Determinant Factors of Successful Public Open Space in India

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Abstract: The public open spaces are the inevitable part of the cities. These spaces act as a focal point which reflects the culture and the public life. There are in-numerous cities which are known for their public life while many are still struggling to satisfy their users need. This difference could be due the local significance and the context of the city. Therefore, the research paper will identify the factors of public open space in Indian context. The research paper has employed qualitative as well as quantitative methodology which is performed through literature review followed by questionnaire survey. Three different Public open spaces of New Delhi, India including New Friends colony, Saket, Nehru Place has been taken as site study over which questionnaire survey has been performed. The questionnaire design is based on the 'Likert scale' ranging from 1 to 5 i.e. from 'strongly disagree' to 'strongly agree'. The factors have been derived through literature review which is further analysed through questionnaire results. Each factor is divided into different construct having three to four questions which is analysed through Cronbach's alpha in order to evaluate the authenticity of response by users. Further, exploratory factor analysis using IBM SPSS software has been employed to explore the factors of Public open space in Indian context. The factors are further confirmed through confirmatory factor analysis using Amos software. The research findings show the significant factors namely, access and linkages, uses and activities, urban elements/Amenities, visual image and identity, maintenance and management and microclimate are the major factors of public open spaces in India.

Keywords: Public open space factors, Indian City context, Indian socio-cultural

Introduction

Public open spaces are one of the vital components of the cities as it reflects the culture. A Public open space is an area where people can sit, relax, interact and experience the public life of a city. It has been mentioned by various researchers that context has an immense impact on the factors that makes space effective. Moreover, in order to make Indian Public open spaces more effective, factors of Public open space have been examined in order to check their importance in Indian context. Thus, the aim of the research paper is to analyse the factors which contribute to make Public open space successful in Indian context. The outcomes of the research will enhance better understanding regarding successful factors of Public open space for Indian cities which eventually further helps in developing new theories on public open space. The objectives of the research will be achieved through conducting case studies which will be undertaken in three different public open spaces of New Delhi. The survey will be unfolded in two steps: observations leading to questionnaire which will be further assessed by exploratory factor analysis and confirmatory factor analysis.

Literature Review

Public open space

Debra Efroymson (2009) define public open space as a place where anyone can enter or leave without anyone's consent. The place gives the opportunity to interact, sit alone or in groups and observe people. It is a place where people can experience public life. A public open space is one of the vital elements of the city, which has a great impact on social, cultural, economic and environmental aspects of the city (Truong, 2008). Hume (2009)

defines public open space is a place for community interaction, public protection, the pleasure of social life and values which is intend to planned and managed for present and future generations.

Sucker (2010) describes public open space as a reflection of socio-cultural as well as the political situation of society. Historically, cities have been depicted by the activities happened in public open spaces and considered a place for building communities. Hence, plays an essential role in fostering societies (Giddings et al., 2011). Adding to this Truong (2008) states that, earlier, public open space is considered as a central meeting place for political and societal decisions and a place for performing various individual or group activities. According to (Jan Gehl, 2003, p.10),

“Public open space is traditionally used as a marketplace, traffic space, performing socio-cultural activities and meeting place in balance, in spite of the different usage patterns of the city. Public space is a place where people can meet and make contact with each, exchange information, such as working experience or economic development. In addition, a lot of vital activities occur in public open space: the celebration of festivals, socio-cultural activities, pageant, coronations, etc”.

Kostof (1992) before car invention took place, public spaces were considered as one of the vital components of the city. In Greek civilisation ‘agora — the marketplace,’ showcases the pedestrian-oriented culture of the society while in roman, forums were the place for organising public affairs. Many historical public squares are still able to generate a sense of belonging and sense of place through demonstrating a socio-cultural of that society, hence, witnesses the public functions, festivals, day to day interactions between people and able to hold public for a longer time (Kostof, 1992).

