

Title

“VALIDITY ANALYSIS OF PERCEPTION OF VARIOUS PROFESSIONALS ON RESIDENT SATISFACTION IN GREEN RATED APARTMENTS IN URBAN INDIA”

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ABSTRACT:

The purpose of this research is to identify the gap in understanding of various construction industry professionals like architects, engineers, academicians, green building raters and builders on parameters which determines the resident's satisfaction in green rated buildings in Indian context. For achieving sustainable and resilient infrastructure and communities, it is important to consider views of users for designing of future infrastructures, like resident's opinion on housing colonies or employee's opinion office design. (Roberts et al. 2019) In construction industry, there are many stake holders and the perception of parameters for resident's satisfaction varies as per the profession of the person and city. (Rajiv et al. 2015)

The objectives of this study are to understand about various concepts in human psychology explaining human satisfaction in urban housing in India, through opinion survey. And understanding gap between perception of above-mentioned professionals linked with construction industry.(Alborz and Berardi 2015)

The results of opinion survey were analyzed with SPSS software and compared, profession wise and region wise. Further reliability and validity were checked in SPSS.

Keywords: Maslow's Hierarchy of Needs, Opinion Survey of various Professionals, Resident's Satisfaction, Validity and reliability, SPSS

1.0 INTRODUCTION

As tangible and intangible benefits of green buildings are known, to our knowledge, no study has been reported on resident's satisfaction occupant of green buildings in India. (Bahadure and Bahadure 2014) The aim of this research work is to develop a methodology to assess resident's satisfaction, which can used later in the field through various surveys to gather insights on resident's satisfaction in green buildings, the areas of concerns and possible solutions to recommend the policy makers so as to have strong policies in place for green infrastructure across the country and provide win-win-win situations to environment, industry and its customers. (Mohit and Raja 2014)

2.0 METHODOLOGY:

The study aimed at understanding the housing phenomenon keeping in view, green buildings demand, green rating systems and findings in the direction of resident's satisfaction specifically for green buildings. The residents' satisfaction need to be studied scientifically and hence the basis chosen on the concepts of human psychology on

needs and satisfaction by Maslow's Hierarchy on Needs.(Hale et al. 2019; Umoren 1992; Etminani-Ghasrodashti, Majedi, and Paydar 2017; Uri and Poirier 1986)

In this work, the concept and ideas of residential satisfaction were studied on the green rating fields. Then parameters were identified for deriving satisfaction through published literature.

The mapping of parameters for satisfaction in housing as per Maslow's hierarchy of needs was done. The base framework was arrived at after mapping of resident's satisfaction parameters with Maslow's hierarchy of needs. This included assessment of residents' need as per hierarchy by Maslow. (Hale et al. 2019; Umoren 1992; Etminani-Ghasrodashti, Majedi, and Paydar 2017).

Table 1 to 5 included the parameters for mapping needs to assess residents' satisfaction as follows:

TABLE 1: MAPPING OF PHYSIOLOGICAL NEEDS:

