

Statistical Analysis of Criteria and Key Aspects for Urban Design Quality Assessment of Built Environment

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Abstract

Built Environment encompasses places and spaces created or modified by the people for different activities like living, working and playing. It is intuitively known that quality of built environment affects the performance of activities that are going on in that particular environment. Urban Design is contributing positive role in creating healthy built environment and overall performance of built environment has improved a lot. Now it important to know the quality of built environment for a particular place and for the same criteria and key aspects has been identified and analysed.

This paper would be dealing with establishing Criteria and Key Aspects for qualitative assessment of built environment and their statistical analysis to test significance and correlation among one another.

Key words: Built Environment, Urban Design, Criteria, Key Aspects

1. INTRODUCTION

The Commission for Architecture and the Built Environment (CABE) has defined urban design 'as the art of making places for people. It includes the way places work and matters such as community safety, as well as how they look. It concerns the connections between people and places, movement and urban form, nature and the built fabric, and the processes for ensuring successful villages, towns and cities.'^[4] The Urban Design Quality Assessment (UDQA) Criteria and Key Aspects for built Environment is extracted from the seminal books of – The Image of the City, Kevin Lynch^[7], The Concise Townscape, Gordon Cullen^[3], Responsive Environment, Ian Bentley, Alan Alcock, et.al.^[2] etc. and some reports^[8], This paper describes in greater detail for establishing Nine Criteria under which there are Thirty Six Key Aspects which defines the respective criteria.

2. DATA COLLECTION

Based on literature study certain important Indicators were identified and grouped as Criteria and Key Aspects which encompasses as probes or leads for the members to capture the micro level quality parameters to judge the quality of built environment. For the very purpose, a questionnaire was formulated bearing Nine Criteria which is further divided into Thirty Six Key Aspects and sent to professionals like Architects, Urban Designer, Landscape Architects, Conservation Architects, Town Planner and Academicians for the purpose of pilot survey. They were asked to gauge these key aspects in the calibrated scale of 1 to 5 from least to most significant. (Pilot Survey of 42 Samples were analyze

PILOT SURVEY QUESTIONNAIRE FORM FOR ESTABLISHING CRITERIA AND KEY ASPECTS OF QUALITATIVE ASSESSMENT OF BUILT ENVIRONMENT

	Criteria and Key Aspects	Assigned Key Aspect Grade Points
	How does the site meet the criteria?	1/2/3/4/5
1.0	Criterion I: Making Places and Collective Value of the Built Environment	
1.1	Continuity of streets and enclosure of open spaces.	
1.2	Townscape value i.e. buildings, blocks, sky line, streets and squares that create the urban form.	
1.3	Front and back setbacks provided in the buildings.	
1.4	Public and private areas are clearly delineated and designed.	
2.0	Criterion II: Efficiency in Planning and Layout development of the place	
2.1	Efficiency in Planning and site coverage.	
2.2	Development of streetscape.	
2.3	Innovation in the design and layout of the development.	
2.4	Visual Appropriateness i.e. three dimensional effect of development in terms height and massing.	
3.0	Criterion III: Design and External Appearance of Buildings	
3.1	Identity, character and response to the context.	
3.2	Ambiance in context to sense of place.	
3.3	Scale, proportion and building line for articulation of the building facades.	
3.4	Materials and detailing that ensure the quality and finish of the development (buildings / open spaces/streets).	
4.0	Criterion IV: Legibility of place	
4.1	Views, vistas and gateways that strengthens people's understanding and use of the place.	
4.2	Edges, Paths, Landmarks and character areas.	
4.3	Way finding Sign ages	
4.4	The 'wow' factor of the development. (i.e. how good and bad design is Built Environment as a whole).	
5.0	Criterion V: Movement, Connections and Linkages of the Built Environment	
5.1	External connections and integration i.e. How well is the place connected with the wider street network.	
5.2	Permeable and internally well linked streets. i.e. ease of movement through and around the area.	
5.3	Provision of Off-Street and On street vehicle parking.	
5.4	Pedestrian and cycle provision avoiding traffic dominance.	
6.0	Criterion VI: Public Realm and Open Spaces	
6.1	Streetscape elements such as lighting, building/shop fronts and fences/railings	
6.2	Quality of public realm in terms of functionality and context.	
6.3	Quality of public realm in terms of materials, furnishings, landscape specification, detailing and construction.	
6.4	Maintenance and ongoing care of public open space as well as structures.	
7.0	Criterion VII: Safe and Inclusive Design	
7.1	Overlooking and natural surveillance, from nearby uses.	
7.2	Physical security measures employed in an area / scheme.	
7.3	Lighting and the evening environment creating a safer place after dark.	
7.4	Accessible and inclusive design.	
8.0	Criterion VIII: Space and Use Attributes of Buildings	
8.1	Use in terms of mix and tenure i.e. supporting an appropriate mix of uses and tenures through design.	
8.2	Land use in terms of density & intensity i.e. appropriate for context, vitality and sustainability.	
8.3	Response of public realm with ground floor units/building/street.	
8.4	Flexibility and adaptability of areas and buildings.	
9.0	Criterion IX: Sustainable design Aspects	
9.1	Sustainability of the location in respect of accessibility and the nature of uses.	
9.2	Local resource used in the development of place.	
9.3	Provision of green space and landscape within the Built Environment.	
9.4	Environmental performance of the Built Environment as a whole.	