Ancell and Thompson-Fawcett (2008) Hajjari (2009) elucidate that public open space are accessible to the public which creates livelihood in society with the help of effective cultural and physical settings. Cafes, retails, bazaars, streets, walkways, parks, etc. are included in public open space for the pleasure of social life and values which is intend to planned and managed for present and future generation (Huat and Edwards, 1992, Cybriwsky, 1999, Kayden, 2000, Moir, 2002).

Wu and Plantinga (2003) state that public open space is an important part of modern cities as it helps in reducing the stress of people living in society. While, Alexander (1977) described that good social space should be where people feel comfortable and want to interact rather than feel trapped.

According to Jia (2008) public open space displays the social life of a city in the better way, by participating in activities occurs in public open place is an opportunity to learn how people behave, react, work, dress with the people whom with they live and communicate. Most of the time, people participating in public activities in public space become familiar with others as well as sometimes gets new ideas inspired by others of public open space.

Table 1 showing categorisation of public open spaces in India

S. No.	Category	Types of Public open space
1	Environment (natural features)	City park District park Community / neighborhood park
2	Social infrastructure	Sports ground Multipurpose ground for exhibitions and fairs
3	Trade and commerce	Public open space in Community centres / District centers (public square / plaza)

Street markets / bazaars

Formal / informal markets (handicraft bazaar)

Due to the context, typology of public open spaces is different in every region of the world, even every city has their own typology of public open space. Moreover, the selected site is in Delhi therefore, it is important to identity the typology of public open space in Delhi. Delhi master plan (2010) described that, there is no such categorisation of public open space was constructed, however, as mentioned in table 1 under different categories like environment (natural features), social infrastructure and trade and commerce, public open spaces are defined.

Types of Public open space in India

Attractions and Destinations project for public spaces approach based on Whyte (1987)	Gehl architects approach-Gehl (2004)	True urbanism approach-making cities livable - Lennard (2004)	Design guidelines for urban open space-Marcus Francis (1998)	Derived Factors
Attractions and Destinations	Uses & activities	Community Festivals Mixed use	Uses & activities Seating Food an eating Program	Uses & activities
Access	Accessibility Parking Paving Traffic Security	Accessibility and transfer	Access & mobility	Accessibility
Amenities Flexible Design	Urban elements Aesthetic quality	Urban elements Outdoor cafes & restaurants	Urban elements Amenities	Urban elements/Amenities
Image and Identity	Facades Access and mobility Edge Views and vistas Human scale	Image / DNA Human scale	Visual Complexity Size Boundaries	Visual image and identity
Management	Aesthetic quality		Maintenance	Maintenance & management
Reaching Out Like an Octopus • Inner Square & Outer Square	Proximity and connection	Compact urban fabric	Circulation Information and Signs	Linkage
Seasonal Strategy	Climate/Night situation		Climate/Night situation	Microclimate

Factors of Public open space

Whyte (1980); Lennard and Lennard (1995); Gehl (Gehl, 1996); Project for public space (2000) stated various factors of Public open space. However, therefore six factors are derived from the above mention studies and consider as the main attributes of this research. The six main factors including access and linkages, uses and activities, urban elements/Amenities, visual image and identity, maintenance and management and microclimate.

Uses and Activities

Whyte (1980) described uses and activities as one of the essential factors to rejuvenate the Public open space in different time and season. According to Gehl (1996), in public space people are attracted by people and activities are attracted activities. Therefore, it is important to put uses and actives as it generates social interaction and captivates public for longer duration. However, Lennard and Lennard (1995) entitled uses and activities as a community festivals and mixed use. Further, Marcus and Francis (1998) Uses & activities Seating, Food an eating and programs as the vital factor for generating social interaction in public space.

Access and Linkages

Whyte (1980); Lennard and Lennard (1995); Gehl (1996); Marcus and Francis (1998) describe, access as a visible approach of the space, while Tibbalds (1992) referred access as a physical and visual reach of a space which affects the user's perception regarding safety and comfort. Taghipour et al. (2015) defined linkages as a connection between spaces, inner and outer circulation.

