaces in Residential Environment

"The between is a space permanently on the run: a place in itself, a limit made fringe. Moreover, it is a conquering between two belligerent territories: Strange, infiltrated, camouflaged, between is not necessarily a residual space like the void between two volumes, but rather in complex geometries, it may be a substantial place; the place where the geometry "inhales and exhales"; a place of synchronic ambiguities. Of interest is, in fact, this "gasket" capacity of the interstitial void implicit in these irregular configurations. This possible rhythm among the occupied, the

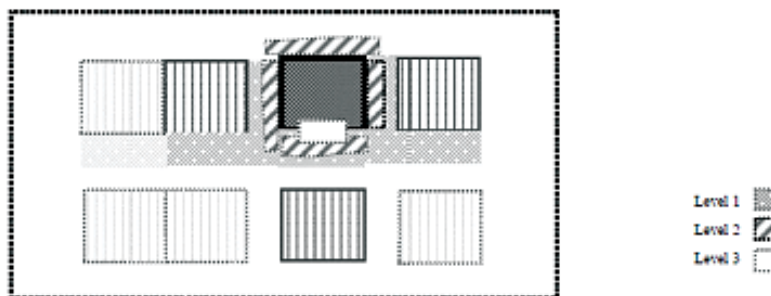


Fig.1: Levels of in-between spaces in a sequence from outer spaces in residential environment toward inner ones of a block

omitted and the linked: fills, voids and links or articulations, that is to say, surfaces, points and lines that interrupt spatial sequences and combinations. The void, thus, does not separate but joins" (Gausa et al., 2003). Thus, the in-between spaces in residential environment are the empty-full sequences from the most outer toward the most inner spaces in an environment (Fig.1).

It defines three levels of in-between spaces that are between outer and inner territories of blocks in residential environment: the outer confine is between blocks and the inner confine is between inside and outside of a block. The three levels are:

1. Spaces in inner confine of a residential environment between one block and adjacent blocks.
2. Spaces in inner confine of residential environment between a block and its outer confine.
3. Entrance of one block that is emplaces between its outer confine in residential environment and its inner confine inside the block.

Indicators of ISQ

These levels include fifteen indicators used to evaluate residents' satisfaction of indicators; the indicators determined based on the research literature and then the results assessed again by architectures of residential environments. Previous researches indicate the effects of different variables as determinants of residential satisfaction or dissatisfaction such as housing type, neighborhood facilities, structure type, building features, housing condition and management (Ukoha and Beamish, 1997); dwelling units and environmental facilities (Savasdisara et al., 1989); neighborhood, particularity with privacy (Djebuarni and Al-Abed, 2000); and neighborhood factors (Salleh, 2008). Therefore, further researches required a general theory of residential

satisfaction and then residential satisfaction conceptualized as a multidimensional structure. On the other hand, there are various attributes of housing that residents' satisfaction can be assessed by. Francescato et al., (1989) explained satisfaction as multidimensional structure with effective, cognitive, and behavioral dimensions. Lu (1999) conceptualized residential satisfaction as a complex structure including environmental characteristics and individuals' socio-demographic variables.

Amole (2009) reported that the literature which is related to the residents' satisfaction also has been categorized as social-psychological, managerial-organizational and physical attributes. Users' satisfaction has been studied in terms of two dimensions of built environment like spatial, psycho-social, qualified and performed characteristics (Ozsoy et al., 1996), also the residential satisfaction conceptualized as influenced by objective and subjective measurements of housing attributes and community life (Marans, 2003).

