

Evaluation of user satisfaction concerning Spatial organization in public open space

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ABSTRACT--The research paper examines the level of users satisfaction regarding spatial organization in Indian public open space. Moreover, for comprehensive investigation, it also seeks to explore the difference in responses between gender and age group. The methodology of research includes quantitative method with questionnaire-based survey, evaluate by using 'Likert scale' ranging from 1 to 5 i.e. from 'strongly disagree' to 'strongly agree'. The three public open spaces of New Delhi have been selected as a case study. The output of the study is validated through univariate statistical tools including mean and standard deviation, whereas for analyzing difference in responses between male and female, different age group, T-test and one-way ANOVA has been performed, respectively. The finding contributes to determine the outlook of user's satisfaction for present spatial organization of Public open space. Further, the study concludes that the user's response is between unsatisfied to neutral which implies that spatial organization in Indian public open space needs improvement as per users necessity.

Keywords--User Satisfaction, Spatial Organization, Indian public open space, Indian context

I. INTRODUCTION

Woolley (2003) interpreted public open space as an essential attribute of urban environment which serves to user living in cities to enjoy public life. Hernandez-Garcia (2013) elucidated that public open space provide opportunities and welfares in different ways which uplifts the quality of life in urban areas. Garau (2016) identifies that design and organization of spaces of public open space elucidate the purpose of the public space. While, Kaplan and Kaplan (1989) mentioned spatial organization as an intrinsic part of public open space. Thus, the augmentation of study suggests that public open space requires more concentration towards space organization and design, which should be in interrelation of the city context and mutate according to the users need. However, Stephen et al. (1992) states that human needs are linked with a user satisfaction in public open space. Adding to this, Fichter (2013) delineated that spatial organization develops sense of belonging which depends upon the culture and users need which eventually affects the user satisfaction and makes public open space effectual.

On the other hand, Indian cities has witnessed a massive change due to globalisation in last two decades. Perhaps, one of the major reasons to shifts the concentration of designers and planners from providing quality of life in cities to transit oriented development. The present state of Indian cities represents that idea of making effective cities has been shifted from enriching public life by providing quality of pedestrianised area, public space to the easement for cars. This eventually, declining the quality of public open space. Bhatia (2015)

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described, Indian Public open space majorly lacks in spatial organization and uses and activities which eventually abstains the social sustainability and makes public open space ineffectual. Thus, the hypothesis of the research is that the spatial organization of public open space is unable to meet the required needs of the users, therefore, users feel unsatisfied in Public open space.

To facilitate the effectiveness of public open space, it is essential to evaluate the experiences and challenges users encounter every time while visiting Public open space, which affect their expectations. Therefore, this research paper is going to evaluate the user satisfaction of spatial organization in Indian public open space. Further, the focus of the study involves, how users of different gender and age group, their satisfaction level differs, while experiencing the public open space. Consequently, the outcomes of the study contribute in uplifting the experience of user's public open space and enhances quality of public life.

II. LITERATURE REVIEW

2.1 User satisfaction

Lindgaard (2007) defined user satisfaction administer by 'attitude' and 'comfort'. Moreover, Lindgaard (2007) explains that first impression of an any object or place, imprints either positive or negative impact, which further through amount of attention develops the judgment on users mind and called user satisfaction. In other words, user satisfaction is an affirmation of user statement or experience. If the designed space able to deliver the products and services which is as per the expectations of user, in that case users feel satisfied (Oliver, 1996), whereas users feel unsatisfied if product is below their desired expectation (Fletcher & Fletcher, 2003). In terms of place, Stedman (2002) delineated user satisfaction as a multidimensional and brief finding about the identified quality of a place. While, mainly level of satisfaction in a place is guided by varied factors like physical factors, activities and

microclimate (Whyte, 1980). Ozkan.et al. (2015) conclude that, a high association amidst space performance and space usage level with user satisfaction. High performance in space which fulfils users need helps in attaining user satisfaction, however low performance of space degrades the level of users satisfaction (Özkan et al., 2015).Furtherr, Aydin and Uysal (2009) high space performance demonstrate the space quality which eventually enhances the user satisfaction in a place. Adding to this, (Özkan, 2011) specifies that the performance of a place determining the user satisfaction which includes technical, functional and aesthetic performance.

