

Accessibility and Usability of Sustainable Green Buildings: A Case Study On Hyderabad, Pakistan.

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Abstract: The right of access and availing the available facilities are foundational and fundamental right of each living man on earth. This right can be ensured by removing all such barriers and hurdles which make the access of people difficult or impossible. Sustainable designs (SD), green building and healthy designs, are the ideas which may bring evolution in the daily life of people on earth and somehow may contribute in making a life easier of PWDs. This research paper mainly gives attention to universal design for all and its findings can be implemented in buildings design and buildings for frequent public use. The upcoming urban planning have special concerned that in future cities, towns and basic infrastructure and services must be friendly to prevailing environment, easy to access, simple and smart in use and inclusive for the use of all along with the disable people who are the part and parcel in the fabric of natural society. The aim of this research is to assess the satisfaction, perceived by public satisfaction of four public buildings at Hyderabad city. Total sixteen attributes were assembled into two components, i.e. External environment and internal environment. Data were collected from 120 respondents and analyzed using respondent satisfaction index and examination index. Furthermore, the findings of this study show that the respondent has low levels of satisfaction with public buildings, followed by the external environment and internal environment. Hence, this ongoing research leans to bridge the deficit that presently found in prevailing public buildings' condition in Pakistan. Furthermore, this study provides main variable's of respondents' satisfaction which will guide the private agencies and government. Moreover, it will improve the overall condition of government and private building by providing a policy framework.

Keywords: Accessibility, sustainable design, town planning, urban infrastructure, environmental barrier.

1. Introduction

The right of accessibility and enjoying facilities are foundational and fundamental right of each living man on earth. This right can be provided by removing all such barriers and hurdle which make the access of people difficult or impossible [20] Although we are living in the modern age of development yet there is much to be done in town planning and in the basic structure of building design so the right of accessibility and equality can be ensured in true sense. Sustainable designs (SD), green and healthy designs, are the ideas which may bring evolution in the daily life of people on earth and somehow may contribute in making a life easier of PWDs [9].

This paper discusses an ongoing research on universal design for all and its findings can be implemented in buildings design and buildings built for frequent public use [21] Research and studies on such topics have contributed to the improvement of the global accessibility system in developed Countries as well as in developing countries. The areas of study include accessibility issues in the Current accessibility system and in Sustainable development (SD) as it was inculcated and promulgated by the steps taken for

health building and congress of Green Buildings (Chiang, 2005). In order to achieve meaningful and useful outcomes of this research it includes site observation, facilities measurement and photographic documentation. This research will be conducted in five significant public buildings in this city, Hyderabad. The findings of this study may use as reference, in the work of Architecture, Designers and building management in providing adequate accessible for the buildings' visitors.

2. Related Work

In past large number of organizations has worked on this issue such as international conference of sustainable building and the international conference of sustainable city. While SD can be problematic; however, if there is no connection between a sustainable building and it's Accessibility, including safety and usability by people [22] Importantly, the New Urban Agenda needs to ensure that future cities, towns and basic urban infrastructures and services are more environmentally friendly, accessible, user-friendly and inclusive of all people's needs, including those with disability (HABITAT III, 2016) [01] accessibility

is fundamental needs for all and disabled persons. Overall, the idea is to recognize that, disability results from the interaction between a person's and environmental barriers that hinders their full and Effective participation in society on an equal basis with persons has no disability [2].

(PWDs of Malaysia strongly encourage the Universal design (UD). in term of protection of environment and social equity PWDs Act are supportive in nature by all means [22]. this ultimate research brings forward the keen analysis that in what manners these two ideas of sustainable development and multiple laws are confirmed, compromised or complemented by bringing the accessibility in use at large to all people with the help of uniform building By- law" (UBBL) [23] in sustainable green buildings. Further, all the miscellaneous findings of this research will facilitate the current and future development.

3. Methodology

Hyderabad is one of the largest city of Sindh, which is ranked at 2nd In Area and Population too, while it is ranked at 7th in the entire country in both aspects. District of Hyderabad has four Talukas. Currently, the city of Hyderabad is facing immense problems related to the public satisfaction level and in the future the population of Hyderabad will cross the line and reach at 0.9 million, in accordance with the last census of 2017 in Pakistan.

The total population of the District, Hyderabad, is 1.7 million, among which the 60.07% had become the urbanized area that makes it 2nd most urbanized district of Sindh after Karachi in accordance with the (2007-2027). The researcher selected 4 public buildings office of National Database and Registration Authority (NADRA), Civic Center, Passport Office and Dawood center are selected to analysis, the key feature that can improve and enhance the satisfaction level for all.