TIER	PHYSIOLOGICAL NEEDS	AUTHOR OF REFERRED RESEARCH PAPER
1	Architectural layout	(Ibem and Aduwo 2013) (Howley 2010) (Rajiv et al. 2015) (Markoc and Cinar 2017)
2	Floor level / Accessibility	(Byun and Ha 2016)
3	Density / size of housing	(Howley 2010) (Hur and Morrow-jones 2008) (H.-J. Lee and Parrott 2004) (Markoc and Cinar 2017) (K. I. Lee and Yeom 2009)
	Room sizes	(Ibem and Aduwo 2013) (Howley 2010) (H.-J. Lee and Parrott 2004) (Rajiv et al. 2015) (Yu et al. 2017)
	Natural Light	(Ibem and Aduwo 2013) (H.-J. Lee and Parrott 2004) (Zalejska-Jonsson 2014) (Mustafa 2017)
	Natural ventilation	(Ibem and Aduwo 2013) (H.-J. Lee and Parrott 2004) (Rajiv et al. 2015) (Zalejska-Jonsson 2014) (Bonde and Ramirez 2015) (Yu et al. 2017) (Mustafa 2017)
	Healthy Environment (a) Physical Health, (b) Mental Health	(H.-J. Lee and Parrott 2004) (Bonde and Ramirez 2015) (Hale et al. 2019)
	Infrastructure (a) Water, (b) Sewage, (c) Electricity	(Ibem and Aduwo 2013) (Alborz and Berardi 2015)
	Comfort conditions (a) Thermal, (b) Humidity, (c) Sound-	(Ibem and Aduwo 2013) (Markoc and Cinar 2017) (K. I. Lee and Yeom 2009) (Zalejska-Jonsson 2014) (Bonde and Ramirez 2015) (Khoshbakht et al. 2018) (Alborz and Berardi 2015) (Yu et al. 2017) (Mustafa 2017)

TABLE 2: MAPPING OF SAFETY NEEDS:

TIER2	SAFETY NEEDS	AUTHOR OF REFERRED RESEARCH PAPER
1	Physical Safety (a) Safety from Crime, (b) Safety from Disasters, (c) Accessibility, (d) Road network, (e) Medical Facilities, (f) Pedestrian Access, (g) Child & Elderly Safety, (h) Women Safety, (i) Surveillance- CCTV & Guards -	(Ibem and Aduwo 2013) (Hur and Morrow-jones 2008) (Rajiv et al. 2015) (K. I. Lee and Yeom 2009) (Umoren 1992)
2	Emotional Security (a) Security of Life, (b) Security of Property, (c) Cost of Housing	(Ibem and Aduwo 2013) (Hur and Morrow-jones 2008) (Rajiv et al. 2015) (Hale et al. 2019) (Umoren 1992)

TABLE 3: MAPPING OF LOVE AND BELONGINGNESS NEEDS

TIER3	LOVE AND BELONGINGNESS NEEDS	AUTHOR OF REFERRED RESEARCH PAPER
1	Relation among neighbours	(Ibem and Aduwo 2013) (Etminani-Ghasrodashti, Majedi, and Paydar 2017)
2	Rules regulations of housing	(Ibem and Aduwo 2013) (Hale et al. 2019)
3	Shared neighbourhood facilities	(Hur and Morrow-jones 2008) (Markoc and Cinar 2017) (Christian 2002)
4	Management and Maintenance	(Ibem and Aduwo 2013)
5	Views from Apartment	(Howley 2010)
6	Travel Distances to work and to friends and family	(Ibem and Aduwo 2013) (Hur and Morrow-jones 2008) (Markoc and Cinar 2017)
7	Friends & family staying in same colony/ Sense of belonging	(Etminani-Ghasrodashti, Majedi, and Paydar 2017) (Hur and Morrow-jones 2008) (Markoc and Cinar 2017) (Hale et al. 2019) (Umoren 1992)
8	Religious affiliation/ ethnicity/ racial mix	(Howley 2010) (Hur and Morrow-jones 2008) (Umoren 1992)
9	Community gatherings/ festivals/ family programs	(Ibem and Aduwo 2013) (Hale et al. 2019)

TABLE 4. MAPPING OF ESTEEM NEEDS

TIER4	ESTEEM NEEDS	AUTHOR OF REFERRED RESEARCH PAPER
1	General appearance / Glamourous building	(Hur and Morrow-jones 2008) (Rajiv et al. 2015)

2	Recreational activities	(Ibem and Aduwo 2013) (Rajiv et al. 2015) (Hale et al. 2019)
3	Customization opportunities	(Chadeneau et al. 2014) (Zavei and Jusan 2012)
4	Proud feeling	(Hale et al. 2019)