Figure 1: Public open space, New Friends colony, New Delhi

Figure 2: Public open space, Saket, New Delhi

Urban elements/Amenities

Whyte (1980); Lennard and Lennard (1995); Marcus and Francis (1998); Gehl (2003) considered urban elements and amenities as the major attribute to access the Public open space. Moreover, Carmona et al. (2008) stated that the quality and organization of urban elements is directly related to the quality of public space. While, Whyte (1980) considered, installation of small visually pleasing urban elements like sit outs, installations, cascades attract users. Elements likes sit outs, steps, ponds, monuments, landscape, etc., stimulate people to interact and stay for longer period of time (Kaplan and Kaplan, 1989).

Visual image and identity

Whyte (1980) assumed image and identity as a tool to captivate public, while Gehl (1996) assessed urban element and amenities through Facades, Edge, Views and vistas and Human scale. Alike, Lennard and Lennard (1995); Gehl (1996) described image and human scale is a subordinate of visual image and identity. Stephen et al. (1992) describe comfort and image as one of the essential elements of Public open space as it has high impact on people's satisfaction.

Maintenance and management

Whyte (1980); Marcus and Francis (1998) as a defined maintenance and management as of the requisite aspect of effective Public open space. Rimanova (2010) mentioned safety and maintenance are the two essential factors for the success of Public open space. However, Gehl (1996) mentioned aesthetic quality attracts visitors as it is enhancing the visual appearance of the place.

Microclimate

Undoubtedly, microclimate affects the user's satisfaction level. Whyte (1980) asserted microclimate as the essential factor of Public open space as it has an undeviating repercussion on user's satisfaction level. Adding to this Stephen et al. (1992), favourable microclimate produces effective physical comfort. Whereas, Carmona et al. (2008) mentioned that at different time of a day i.e. day and night, users perceive place differently. Therefore, public space should have the security provision of both day and night as it directly related to the sense of comfort.

Methods

Study Area

For this research, three Public open spaces of south zone, New Delhi has been selected as a case study. The selected site should be distinctive in context yet have similar sizes, from same city. Moreover, the design spaces should be different from each other, in order to get different responses from the users.

Therefore, as per mentioned criteria, the author has taken Public open space of district centre of Saket, Nehru Place and New Friends Colony. District centre of New Delhi includes Hotels, restaurants, commercial areas, offices, etc. Thus, the selected site is surrounded by different land uses which serves to distinctive population.

Data Collection

This research explores about factors of successful public open space. The methodology of conducting research is held through questionnaire survey. This gives an idea that which factor is important for users as well as their satisfaction about different design spaces. Prior to survey, a pilot study comprises of 19 samples has been done in order to establish the validity of the questionnaire.

Sample size

The select site areas have a finite population of 2,733,752 ([2011 census](#)). The selection of sample size is based on Israel (1992) sample formula for finite population. Therefore, according Israel (1992) the calculated sample size is 400 persons for population more than 100,000 by taking $\pm 5\%$ precision level. For research analysis, confirmatory factor analysis has been adopted. According to Stallings (1975); Hair. et al. (2010), the ratio of

items and respondents should be 1:10, moreover, this research includes 27 questionnaires under four different factors. Therefore, the sample size be minimum 290.

Questionnaire Design

The purpose of questionnaire is to explore the user's experience regarding different factors of Indian public open spaces. The design of questionnaire is based on the 'Likert scale' in order to get the most reliable outcomes. The construct of questions is divided into six parts including six attributes of Public open space which constitute 27 items/attributes. Moreover, in each construct, similar questions were asked in order to check the reliability of answers (Likert, 1932). Further, the questionnaires are designed to obtained the satisfaction level of the users as it defines their needs regarding Public open space.

Data Analysis

For data collection, 30 questions are designed under six different constructs in order to find out the most preferred factor by users. The data analysis has been performed into three stages. Primarily, Cronbach's alpha has been conducted in order to check the internal consistency of a construct. Moreover, the value of Cronbach's alpha more than 0.7 is consider as acceptable (Cronbach, 1951). Thus, all the construct is having acceptable alpha value as shown in Table 3.