4. Conceptual Frame Work

Accessibility is fundamental needs for all and disabled persons. Overall, the idea is to recognize that, disability results from the interaction between a person's and environmental barriers that hinders their full and Effective participation in society on an equal basis with persons has no disability (Hussein, 2012).

5. Explanation

These are sixteen attributes taken from the literature review that includes External Barrier free Walkway, External Step Ramp, External Ramp, External Staircase in internal elements there are Building Entrance Door, Room & Space, Barrier Free Toilet, Internal Step Ramp, Internal Ramp, Internal Staircase, Lift, Special Phone, Directional Signs & symbols, Guiding Block, Restaurant & cafeteria, Seating and Rest Area.

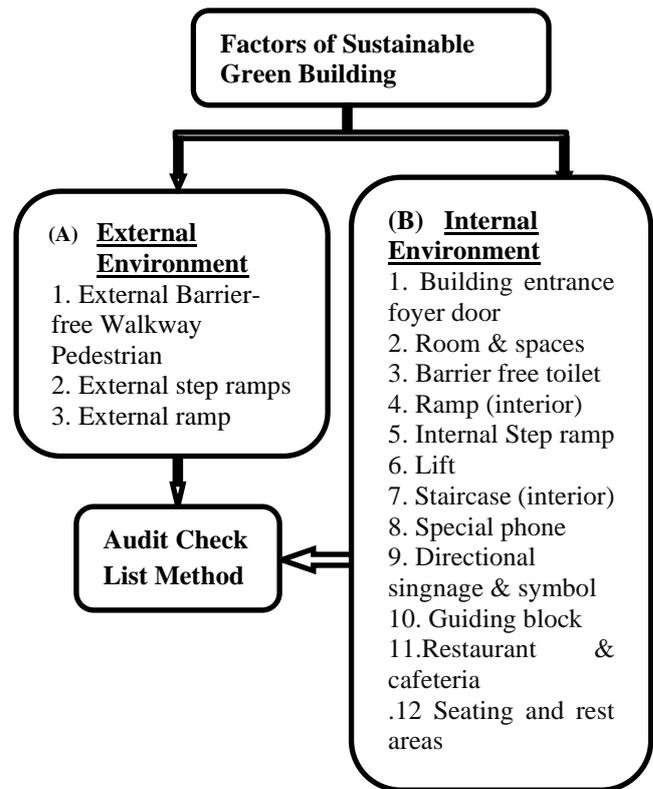


Fig. 1 Explaining the variables of Building and Method adopted to check level of satisfaction.

6. Sampling Design

The study evaluated the level of accessibility and usability of some public buildings in City, Hyderabad. It investigates the levels of satisfaction among the multiple users or visitors belong to different age group who visits these five public buildings very frequently. It inquires whether these public buildings have or have not certain elements which support services, public facilities and social environment regarding accessibility and usability by all. If these buildings occupy such certain element so what are their satisfaction level in accordance with the user and visitors of the buildings. From a detailed literature review the attributes, of a public building which possess the adequate level of accessibility and usability, were identified. In this research, the method of random sampling was used to select the samples for questionnaire survey. These four public buildings were critically analyzed by making a number of visits according to their categories.

The primary methods of data collection were utilized to measure the objectives the Own-Established questionnaire was utilized to gather the information, which contain mainly two parts. Part 1: The elements of external environment. Part 2: The elements of internal environment which are further sub-divided into a different attribute which collectively provides an effective accessibility system viable for its large and beneficial usage in public buildings. The Likert scale, set as "5"= Very Satisfied, "4"= Satisfied, "3"= Slightly Satisfied, "2"= Disappointed and "1" Extreme Disappointed, that was used to estimate the Satisfaction level in multiple

public buildings and Public office's' attributes. The benefit of Likert scaling is very vast because it can be used for getting better result, while it's difficult to form and it allows aims and objectives related to the Accessibility and usability is used to investigate the level of satisfaction, however the number of ways were used in data analysis in which the descriptive, audit checklist (based on personal observation), Mean Scores, Multiple linear Regression model (using Likert scale for easement of respondent and to collect true and related data were included.