2.2 Spatial organization in public open space

According to Nezhad et al. (2003), spatial organization comprise arrangement and design of spaces in order to attain few characteristics like order, sequence and position of spaces which eventually establish an association between elements. Moreover, Nezhad et al. (2003), asserts that every organization has a divergent impact on semantic relationships between spaces. Every space requires disparate semantic relationship as well as spatial organization since every place possess contrasting context and cultures. Torabi and Brahman (2013) declared spatial organization as an imminent component for defining the identity of architecture of a place. Besides this, Torabi and Brahman (2013) argue a strong connection between architecture spaces and the culture of a place.

While, Goffman (1963), reported a strong relationship between spatial organization and people's behaviour as well as on their level of interaction in public open space. In addition, Fichter (2013) delineated that every individual/group have a divergent standpoint on experiencing public open space, therefore, spatial organization should be such that user could be able to connect with space and develops sense of belonging. Huang (2010) asserts that facilities when meets the users need in public open space, helps in uplifting the user satisfaction.

Further, Melik (2008), defined that, spatial organization and design of space in an association of the social life of place creates effective public open space. Several research defined attributes of spatial organization while, Shafique and Majid (2020) elucidated access and linkages, uses and activities, facilities and comfort as a vital elements of spatial organization in Indian public open space as well as, all the four factors are highly correlated with each other. According to Carmona. et al.(2008), the quality and spatial organization of urban elements have immense impact on the quality of public open space. Adding to this, Whyte (1980) considers that better spatial organization captivates users for longer time which includes attractive installation of urban elements, access and activities.

2.3 User satisfaction and Spatial organization in public open space

According to Stephen et al. (1992), user satisfaction in public open space magnetised by human social needs, which predominantly includes comfort and security. However, Fichter (2013) commended that users should connect with the spatial organization by developing a sense of belonging as every individual/group have their own outlook of observing a public space. Moreover, due to distinctive culture, user's satisfaction level changes according to the spatial organization of place. Further, Fletcher and Fletcher (2003) delineated users satisfaction as one the vital indicator to access the effectiveness of public open space. In public open space, user satisfaction depends on varied situational attributes comprises resource, social and management settings which should be in association of intangible factors of public open space like socio-economic characteristics, cultural qualities, attitudes and preferences of users (Fletcher & Fletcher, 2003).

In parks settings, satisfaction is influenced by various situational variables including resource settings, social settings and management settings, and these influences are further mediated by the subjective evaluations of individual visitors according to their socioeconomic characteristics, cultural characteristics, experience, norms, attitudes and preferences (Fletcher & Fletcher, 2003). On the other hand, public open space Mori et al.(2005), specify favourably strong connection between green space and user satisfaction which stimulates them to participate in physical and social activities. Further, spatial organization should offer passive activities like, relaxing, watching, chatting, etc as it uplifts users satisfaction by developing sense of belonging (Whyte, 1980). Abdullah (2008) reported physical-spatial constitutes to users satisfaction in public open space as activities effects people's attachment.

García-Ramon et al. (2004) claims that, user experience and people's use in public open space differs due to gender, age difference, ethnic and social class while McDowell (1999) also emphasis, the role of age, gender, ethnicity and social class on user perception, their satisfaction level and the use of public open space. On the other hand, Holland et al. (2007) declares that age and gender, ethnicity and time of a day effects the utilisation of space by user and amend the way of socialisation in public open space.



Figure 2: Public open space, Saket, New Delhi



Figure 3: Public open space, New Friends Colony, New Delhi

(Akari, 2014) summarises that user age has a strong correlation with the physical, environmental, and social needs in public open space. Older people use spaces like sit outs, walkways for spending time quietly or meditating peace environment or do regular walk in order to enhance the life expectancy. While younger people needs divergent activities, spaces, etc, in order to mingle with other individual / group (Akari, 2014). Older people prefer to take advantage from environment which younger people prefer to explore physical environment as well as mingle in social environment (Akari, 2014). Furthermore, (Akari, 2014) concludes that older people



Figure 1 Derived factors of spatial organization in Public open space

satisfaction level much lower than the younger people, as they need limited environment aspects along with the some facilities present in public open space.