Secondly, in order to validate the item of each construct, exploratory factor analysis has been done. Principal component analysis with Varimax rotation has been employed as a preliminary tool in order to validate the selected items. Items having factor loading less than 0.5 are removed from the construct (Hurley et al., 1997). Therefore, 27 items are selected whereas three items have been deleted from the construct as it is unable to meet the required factor loading. In the end, confirmatory factor analysis has been performed to find out the correlation between each construct as well as standardised factor loading of each item and construct in order to examine the most essential construct of Public open space in Indian context.

Table 3 Table showing exploratory factor analysis of attributes of Public open space

Construct	No. of items	Indicators	Factor loading	Cronbach's Alpha
Access and linkages	4	Entrance is good	0.810	0.909
		Clear entry and exit	0.810	
		Easy to get parking space	0.779	
		Walkable distance from bus, metro to public open space	0.796	
Uses and activities	5	Spaces are attractive	0.819	0.928
		Activities are sufficient to spend time	0.843	
		Diversity in activities	0.846	
		Activities for less abled, senior citizens	0.882	
		Sufficient area for shopping, relaxing	0.850	
Urban elements/Ame	6	Diversity\in physical form	0.809	0.937
		Spaces with proper sit-outs	0.842	

nities		Toilets, drink water and first aid available	0.836	
		Street furniture and street lightings are available	0.851	
		Water fountain/Statues/sculpture are attractive	0.839	
		Sufficient area for shopping/relaxing	0.841	
Visual image and identity	4	Spaces are captivating	0.836	0.917
		Attractive landscape and open area	0.816	
		Urban elements are in harmony	0.840	
		Visually appealing designed spaces	0.844	
Maintenance & management	4	security cameras are properly installed	0.631	0.844
		Proper Night Lighting	0.628	
		Spaces are clean	0.633	
		No noise/smell in surrounding	0.603	
Microclimate	4	Shade protect the play areas from climatic condition	0.508	0.842
		Sitting with proper shades (temporary/trees	0.617	
		Green areas are provided for shade and relaxing	0.610	
		Sufficient hardscape is provided (walking/jogging).	0.622	

Confirmatory factor analysis

Confirmatory factor analysis is a subset of structural equation modelling which is intended to test the hypothesis of designed model and ensure model fit data which involve determining existence of relationship between latent, observed, unobserved variables and constructs (Child, 1990, Byrne, 2016). This confirmatory factor analysis model contains exogenous (independent) and endogenous (dependent) variable comprises indirect and direct effects of one variable on other.

Validity and Reliability

In order to check the model fitness, there are few indices which testify the goodness of fitness of a model. This includes CMIN (likelihood ratio of chi square), GFI (goodness of fit index), AGFI (Adjusted Goodness-of-Fit Index), RMSEA (Root Mean Square Error of Approximation), RMR (Root Mean Square Residual). According to Joreskog and Sorbom (1986), the value of CMIN should be less than 5, while Bagozzi and Yi (1988); Anderson and Gerbing (1988) recommended values of GFI, AGFI ≥ 0.90 . Further, (Browne and Cudeck, 1992) commend values of RMSEA ≤ 0.08 and RMR ≤ 0.1 . Furthermore, Rasidi et al. (2012) mentioned that RMSEA depends on degree of freedom as well as indicates the badness of fit index.

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Figure 3 showing results of confirmatory factor analysis of Public open space factors

Table 4 showing model fit indices of confirmatory factor analysis of Public open space attributes

Goodness of fit measures	χ^2 test statistics/df	GFI	AGFI	RMSEA	RMR
Recommended value	≤ 3.00 a	≥ 0.90 b	≥ 0.90 b	≤ 0.08 c	≤ 0.1 c
Structural model	1.574	0.909	0.892	0.037	0.080

Note: N = 461; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index; CFI = Comparative Fit Index;