TABLE 5: MAPPING OF SELF-ACTUALIZATION NEEDS

TIER5	SELF-ACTUALISATION NEEDS	AUTHOR OF REFERRED RESEARCH PAPER
1	Growth Opportunities	(Hale et al. 2019) (Zavei and Jusan 2012) (Umoren 1992)
2	Spiritual places/ yoga / gym	(Hale et al. 2019) (Umoren 1992)
3	Overall satisfaction / self-fulfilment	(Alborz and Berardi 2015) (Christian 2002) (Umoren 1992)
4	Satisfaction derived by being useful to society	(Hale et al. 2019) (Christian 2002) (Umoren 1992)

Based on mapping a questionnaire was formulated and for Opinion Survey, Likert-scale is most frequently used to measure psychological constructs where satisfaction and importance of certain parameters can be measured. Participants (construction industry professionals) were asked to show their views on level of importance of parameters as perceived by them. The participant had to rate each question on five-point scale as below:

1. NI – 1 Point
2. SI – 2 Point
3. MI – 3 Point
4. I – 4 Point
5. VI – 5 Point

The Questionnaire has 6 sections. Section 1 is about details of respondents and Sections 2 to 6 are the research questionnaire with total 60 questions

Composition of questionnaire was as below

1. Questions based on Physiological Needs: 18 questions
2. Questions based on Safety needs: 13 questions
3. Questions based on Love and Belonging needs: 19 questions
4. Questions based on Esteem needs: 6 questions
5. Questions based on Self-Actualization needs: 4 questions

In order to build a holistic view, it is essential to have expertise from diverse fields from the construction industry. Hence, the following stakeholders were considered for opinion survey. The professionals identified were as follows:

1. Academician
2. Professional Architect
3. Professional Engineers

4. Green Building experts
5. Developers / Builders / Contractors

The opinion survey was floated online through the medium of google forms. A total of 150 professionals were considered and the link to google form was shared with them to collect response. The valid responses of 101 from 150 professionals were analyzed. The distribution of these responses of different professionals is as follows:

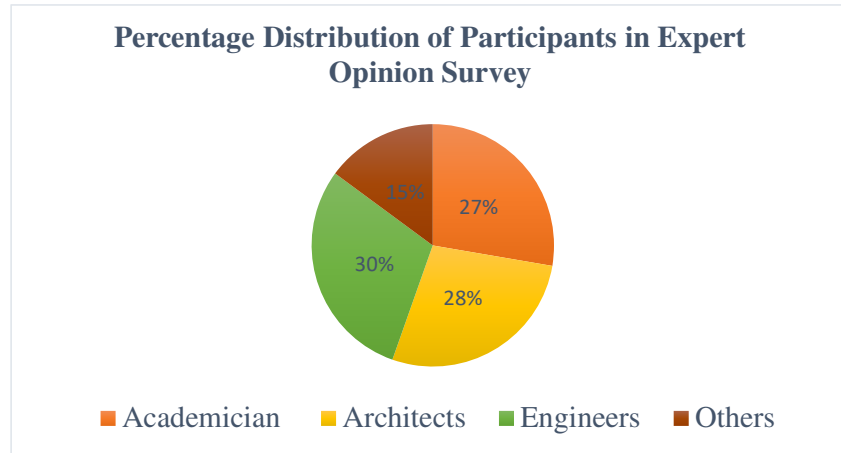


FIGURE 1: PERCENTAGE DISTRIBUTION OF PROFESSION OF PARTICIPANTS IN EXPERT OPINION SURVEY

3.0 STATISTICAL ANALYSIS OF OPINION SURVEY:

The statistical analysis of the opinion survey was done on IBM, Statistical Package for the Social Research (SPSS Statistics) Version 20.0 Following tests were conducted on the SPSS statistics.

TEST 1 : RELIABILITY OF QUESTIONNAIRE OF EXPERT OPINION SURVEY:

Reliability examines whether information gathered in survey is consistent.