Furthermore, Erkip (1997) defined good accessibility, comfort, distinctive activities, congestion level and facilities as an indicators of users satisfaction in public open space, whereas Giles-Corti (2005) construe facilities, amenities, comfort and safety as the four notable component that contributes a significant part in encouraging users satisfaction in public open spaces. While Shafique and Majid (2020) identified access and linkages, uses and activities, facilities and comfort as the main component of spatial organization in public open space. Therefore, this signifies that user satisfaction is inter-related to spatial organization of public open space

III. METHODOLOGY

3.1 Selection of case study

The criteria of site selection is guided by few considerations comprises; selected site should in same city as the structure of the city remain same; should be of similar size with contrasting design spaces as to access the variation in spatial organization and lies in different context as to acquire users of different class, income group and age. Therefore, three public open space, namely New friends colony, Saket and Nehru place of New Delhi has been selected as a case study which attains the desired parameters. These public open spaces are the part of the district centre. Along with the public open space, district centres also comprises commercial, hotels, healthcare, etc., land uses. All the three selected sites lie in the South zone of New Delhi with different context.

3.2 Data Collection

The study belongs to a qualitative research based on an empirical study as it aims to examine the level of user satisfaction regarding spatial organization in public open space. The study employs questionnaire-based survey constitutes Likert scale ranging from 1 to 5 from "highly disagree to highly agree," possess four different constructs with 26 items as attributes. Moreover, a pilot study has been done with 19 samples as to substantiate the questionnaire, prior to survey. The outcomes of survey itemise the level of user satisfaction regarding spatial organization in public open space.

3.2 Sample size

The sample size depends on the site context, while Delhi has a finite population of 2,733,752 ([2011 census](#)). Israel (1992) introduced sample formula for determining sample size for finite population. For population more than 100,000, samples of 400 has been defined with precision of $\pm 5\%$. Therefore, the 461 samples are selected in order to determine the satisfaction level of users in public open space. Further, amalgamation of systematic sampling method with time interval technique is used for data collection, in which main spots in public open space are finalised and every fourth visitors is counted and requested to answer the listed questionnaire in first 10 minutes of each hour. The samples collection requires equal number of male/female samples, in order to access the satisfaction level of both and measure the differences between them. Consequently, this sampling technique contributes to provide variation in time and users. This technique is adopted by Akari (2014) and Jaafar and Bina (2009) in their research based on public space.

3.2 Data Analysis

The questionnaires were outline to accomplish data collection and collect the user's satisfaction regarding different attributes of spatial organization in Indian public open space. Prior to analysis, the reliability of answers through internal consistency for each factor has been analysed using Cronbach's Alpha value through IBM SPSS software. Moreover, the data analysis has been performed in three stages. In first stage, univariate analysis has been performed as to determine the mean and standard deviations of each factors. While in second stage, Levene's Test for Equality of Variances has been used to examine the variance between gender in each factor of

spatial organization in public open space. At last, one-way ANOVA is performed, to check the difference in variances between different age groups bu using IBM SPSS.

IV. RESULTS

The data set comprises total 461 respondents which attempt to be equal in gender, while data from different age groups are randomly collected. Therefore, dataset contains 219 female (49.6%) and 224 males (50.6%). Whereas, the age groups are randomly divided as following 0-18 (15.8%), 18-30 (44.2%), 31-50 (29.1%) and 50 above (10.8%). Moreover, table 1, demonstrate the Cronbach's Alpha value of each construct are above the recommended value i.e. 0.7 Cronbach (1951) comprises Access & Linkage (0.940), Uses and activities (0.928), Facilities (0.937) and Microclimate (0.958). On the other hand, (table 1) determining the percentage of satisfaction level of users in terms of each item. Through referring (tables 1), it can be deduced that majorly all the items are between 40-50% which indicates that users satisfaction level is between unsatisfied to satisfied. The range of Accessibility and linkages satisfaction is between (46.0 - 48.4%). This includes 'Walkable distance from bus/metro to public open space' is 46% as the lowest satisfaction level, while 'Entrance is good' have highest i. e. 48.4%.