NFI = Normed Fit Index; RMSEA = Root Mean Square Error of Approximation; RMR = Root Mean Square Residual Source: a (Jöreskog and Sörbom 1986), b (Bagozzi and Yi 1988), b (Anderson and Gerbing 1988), c (Browne and Cudeck 1993)

As already mentioned, that the results are achieved in three steps. First Cronbach's alpha value has been done in order to check the reliability of answers followed by the exploratory factor analysis for checking the factor loading of each item and then confirmatory factor analysis has been performed which examine the correlation between each construct. Through table 3, it can see that all the constructs are having excellent alpha value, comprising access and linkages (0.909), uses and activities (0.928), urban elements/Amenities (0.937), visual image and identity (0.917), maintenance and management (0.844) and microclimate (0.842).

The results of exploratory factor analysis reveal that 27 items are above the required value of 0.5 while two from microclimate and one from Maintenance & management has been deleted as it is having lower factor loading value. The results demonstrate that the items of accessibility and linkages construct ranging factor loading between 0.810 to 0.779, while in users and activities construct mostly factor loading are between 0.819 to 0.850. Moreover, urban elements/Amenities factor loading is between 0.808 to 0.851, while, visual image and identity is in a range of 0.816 to 0.844. Further, maintenance and management factor loading ranges between 0.603 and 0.633, whereas microclimate factor loading is between 0.508-0.622 (table 3).

Validity and Reliability of factors of Public open space model

To analyses the validity of model, confirmatory factor analysis has been performed. The confirmatory factor analysis model reveals that all the goodness of fit indices are under recommended value shown in table 4. The value of CMIN/df= 1.574, GFI=.909, AGFI=.892, RMSEA=0.037 and RMR=0.080, which signifies that all the values of indices are under recommended values and eventually proves the model is fit.

Relation between variables

The result of correlation between factors has been performed using confirmatory factor analysis shown in figure 2. The outcomes reveal that all the factors have strong correlation between with other which confirms that factors are fits to Indian context. The relation of accessibility and linkages with uses and activities is 0.91; Urban elements/Amenities is 0.92 and with Visual image and identity is 0.92; with Maintenance & management is 0.98 and with Microclimate is 0.62. While, relation of uses and activities with Urban elements/Amenities is 0.97; with Visual image and identity is 0.98; with Maintenance & management is 0.67 and with Microclimate is 0.98. Moreover, relation of Urban elements/Amenities with Visual image and identity is 0.98; with Maintenance & management is 0.97 and with Microclimate is 0.69. However, relation of Visual image and identity with

Maintenance & management is 0.67 and with Microclimate is 0.65 whereas correlation between Maintenance & management Microclimate is 0.95

Discussion

The results demonstrate that there is a high correlation between all the factors which means that all the factors are highly connected with Indian context. Though figure 2, it can be seen that uses and activities with Urban elements/Amenities and Visual image and identity are highly correlated. Therefore, while designing, these factors should complement each other as well as should give equal emphasis.

Adding to this, relation of accessibility and linkages with uses and activities, Urban elements/Amenities, Visual image and identity and Maintenance & management is also demonstrating significantly high relation. This is what Lynch (1981) defined that paths are the vital element in order to define image of the space. Thus, accessibility and linkages should be considered as one of the significant factors while designing.

On the other hand, visual image and identity showing highest standardised factor loading of 0.99 followed by Urban elements/Amenities and uses and activities having 0.98 value. Thus, these factors play pivotal role in Indian Public open space.

Conclusion

In conclusion, the research confirms that, to achieve successful Public open space in Indian context, accessibility and linkages, uses and activities, Urban elements/Amenities, Visual image and identity, Maintenance & management and Microclimate are the six vital factors. Visual image and identity is one of the significant factor of Indian Public open space, followed by the Urban elements/Amenities and uses and activities, while Maintenance & management and microclimate are equally important. However, standardised factor loading of accessibility and linkages elucidates that considered importance should also be given for uplifting the effectiveness in Public open space. Thus, the above given factors are fits to Indian context and should be considered as successful factors of Public open space while designing.

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