Table.1: Pilot survey Questionnaire Form

3. DATA ANALYSIS

There are thirty six Key Aspects which are grouped into Nine Criteria i.e. Each Criteria has four Key Aspects. These Criteria and Key Aspects are coded as KA11, KA12, KA13, KA14 and so on for the purpose of calculation. KA11 be

read as Key Aspect1 Criteria1, KA12 be read as Key Aspect2 Criteria1 and so on. Data is analysed by taking 42 samples.

3.1 MEAN VALUE CALCULATION

This may be define as the value which we get by dividing the total of the values of various given items in a series by the total no of items. Kothari and Garg [6].

Suppose we want to calculate mean value of KA31 on the scale of 1 to 5. KA31 denotes "Identity, character and response to the context"(Table 1). Now out of 42 samples, two samples provide 2 score, 27 samples provide 3 score, 11 samples provide 4 score, 2 sample provide 5.

Mean value: $(2X2+27X3+11X4+2X5)/42=3.309$

Therefore Mean of KA31=3.309 on the scale of 5.

Mean value which is also known as statistical average was calculated for all the forty two Key Aspects with the help of SPSS- 20 Software. This statistical average was calculated to understand the significance of each individual Key Aspects for the quality assessment of built environment.

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std. Deviation	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
KA11	42	2.00	5.00	3.66	.75	-.23	.71
KA12	42	2.00	5.00	3.28	.70	.29	.71
KA13	42	1.00	5.00	3.61	.88	.87	.71
KA14	42	1.00	5.00	3.59	.96	.05	.71
KA21	42	2.00	5.00	3.83	.85	-.70	.71
KA22	42	2.00	4.00	3.09	.79	1.36	.71
KA23	42	1.00	5.00	3.30	1.09	-.31	.71
KA24	42	2.00	5.00	3.73	.96	-.61	.71
KA31	42	2.00	5.00	3.30	.64	.87	.71
KA32	42	2.00	5.00	3.83	.72	-.23	.71
KA33	42	2.00	5.00	3.61	.82	-.30	.71
KA34	42	1.00	5.00	3.30	.78	.75	.71
KA41	42	2.00	5.00	3.73	.73	-.43	.71
KA42	42	2.00	5.00	3.40	.93	-.75	.71
KA43	42	2.00	5.00	2.95	.85	-.94	.71
KA44	42	1.00	5.00	3.19	.91	.18	.71
KA51	42	2.00	5.00	3.76	.75	.49	.71
KA52	42	2.00	5.00	3.52	.67	-.16	.71
KA53	42	1.00	5.00	3.47	.94	.82	.71
KA54	42	1.00	5.00	3.07	.94	.23	.71
KA61	42	2.00	5.00	3.47	.63	-.19	.71
KA62	42	2.00	5.00	3.28	.83	-.41	.71
KA63	42	1.00	4.00	2.92	.77	-.51	.71
KA64	42	1.00	5.00	3.28	.86	.08	.71
KA71	42	2.00	5.00	3.45	.80	-.31	.71
KA72	42	1.00	5.00	3.54	.94	.12	.71
KA73	42	2.00	5.00	3.11	.88	-.48	.71
KA74	42	1.00	5.00	3.38	.85	.48	.71
KA81	42	2.00	5.00	3.28	.70	.29	.71
KA82	42	1.00	5.00	3.14	.89	-.03	.71
KA83	42	1.00	5.00	2.95	.90	.06	.71
KA84	42	1.00	5.00	3.35	.87	1.18	.71
KA91	42	1.00	5.00	3.57	.73	2.55	.71
KA92	42	1.00	5.00	3.66	.87	1.01	.71
KA93	42	2.00	5.00	3.61	.85	-.48	.71
KA94	42	2.00	5.00	3.76	.90	-.56	.71

Table 2. Descriptive Statistics Chart (Produced through SPSS 20)

The above table shows that the mean value of each key aspects on the scale of five and displays the level of significance of each of the thirty six key aspects. The Key Aspect KA21&KA32 i.e. "Efficiency in Planning and site coverage" and "Ambiance in context to sense of place" depicting the highest score of 3.83 out of 5 and the Key Aspect KA63 i.e. "Quality of public realm in terms of materials, furnishings, landscape specification, detailing and construction"

depicting the lowest score of 2.92 out of 5. The analysis shows that all the key aspects taken for qualitative assessment for built environment lies between 58% to 77%.