Moreover, in uses and activities, 'diversity in activities' have 45.2% as lowest, whereas 'spaces are attractive' have highest satisfaction level i.e. 50.2%. Further, all items of facilities have reasonably equivalent responses. All the items have satisfaction level between (45.2 - 46.6%) i.e. only 1% of difference. At last, in microclimate, 'Well maintained and shaded pathways' have least satisfaction level i.e. 45% while, 'Sufficient hardscape is provided (walking/jogging)' have highest satisfaction level i.e. 48.4%. Therefore, it can be deduced that items of all the factor have satisfaction level between unsatisfied to neutral. Adding to this, table 2 reveals the mean and standard deviation user satisfaction of each factor of spatial organization. Therefore, according to the table 2, Access and Linkage, Uses and activities are having equal mean of ($M=2.36$, $SD=1.03$) and ($M=2.36$, $SD=1.06$), respectively. While, mean of Facilities and microclimate is ($M=2.31$, $SD=1.03$) and ($M=2.31$, $SD=1.05$).

4.1 User satisfaction in relation to gender

Further, through graph 2, a slight variance between satisfaction level of male and female can be seen. The mean of satisfaction level of male in Access & Linkage is ($M=2.37$, $SD=1.03$); Uses and activities is ($M=2.38$, $SD=1.04$); Facilities is ($M=2.33$, $SD=1.01$) and microclimate is ($M=2.33$, $SD=1.03$) while, female mean of satisfaction level in Access & Linkage is ($M=2.35$, $SD=1.06$); Uses and activities is ($M=2.34$, $SD=1.09$); Facilities is ($M=2.28$, $SD=1.05$) and microclimate is ($M=2.29$, $SD=1.07$). The independent sample t-test for Equality of Means has been conducted in order to analyse the significant difference of user's satisfaction level on gender. The results confirm in table 2, that all the factors of spatial organization accept the null hypothesis i.e. the p value is above the recommended value of 0.05 (Pallant, 2011). The significant value in Levene's test of Access & Linkage is 0.842; Uses and activities is 0.531; Facilities is 0.731 and microclimate is 0.745. This

implies that there is no difference between satisfaction level of male and female on spatial organization of public open space.

4.2 User satisfaction in relation to age group

Furthermore, one-way ANOVA has been performed, in order to examine the difference in variance between different age group. The outcomes reveal that Access & Linkage, rejects the null hypothesis having value less than required value of 0.05 Pallant (2011) while Uses and activities, Facilities and microclimate accepts the null hypothesis having value 0.131, 0.055 and 0.093 respectively. However, graph 3, comprehensively demonstrate that users from all the age group are relatively showing similar satisfaction level in each factor. Certainly, users response are unsatisfied, however, user above 50 years age group as showing reasonably higher satisfied level followed by users from 0-18 age, while, users of age group 18-30 years and 30-50 years have alternative responses.

Table 1 : showing results of level of user satisfaction regarding spatial organization in Public open space

Factors/ Construct	No. of Items	Attributes / Indicator	Percentage of user satisfac tion	Cronbac h's Alpha
Spatial Organization (N=461)				
Access & Linkage	6	Entrance is good	48.4 %	0.940
		Clear entry and exit	47.2 %	
		Easy to get parking space	47.4 %	
		Pedestrian entrance is good	48.2 %	
		Walkable distance from bus/ metro to Public open space	46.0 %	
		Size & condition of walkways are good	46.4 %	

	Mean	Levene's Test for Equality of Variances	t-test for Equality of Means
Uses and activities	5	Spaces are attractive	50.4 %
		Activities are sufficient to spend time	46.6 %
		Diversity in activities	45.2 %
		Activities for less abled, senior citizens	47.2 %
		Sufficient area for shopping/relaxing	46.0 %
Facilities	7	Diversity in physical form	46.6 %
		Spaces with proper sit-outs	46.6 %
		Toilets, drink water and first aid available	45.2 %
		Street furnitures and street lightings are available	45.2 %
		Night Lighting and security cameras are properly installed	45.4 %
		Spaces are clean and well maintained	45.2 %
Microclim ate	8	Shade protect the play areas from climatic condition	47.8 %
		Sitting with proper shades (temporary/trees)	45.4 %

Construct	Gender	Mean	S.D.	F	Sig.	T	Sig. (2-tailed)	Mean difference
Access & Linkage	Male	2.37	1.03	0.40	0.48	0.183	0.855	0.097
	Female	2.35	1.06					
Uses and activities	Male	2.38	1.04	0.39	0.45	0.411	0.681	0.099
	Female	2.34	1.09					
Facilities	Male	2.33	1.01	0.11	0.13	0.586	0.558	0.963
	Female	2.28	1.05					
Microclimate	Male	2.33	1.03	0.10	0.12	0.389	0.698	0.984
	Female	2.29	1.07					