Objective: To check the reliability of questionnaire.

Responses of Academician, Architect, Engineer and other were studied

TABLE.6 : RELIABILITY STATISTICS

Reliability Statistics	
Cronbach's Alpha	N (number of items)
0.957	60

Result: As reliability statistics i.e., Cronbach's Alpha should be minimum 0.7, for calling it a reliable questionnaire. In our case it is 0.957, which shows all responses are statistically consistent. Reliability of all questions is found to be 0.957 which is significant. All questions are well design and responses are consistent The questionnaire for professional's opinion survey is reliable

TEST 2: VALIDITY TEST OF QUESTIONNAIRE OF PROFESSIONAL'S OPINION SURVEY

Validity refers to the degree to which an instrument accurately measures what it intends to measure. Possible validity range is 0.0 to 1.0, where 0.0 is weak validity and 0.5 is moderate validity and 1 depicts maximum validity.

Therefor the questionnaire for opinion survey is valid. Table 7 and table 8 shows the validity test.

TABLE 7: VALIDITY OF QUESTIONNAIRE AS PER STATE OF PARTICIPANTS

Responders	Maharashtra	Delhi	Other	Overall ranks
Maharashtra	1			
Delhi	0.8610	1		
Other	0.8610	1	1	
Overall ranks	0.9283	0.9831	0.9831	1

From the above table 7the thinking of responders from Maharashtra, Delhi and other states are significantly associated

TABLE 8: VALIDITY OF QUESIONNAIRE AS PER PROFESSIONS OF PARTICIPANTS

Responders	Academician	Architect	Engineer	Other	Overall
Academician	1				
Architect	0.9454	1			
Engineer	0.9247	0.9511	1		
Other	0.9037	0.9443	0.9125	1	
Overall	0.9639	0.9845	0.9673	0.9681	1

From the above Table 8, thinking of respondents with various professions such as Academician, Architect, Engineer and other are significantly associated.

4.0 CONCLUSIONS:

The green rating systems in India as well as across the globe are generally environment centric. That gives very little to no weightage to the users' need, and thus are not user centric, yet. The tools need to be designed to explore users' satisfaction in all the type of buildings including green rated buildings. Getting right insights on resident satisfaction is quite depends on the methodology used for assessing their satisfaction. Hence, a suitable methodology was developed to get right residents' feedback on green parameters and linked with physiological and psychological needs to make the insights more users' centric.

In that attempt, the results of test 1 (the questionnaire) is found to be quite reliable. This is since all the building constriction professionals provided opinions were very slightly differed. Similarly, the result of Test 2, (the questionnaire) for Opinion Survey is found to be valid. The test was run across different geographical locations (Maharashtra and Delhi) in India having significant cultural difference, however, no significant difference was found in their opinions.

Keeping the opinions of different professionals (Academician, Architects, Engineers, Green raters and Builders) related to construction industry and opinion survey across culturally different geographies indicated that the methodology is robust and can be further extended to gather insights on residents' satisfaction in non-green as well as green buildings ratings. This help in encouraging green building construction in India from industry, environment as well as residents' satisfaction point of view, which could be a need of time in future.

5.0 FUNDING AND/OR CONFLICTS OF INTERESTS/COMPETING INTERESTS

Funding and/ or Conflicts of Interests/ Competing Interests: Authors have no competing interest/ conflict of

interest, as the work is self-funded.

Significance Statement: The study can be used to understand similarities and differences between the opinions of various professionals related to construction industry. Further to it, a tool in the form of structured questionnaire can be directly used to calculate residents' satisfaction, the dimension which is not yet included in green ratings, which further can make green rating systems more user centric.

Originality: This paper is part of an ongoing doctoral research on Assessment of resident's satisfaction in green rated apartments in urban India, at Department of Architecture and Planning, Visvesvaraya National Institute of Technology, Nagpur, India.

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