TABLE 1

Sample Size							
S. No	Building Types	Names of Building	Estimated visitors/Week	Estimated Visitor/day	Sample size	Fraction of Respondent Selection	Random number to select a respondent
1	Public Building	Civic Center	3500/5	700/30	30	23	12
2	Public Building	Passport Office	1400/5	280/15	15	18	9
3	Public & Private Building	State Life	3000/5	600/25	24	24	14
4	Commercial Building	Dawood Center	6160/7	880/40	22	22	11

7. Selection of Components and attributes for public building satisfaction

External environment, External Ramp, pedestrian walkway, External step Ramp, are in common observation together with External staircase while. Internal environment, Restaurant & Cafeteria, guiding block, Symbols and Directional Sign, Special telephone, Lift, Staircase, Internal Ramp, Internal Step Ramp, Corridor, Fire escape, Urinal Area, Barrier Free Shower Area, Barrier Free Toilet, Room & Space, Door, Building Entrance Foyer and others. Photos were taken captured and videos were recorded in order to make keen and detailed analyses of the dwelling facilities and present condition of three Government building and offices were assessed.

Respondent Satisfaction Index:

Overall satisfaction level index in actuality that represents by sum of sources that were allocated to each attribute and element for overall level of Satisfaction.

$$Slr = \frac{\sum_{i=1}^{N1} external + \sum_{i=1}^{N2} internal}{\sum_{i=1}^{N1} External + \sum_{i=1}^{N2} Internal} \times 100 \quad (1)$$

The above formula is used to find out overall level of satisfaction of the respondent that is clearly presented in the index of satisfaction level; N1, N2, N3, N4, ... and... Nn are few factors of quality determined for measuring satisfaction level of each attribute for sustainable building. However, *external* and *Internal* shows the real score of a respondent to the variables of public buildings and $\Sigma External$ and $\Sigma Internal$ illustrates the total score selected for the variable in the buildings attributes.

8. Examination Index

The Examination index (EI) is used to decide the particular characters of all four selected buildings. This is specially

aimed at investigate the satisfaction of respondents regarding the conditions and the provision of facilities in four selected buildings. This examination index empowers us to differentiate between the factors which are halting the accessibility and usability of the building and at the same time it explains how some certain factors facilitate the accessibility and usability. To figure out the EI, the five-point Likert scale was used and then the total was duplicated by 100 as spoken and discuss by the Ogu 2002.

$$EIx = \frac{\sum_{i=1}^N ayx}{\sum_{i=1}^N Ayx} \times 100 \quad (2)$$

The Examination index is about the variable that was related to the satisfaction level of experiencing people. While on other hand ay_0x is the real score taken on the basis of respondent's observation in designing five point Likert scale. With the help of y_{th} respondents and x_{th} variables. In the above mentioned formula 'A' determines the maximum possible score and the respondent y_0 could give to the variable x in the Likert scale having five points for expressing the satisfaction level. The examination of such elements was divided into three major areas. That is calculated in percentage as (80%-100%) is considered positive, (60%-79%) is moderately positive and (20%-59%) falls into the negative category.

9. Results and Discussion

By using equation 1 and 2, the public buildings satisfaction with each component were found. (Table 2) shows the residential satisfaction of the respondents with the sixteen public building environment attributes that are grouped in two components, consisting public buildings characteristic are external environment and internal facilities for environmental. This is shown by the index of examination of each element's which reflect the entire level of satisfaction and level of dissatisfaction of respondents to the building.

The public building has levels of satisfaction of overall external environment (54.8). Whereas the examination index of public building characteristics shows that the respondents are very low level of satisfied with the external staircase is (38.2) with the use of a staircase, staircase for PWD, and. Riser and tread of staircase. (Table 2A) shows Whereas with from the external environment, respondents are moderately satisfied with the barrier free walkway (65.0) with the space of walkways and smoothness of walkways. And level of satisfaction of overall internal environment is (54.0) whereas the examination index of public building characteristics shows that the respondents are very low level of satisfied with the internal seating area and rest area is (20.0) with use of space for seating. Whereas with from the internal environment, respondents are moderately satisfied with the building entrance door (68.0) with use of space for a door and comfort uses at the time. (Figure 2) shows the mean score for selected four attribute were analyzed separately and the Bar Charts were formed to determine the result.