The chart below is showing the bars of responses in count and responses in percentage of each of the thirty six key aspects. This chart explains that for each key aspect, what is the opinion of each respondent? For instance KA31 i.e. key aspect 1 of criteria 3 "Identity, character and response to the context". 03 people out of 42 respondents said that this criteria is most in deciding quality of built environment where as 02 out of 42 respondents said it is it plays less in deciding quality of built environment and rest of them said that it is important in deciding quality of built environment.

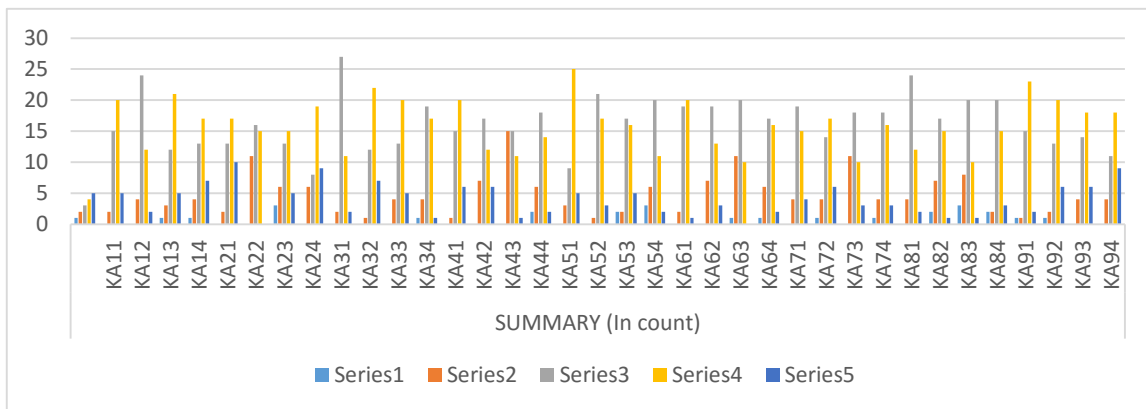


Fig.1: Response in Counts

Accordingly, Fig.2 shows that 05% of respondents feels that KA31 i.e. "Identity, character and response to the context" is most important in this criteria in deciding quality of built environment where as 04% said that it contributes less. Although rest of them said that it is important in deciding quality of built environment

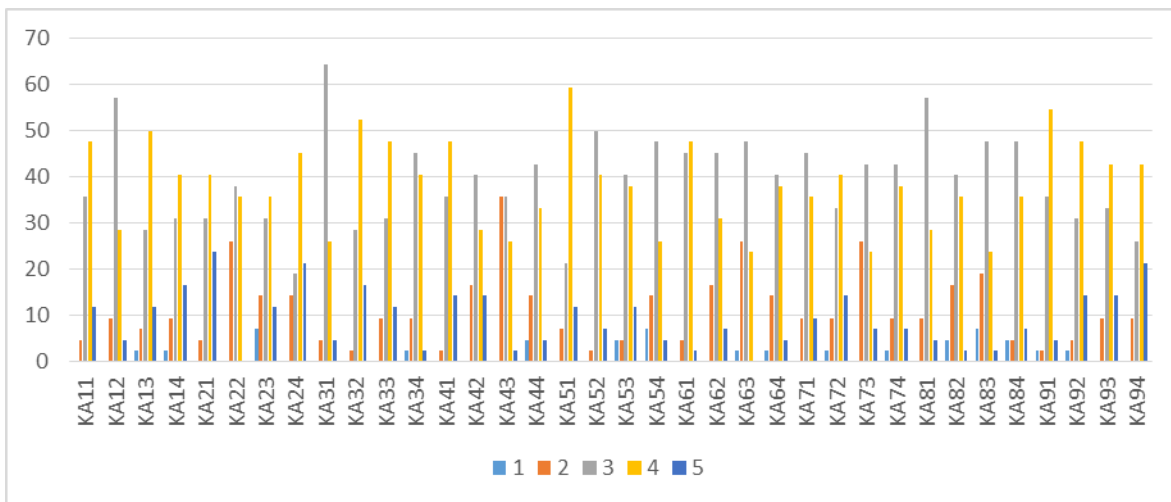


Fig.2: Response in Percentage

Since the mean of all the individual key aspects taken for qualitative assessment for built environment is more than 50%, it justifies that the all the criteria and Key aspects are important.