In this research, levels of in-between spaces evaluated regarding residents' satisfaction of the environments. The term quality means obtaining a high level of residents' satisfaction which is related

to degree that physical characteristics and properties of environment satisfy residents' needs and expectation. Residents' satisfaction studied in terms of three dimensions of residential environment;

Empirical-aesthetics, performance and environmental characteristics that applied to evaluate ISQ. Whereas factors of ISQ impact on REQ they depend on residents' satisfaction. Thus, characteristics of levels of in-between spaces used as indicators to evaluate REQ. These

Table 1: Selected indicators to assess environment quality

Indicators	Studies
Privacy/ Enclosure	CABE & DETR (2000), Chapman (1996), Trancik (1986)
Sentiments of calmness	PPS (2001)
Sentiments of attachment	Southworth (1989), Tibbalds (1990)
Variety/ Visual Pleasure	Nelessen (1994), Houghton & Hunter (1994), LPAC (1993), Goodey (1993), ODPM (2004), Bentley et al. (1985), Greene (1992)
Local identity	CABE & DETR (2000), Punter & Carmona (1997), University of Sydney (1996), PMUDTF (1994), Tibbalds (1990), Violich (1983)
Ownership	DETR (1999), DOE (1993)
Identity	ODPM (2004), Southworth (1989), Greene (1992), LPAC (1993), DOE (1993), DETR(1999), CABE & DETR (2000), Jacobs & Appleyard (1987)
Flexibility	CABE & DETR (2000), Houghton & Hunter (1994), PMUDTF (1994), Goodey (1993), Tibbalds (1990), ODPM (2004), Bentley et al. (1985)
Equity/ Performance Justice	Lynch (1993), ODPM (2004), Jacobs & Appleyard (1987), Tibbalds (1990), PMUDTF (1994), University of Sydney (1996), CABE & DETR (2000)
Personalization	Bentley et al. (1985), Goodey (1993)
Using of new materials	PMUDTF (1994)
Cleanliness	LPAC (1993), ODPM (2004)
Climatic comfort	Lynch (1993), Bentley (1990), Tibbalds (1990), Greene (1992), LPAC (1993), Punter & Carmona (1997)
Greenery/ landscape	CABE & DETR (2000), PMUDTF (1994)

levels include fourteen indicators used to evaluate residents' satisfaction of the indicators themselves. The Indicators which are specified based on the research literature are shown in Table 1.

Quality Assessment Model

Quality Assessment Model (QAM) is a criterion to assess ISQ through empirical-aesthetics, performance and environmental characteristics. So, the QAM structured by the above three characteristics and the indicators categorized in them (Fig.2.). Consequences categorized on the basis of levels of in-between spaces and then assessed again by twenty architectures. Categorized quality indicators (Fig.2.) are a basis for QAM. Since REQ is to obtain a high level of residents' satisfaction based

on degree the ISQ satisfies RSAT (Fig.3.), QAM is based on the following two levels:

1. Residents' individual characteristics.
2. Characteristics of in-between spaces in residential environments.

MATERIALS AND METHODS

Description of the studied sample

Recent increasing growth of population in Kerman caused an increase in construction of organizational housing. On this basis, the research samples selected the same as above housing type. In the first stage of applying a multi-stage sampling technique, three residential environments (Mes Bahonar, Mes Sarcheshme and Jahad Keshavarzi) selected from Havanirooz, Elahiye and