Table 2: showing user satisfaction in terms of mean and variances between age group

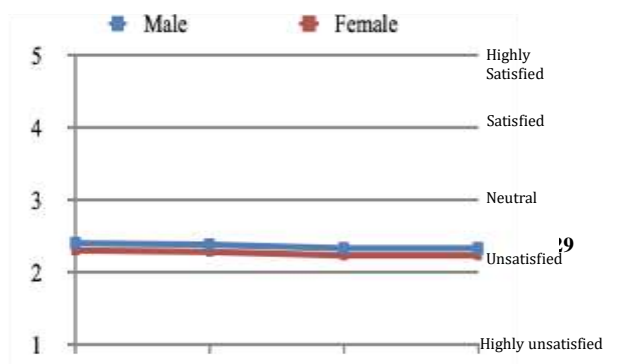
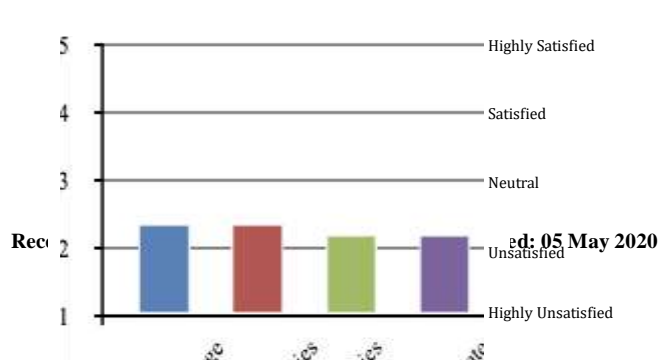
V. DISCUSSION

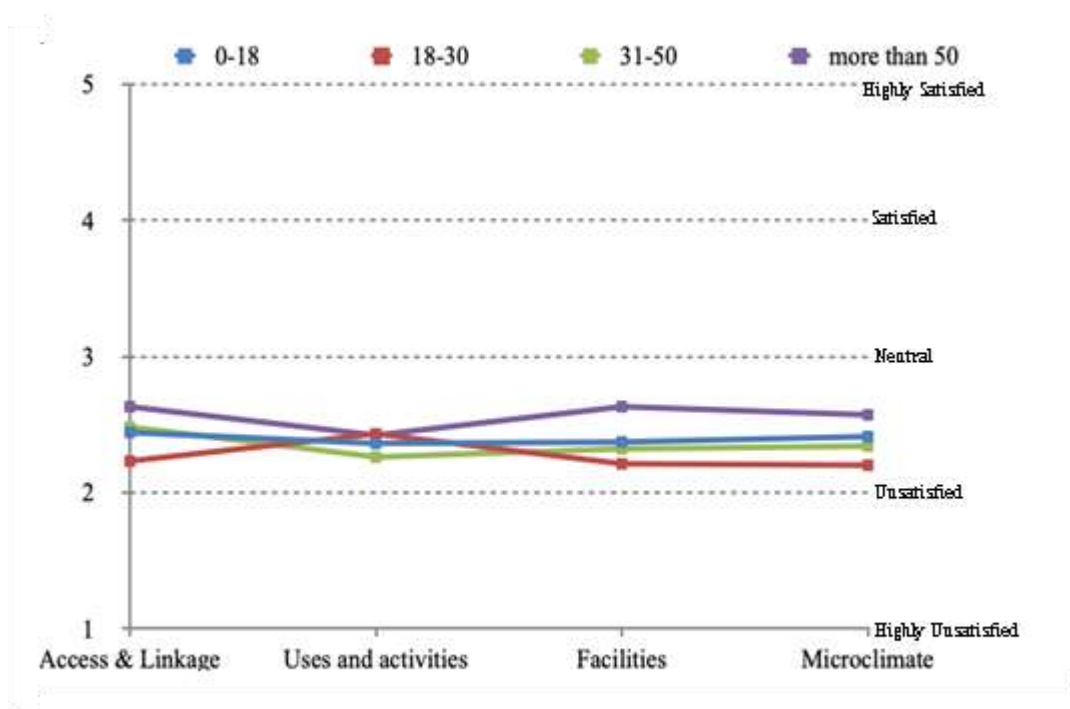
The results of the study clearly mention that overall users satisfaction level is between unsatisfied to neutral. The spatial organization of public open space lacking to fulfil the desired needs as means of all the construct are between unsatisfied to neutral. This supported by Aljabri and Smith (2013) along with good design, users also need good quality of facilities and microclimate as these factors are interrelated in public open space. Moreover, Table 1 interprets that users are most satisfied with the “attractive spaces” of uses and activities having 50.4% (neutral), while least satisfied with “Well maintained and shaded pathways” and “Open space layout design & elements are captivating “ of microclimate having satisfaction percentage of 45% (unsatisfied).