3.2 CORRELATION AMONG THE CRITERIA

The above analysis displays that all the thirty six key aspects are significant in qualitative assessment for built environment. These thirty six key aspects are grouped into nine criteria and be tested that there is any correlation among themselves.

The coefficient of correlation “r” varies between [-1, +1] that shows strong positive –negative relationships among the criteria. For a significant correlation between two criteria the value of significance for two tail test should always be less than .05 (i.e. <.05) for 95 % significance level. Kothari and Garg (1985)

The Pearson product movement correlation among the nine criteria were carried out by using SPSS- 20. Where, C1, C2, C3 stands for Criterion I, Criterion II, Criterion III.

The hypothesis tested is as follows:

H₀: There is correlation between the criteria

H₁: There is no correlation between the criteria

		Correlations								
		C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	Pearson Correlation	1	.470**	.518**	.356*	.368*	.192	.150	.061	.221
			.002	.000	.021	.017	.224	.345	.700	.159
C2	Pearson Correlation	.470**	1	.389*	.159	.076	.398**	.264	.012	.082
		.002		.011	.314	.632	.009	.091	.940	.605
C3	Pearson Correlation	.518**	.389*	1	.334*	.326*	.168	.119	.281	.213
		.000	.011		.031	.035	.286	.454	.072	.175
C4	Pearson Correlation	.356*	.159	.334*	1	.172	.235	.123	.090	.048
		.021	.314	.031		.277	.134	.439	.569	.761
C5	Pearson Correlation	.368*	.076	.326*	.172	1	.428**	.306*	.276	.266
		.017	.632	.035	.277		.005	.049	.077	.089
C6	Pearson Correlation	.192	.398**	.168	.235	.428**	1	.519**	.136	.083
		.224	.009	.286	.134	.005		.000	.390	.599
C7	Pearson Correlation	.150	.264	.119	.123	.306*	.519**	1	.339*	.180
		.345	.091	.454	.439	.049	.000		.028	.255
C8	Pearson Correlation	.061	.012	.281	.090	.276	.136	.339*	1	.380*
		.700	.940	.072	.569	.077	.390	.028		.013
C9	Pearson Correlation	.221	.082	.213	.048	.266	.083	.180	.380*	1
		.159	.605	.175	.761	.089	.599	.255	.013	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table -3: Pearson Correlation among criteria (Produced through SPSS 20)

3.4 CRITERIA CORRELATING WITH EACH OTHER

S. NO.	CRITERIA	CRITERIA CODE	SIGN (2TAIL)* TEST. 05 LEVEL NO. OF KEY ASPECTS	NAME/ CODE SIGNIFICANTLY RELATED WITH CRITERIA

1.	Criterion I: Making Places and Collective Value of the Built Environment	C1	02	C4&C5
2.	Criterion II: Efficiency in Planning and Layout development of the place	C2	01	C3
3.	Criterion III: Design and External Appearance of Buildings	C3	03	C2,C4&C5
4.	Criterion IV: Legibility of place	C4	02	C1&C3
5.	Criterion V: Movement, Connections and Linkages of the Built Environment	C5	03	C1,C3&C7
6.	Criterion VI: Public Realm and Open Spaces	C6	-	-
7.	Criterion VII: Safe and Inclusive Design	C7	02	C5&C8
8.	Criterion VIII: Space and Use Attributes of Buildings	C8	02	C7&C9
9.	Criterion IX: Sustainable design Aspects	C9	01	C8

Table-4: Summary of criteria correlated with each other

3.2.1. ANALYSIS

The above table shows that C1 i.e. Criterion I is correlating with C4&C5 only

For C4, the coefficient of correlation $r = .356$, lies between 0 to 1 Significance level $= .021$, $.021 < .05$ (significant correlation)

For C5, the coefficient of correlation $r = .368$, lies between 0 to 1 Significance level $= .017$, $.017 < .05$ (significant correlation)

3.2.2. RESULT

The overall analysis of correlation explains that there is only one criteria which is not correlating among one another that means criteria are significantly correlating with one another hence the Null Hypothesis H_0 is accepted on the basis of statistical analysis carried out.

4. CONCLUSION

The above two analysis based on key aspects for significance and criteria for correlation displays that all the thirty six key aspects significant and all criteria are correlated among one another. All key aspects and criteria are important in assessing quality of built environment.

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