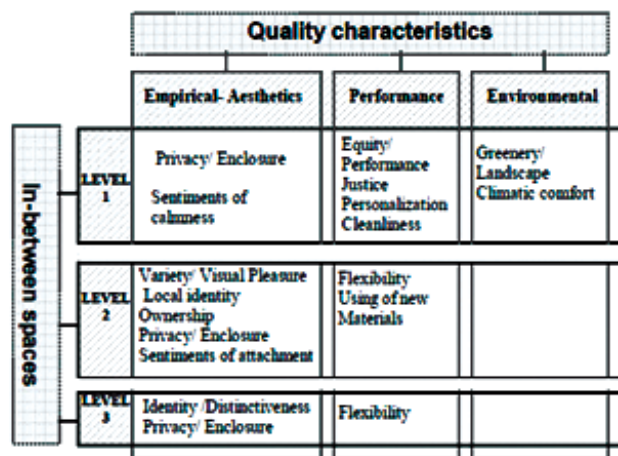


Fig.2: Quality characteristics in three levels of in-between spaces

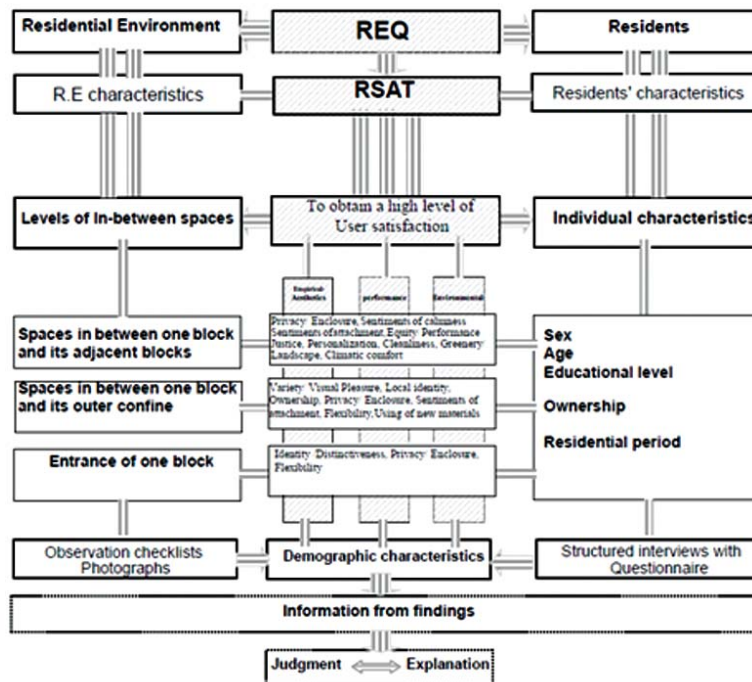


Fig. 3: Quality assessment model (QAM) in residential environments

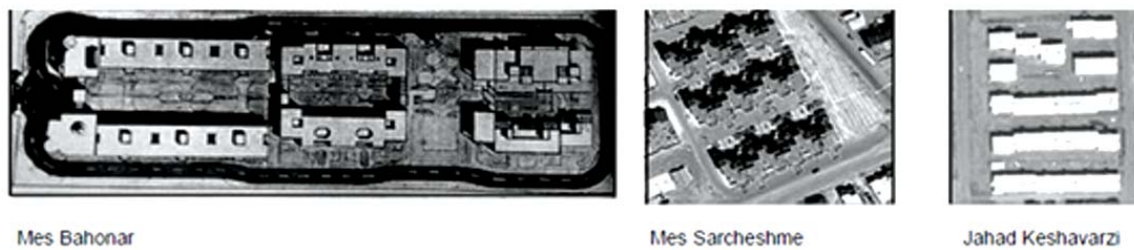


Fig. 4: Layout of housing area of the three samples and their in-between spaces characteristics

Motahary towns respectively. These environments selected due to their different designing in three levels of in-between spaces. Fig. 4. shows plan layouts of the selected samples based on their in-between spaces.

Data collection

Data collection through observation checklists and interview with residents used to evaluate in-between spaces in each samples. Two data series obtained: residents' perception, collected by interview and the observation of physical spaces in the environments such as landscape elements, facade of blocks, residential spaces, entrances of the blocks that recorded by means of observation checklists and photographs. Three levels of in-between spaces in inner confine between inside and outside of a block surveyed by a 23-question of cluster questionnaire to obtain data that show the degree of RSAT from indicators of in-between spaces. The questionnaire which was also the base of interviews, divided into two sections:

1. Individual characteristics: Sex, Age, Educational level, Ownership and Residential period.
2. Three levels of in-between spaces: empirical-aesthetics, performance and environmental characteristics.

Residents' interviews

In the second stage of the technique, simple random sampling used to select residents from each residential environment. Interviews implemented with the active residents presenting in in-between spaces. 112 residents including 31, 39 and 42 residents from Mes Bahonar, Mes Sarcheshme and Jahad Keshavarzi respectively interviewed randomly in this stage. The interviews implemented during Aug. 15 to Sep. 25 of 2010.