On the other hand, Table 2 explains, that the satisfaction level of users in context of Access & Linkage and Uses and activities is moderately higher than Facilities and microclimate with a mean difference of 0.05. Further, there is

Table 3: showing user satisfaction in terms of mean and variances between age group

Construct	Indicator	N= 461	Mean	Standard deviation	One way- ANOVA	
					F	Sig.
Spatial Organization						
Access & Linkage	0-18	75	2.44	1.08	2.927	0.033
	18-30	240	2.23	0.98		
	31-50	94	2.48	1.09		
	More than 50	52	2.63	1.13		
Uses and activities						
Facilities	0-18	75	2.36	1.07	1.885	0.131
	18-30	240	2.43	0.99		
	31-50	94	2.26	1.14		
	More than 50	52	2.42	1.22		
Microclimate						
Microclimate	0-18	75	2.37	1.05	2.547	0.055
	18-30	240	2.21	0.96		
	31-50	94	2.32	1.12		
	More than 50	52	2.63	1.10		
Microclimate						
Microclimate	0-18	75	2.41	1.02	2.154	0.093
	18-30	240	2.20	0.98		
	31-50	94	2.34	1.14		
	More than 50	52	2.57	1.05		





Graph 3 showing means of different age group on different attributes of spatial organization in public open space. Levene's Test confirms the null hypothesis, which authenticates that there is no significant difference between satisfaction level of male and female (table 2). Garcia-Ramon et al. (2004) also mention that demand of male and female are remaining equivalent in public open space as gender does not affects the basic need of the users psychologically as well as socially.

Furthermore, one-way ANOVA test prove that there is difference in satisfaction level in access and linkages, while other three factors including Uses and activities, Facilities and Microclimate show no variance. Moreover, through Graph 3, it can be easily deduced that users “more than 50 years” are most satisfied out of the other three age group followed by the “0-18 years”. While, users between (31-50 years) have mixed review, however, 18-30-year users have high perception on spatial organization of public open space which results in least satisfaction level.

According to Akari (2014), old people needs comparative less activities than young and adults as they more prefer passive activities like walk, sit and relax for social interaction, while young people requires active activities as well as diversity in facilities, microclimate and uses and activities. Adding to this Holland et al.

(2007), declared that users above 50 years age have lesser need which prevails, while perception and requirement of young people are rarely consider by designers. At last, this research found that there is a general dissatisfaction with the quality spatial organization in public open space

VI. CONCLUSION

The research paper aims to evaluate the user's perspective regarding spatial organization in Indian public open space. The questionnaire survey on select sites of New Delhi, reveals that the spatial organization fails to satisfy the users need. The consistency in users' reviews elucidates that all the factors of spatial organization in public open space have similar declination from user's perspective. The overall result demonstrates that, Access and Linkage, Uses and activities are having equal mean of (M=2.36, SD=1.03) and (M=2.36, SD=1.06), respectively. While, mean of Facilities and microclimate is (M=2.31, SD=1.03) and (M=2.31, SD=1.05). Hence, user's satisfaction level in each factor of spatial organization is between unsatisfied to neutral. As comparison to young users, older people seem slightly more satisfied, whereas no significant difference is observed between gender. The mean of all different attributes of spatial organization in respect of gender and age is between 2-2.6 on likert scale, which between 1-5 (from highly unsatisfied to highly satisfied). This implies that satisfaction level of users is between unsatisfied to neutral. These results demonstrate that, the designers should put more consideration towards user's satisfaction in accordance with all four factors of spatial organization in order to make public open space more effectual.

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