Data transformation

Obtained data analyzed by SPSS v.16 software. The results used as comparative evaluation of REQ based on ISQ impact on RSAT in the three selected residential environments. Data analyzed by SPSS and results from observation checklists both used to judge the impact of ISQ on REQ.

Results and Discussion

Finding out from the evaluation

On the basis of QAM, the comparative evaluation of the three selected environments studied according to two main groups of characteristics: residents' individual characteristics and characteristics of in-between spaces.

Analysis of relationship between REQ and residents' individual characteristics

The residents' individual characteristics in the present study are including sex, age, educational level, ownership and residential period. Male/Female distribution variance of residents in each housing area was 9.6% in Mes Bahonar and Jahad Keshavarzi and 7.6% in Mes Sarcheshme. Number of residents interviewed mostly between 30-50, between 18-29 and over 50 years old respectively. Most of them were undergraduate. 87.1%, 59.5% and 46.2% of residents were owner in Mes Bahonar, Jahad Keshavarzi and Mes Sarcheshme respectively. A large percentage of residents in Mes Bahonar, Jahad Keshavarzi and

Mes Sarcheshme (74.2%, 57.1% and 43.1% respectively) lived there for more than 3 years. Relationship between residents' individual characteristics and ISQ showed in (Table 2.).

Pearson's correlation coefficient (r) between RSAT and residents' individual characteristics shows that RSAT index positively correlated with ownership and residential period. In the three surveyed residential environments (SRE), living period in residential environment is a determinant of RSAT. In addition to living period, ownership was also a determinant of RSAT. Moreover, owners in the three SRE were more satisfied than tenants, because increase in rent leads to increase in residents' expectations and decrease in RSAT. Also, decrease in ISQ leads to decrease in RSAT too.

Analysis of relationship between REQ and in-between spaces characteristics

Table 3 shows the relationship between REQ and in-between spaces characteristics.

Pearson's correlation coefficient (r) between feature of the spaces between a block and its adjacent blocks and REQ shows REQ index positively correlated with (F1), (F4), (F6), (F2), (F3), (F5), (F8), and (F7). The other level includes spaces between a block and its outer confine; this shows REQ positively correlated with (F9), (F13), (F14), (F10), (F11) and (F15). (F12) has a lower positive correlation with REQ. the last level contains entrance of

Table 2: Pearson's correlation coefficient (r) matrix between ISQ and residents individual characteristics

	Individual characteristics				
	Sex	Age	Educational level	Ownership	Residential period
ISQ					
Pearson	-.088	-.149	-.056	-.234**	.165*
Significance	.179	.059	.297	.007	.041
N of Valid Case	112	112	112	112	112

*Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

a block that is emplaces between its outer confine in residential environment and its inner confine inside the block; thus, (F16), (F18), and (F17) also positively correlated with REQ. All the above rows of ISQ features ordered based on their correlation with REQ.

Analysis of relationship between REQ and ISQ

Pearson's correlation coefficient (r) between REQ and ISQ shows that REQ index positively correlated with RSAT of the three levels of in-between spaces. Quality of the three levels of in-between spaces

(1, 2 and 3) positively correlated with REQ from highest to lowest degree respectively. The reason is the more capacity of in-between spaces in level 1 and 2 for more various outdoor activities such as individual activities and social interactions.

Several Analyses were conducted to determine the importance of ISQ. Table 3 delineates the relationship between REQ as dependent variable and the eighteen factors of ISQ as independent variables. This relationship applied in all three SRE. It seems to be a direct relationship between REQ and ISQ in the three SRE when the REQ-ISQ relationship evaluated by RSAT. The results show that RSAT degree was equal in the three SRE because their characteristics of in-between spaces were different from each other. Maximum and minimum RSAT of in-between spaces among SRE1, SRE2 and SRE3:

Level 3: (SRE1, 84.9%); (SRE2, 74.3%) and (SRE3, 37.3%).
Level 1: (SRE1, 69%); (SRE2, 66%) and (SRE3, 35.7%).

In addition, All levels of in-between spaces in SRE1 were more detailed and therefore RSAT were more in SRE1 than the other two (70.9%) but in SRE3 all levels of in-between spaces were less detailed and so the RSAT were lower in SRE3 than another one (33.7%). Therefore in all SRE increase in ISQ implied increase in REQ.

Analysis of the gap between REQ and RSAT

RSAT of in-between spaces shown in Table 4.

The performance characteristics including flexibility (F18) of the block entrance in all SRE and using new materials (F15) at the elevation between a block and its outer confine in SRE1 causes more dissatisfaction. Residents dissatisfy more with the empirical-aesthetics characteristics as sentiment of attachment (F14) to spaces between a block, its outer confine and its adjacent blocks (F6) in all SRE. The environmental characteristics including greenery (F1) in spaces between a block and its adjacent blocks in SRE3, and climatic comfort of those spaces in SRE2 and SRE3 caused more dissatisfaction.

A direct relationship found between RSAT and ISQ in all three SRE. The three SRE are different from the viewpoint of characteristics of in-between spaces and all residents' satisfaction of them is not equal too. This study shows that increase in ISQ implies increase in REQ. The REQ index positively correlated with satisfaction of the three levels of in-between spaces. Comparing quality of levels of in-between spaces in the three SRE presented in Fig. 5.

Table 3: Pearson's correlation coefficient (r) matrix between REQ and in-between spaces characteristics

	In-between spaces characteristics																					
	F1	F2	F3	F4	F5	F6	F7	F8	Level1	F9	F10	F11	F12	F13	F14	F15	Level2	F16	F17	F18	Level3	
REQ																						
Pearson	.683**	.536**	.509**	.596**	.482**	.547**	.385**	.398**	.923**	.672**	.521**	.490**	.239**	.652**	.628**	.401**	.914**	.681**	.507**	.566**	.797**	
Significance	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.005	.000	.000	.000	.000	.000	.000	.000	.000	

** Correlation is significant at the 0.01 level

F1: Greenery/ Landscape, F2: Climatic comfort, F3: Privacy/ Enclosure, F4: Sentiments of calmness, F5: Equity/ Performance Justice, F6: Sentiments of attachment, F7: Personalization, F8: Cleanliness, F9: Variety/ Visual Pleasure, F10: Local identity, F11: Flexibility, F12: Ownership, F13: Privacy/ Enclosure, F14: Sentiments of attachment, F15: Using of new materials, F16: Identity/ Distinctiveness, F17: Privacy/ Enclosure. F18: Flexibility.

Table 4: RSAT of in-between spaces (f%)

RSAT (f%)	In-between spaces characteristics																	
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18
	Level 1						Level 2						Level 3					
Mes Bahonar (SRE1) (n=31)	74.2	67.7	74.2	83.9	93.5	41.9	61.3	51.6	71	71	38.7	67.7	87.1	58.1	22.6	87.1	87.1	80.6
Mes Sarcheshme (SRE2) (n=39)	71.8	51.3	71.8	89.7	87	66.7	48.7	59	87.2	59	66.7	87.2	84.6	56.4	61.5	84.6	79.5	59
Jahad Keshavarzy (SRE3) (n=42)	14.3	14.3	47.6	57.1	54.8	23.8	35.7	38.1	26.2	19	19	69	33.3	9.5	21.4	35.7	50	26.2

F1: Greenery/ Landscape, F2: Climatic comfort, F3: Privacy/ Enclosure, F4: Sentiments of calmness, F5: Equity/ Performance Justice, F6: Sentiments of attachment, F7: Personalization, F8: Cleanliness, F9: Variety/ Visual Pleasure, F10: Local identity, F11: Flexibility, F12: Ownership, F13: Privacy/ Enclosure, F14: Sentiments of attachment, F15: Using of new materials, F16: Identity/ Distinctiveness, F17: Privacy/ Enclosure, F18: Flexibility.

1. Surveyed Residential Environment (SRE)

CONCLUSION

Assessing the impact of ISQ on REQ mainly concerned in this paper because the ISQ assessment indicators determined with RSAT. Residential environment are more effective than spaces emplaced between outer confine in residential environment, inner confine inside a block and entrance of the block. Increase in spatial capacities of in-between spaces for more various outdoor activities as individual activities and social interactions through increasing RSAT implies increase in REQ. The sequence of most important qualified determinants of spaces between a block and its adjacent blocks are such as greenery in landscape, sentiments of calmness, sentiments of attachment, climatic comfort, privacy by enclosure, equity and performance justice, cleanliness and personalization. Likewise, in the other level the sequence of determinants in spaces between a block and its outer confine are such as visual pleasure by variety, privacy by enclosure, sentiments of attachment, local identity, flexibility, using new materials and ownership. In the last level, the sequence of determinants in the block entrance is such as identity with distinctiveness, flexibility and privacy by enclosure. The environmental characteristics including greenery in spaces between a block and its adjacent blocks in SRE3 and climatic comfort of those spaces in SRE2 and SRE3 caused more

dissatisfaction.

RSAT index is positively correlated with residents' individual characteristics as ownership and residential period. Finally it's concluded that there is a direct relationship between REQ and ISQ and increase in ISQ implies an increase in residential environments quality. RSAT can be maximized by the following design principles:

- 1) In residential environments both terms empty and full spaces should be combined articulately in more complex spatial structure that well-designed on spaces between a block and its adjacent blocks, spaces between a block, its outer confine and entrance of the block.
- 2) An in-between space should entail different performance, empirical-aesthetics and environmental characteristics.
- 3) In the level of adjacent blocks, different activity areas with flexibility for variety in planned in-between spaces and performance justice with personalization impacts on RSAT.
- 4) In-between spaces in adjacent blocks should be planned to meet the residents' satisfactory environmental conditions (greenery in landscape and climatic comfort).
- 5) The layout of levels of in-between spaces should be created to

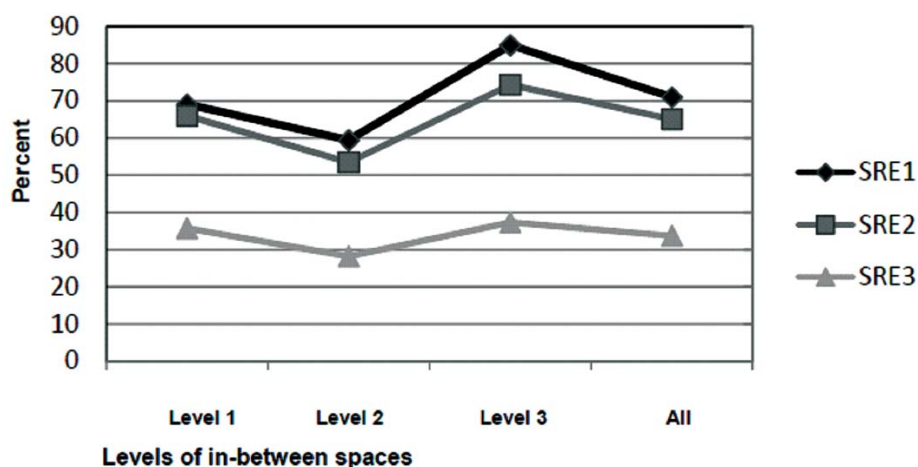


Fig. 5: Residents satisfaction of in-between spaces in the surveyed residential environments (SRE)

supply different levels of privacy by enclosure.

6) The spaces and surfaces between a block and its outer confine should be planned to meet local identity and visual pleasure by variety and using new materials.

7) The entrance of block as one of in-between spaces should be created to supply identity with distinctiveness, flexibility for various usage and privacy by enclosure.

8) The levels of in-between spaces should be planned to meet residents' sentiments of attachment.

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