Hence, that includes External Barrier free Walkway, External Step Ramp, External Ramp, and External Staircase and (Figure 3) shows the mean score for selected four attribute were analyzed separately and the Bar Charts were formed to determine the result. Hence,It has detailed result of first four internal attributes in the list of internal attributes that are Building Entrance Door, Room & Space, Barrier Free Toilet and Internal Step Ramp (Figure 4) give the clear picture about the satisfaction level of internal attributes including internal ramp, internal staircase, lift and special phone (Figure 5) Shows has detailed information regarding the last four internal attributes that are Directional sign & Symbols, Guiding Block, Restaurant & Cafeteria and Seating Area.

TABLE 2 percentage of satisfaction level of respondents regarding External Elements.

External Elements (Attributes) of Selected All Buildings.							
S.No	Satisfaction With	VD	D	SS	S	CS	Exam
1	Satisfaction with the provided space of Walkway	6.4	18.2	36.4	33.6	5.5	65%
2	Satisfaction with smoothness of walkway's surface	7.3	16.4	30.9	32.7	12.7	65%
Barrier Free Walkway							65%
1	Satisfaction level of usage of Step ramp by PWDs and PWNDs	--	--	--	--	--	--
2	Satisfaction level with the rise and tread of Step Ramp	--	--	--	--	--	--
External Step Ramp							
1	Satisfaction with the elevation and comfort ability of Ramp by all age groups	10.9	14.5	33.6	32.7	8.2	62%
2	Satisfaction with the elevation and comfort ability of Ramp by PWDs	9.1	16.4	27.3	35.5	11.8	64%
3	Satisfaction level with the width of Ramp	10.9	20.9	17.3	29.1	21.8	66%
External Ramp							64%
1	Satisfaction level of the use of Staircase	3.6	14.5	10.0	23.6	11.8	33%
2	Satisfaction level of the of staircase by PWDs	5.5	11.8	20.0	17.3	9.1	40%
3	Satisfaction level with the Riser and tread of Staircase	5.5	17.3	11.8	20.0	9.1	40%
External Staircase							38.2%
Overall satisfaction level of respondent							54.8%

TABLE 3 Percentage of satisfaction level of respondents regarding Internal Element

Internal Elements (Attributes) of Selected All Buildings.							
S.No	Satisfaction With	V	D	S	S	CS	Exam
1	Satisfaction level with the provided space for door	10.9	13.6	28.2	20.9	26.4	67%
2	Level of Comfort regarding door's usage at the time of emergency	3.7	13.6	20.0	48.2	10.9	68%
Building Entrance Door							68%

1	Satisfaction level of provided internal Space	10.0	11.8	20.9	46.4	10.9	67%
2	Level of comfort about the size of chamber	10.0	15.4	26.4	32.7	15.5	65%
Room & Space							66%
1	Level of comfort with the design of Toilet	20.0	23.6	12.7	21.8	8.2	46%
Barrier Free Toilet							46%
1	Satisfaction level of usage of Step ramp by PWDs and PWNDs	--	--	--	--	--	--
2	Satisfaction level with the rise and tread of Step Ramp	--	--	--	--	--	--
Internal Step Ramp							
1	Satisfaction with the elevation and comfort ability of Ramp by all age groups	8.2	30.9	22.7	27.3	10.9	60%
2	Satisfaction with the elevation and comfort ability of Ramp by PWDs	10.0	30.9	26.4	23.6	9.1	58%
3	Satisfaction level with the width of Ramp	18.2	20.9	19.1	26.4	15.5	60%
Internal Ramp							59.5%
1	Satisfaction level of the use of Staircase	4.6	20.8	31.8	30.0	11.8	64%
Internal Staircase							64%
1	Satisfaction level with the barrier free design of lift and space	2.7	10.9	21.8	28.2	13.6	54%
Lift							54%
1	Level of satisfaction regarding the usage of phone	--	--	--	--	--	--
Special Phone							
1	Satisfaction level of Pasted and fixed Directional and instructional Signs	5.5	38.1	29.1	25.5	1.8	56%
2	Level of Standard regarding Signs	5.5	23.8	31.8	28.2	10.9	63%
3	Level of Necessity of Signs & Symbols	7.3	15.5	31.8	30.9	14.5	66%
Directional signs and Symbols							61.6%
1	Satisfaction of Guidance by Guiding Blocks	--	--	--	--	--	--
2	Satisfaction level of its signs and usage	--	--	--	--	--	--
Guiding Block							
1	Satisfaction level of provided	7.2	19.5	15.5	3.6	--	20%

	space for Cafeteria									
2	Level of Accessibility regarding easiness by all age groups in	7	2.	5	15.	4	16.	6.4	--	62%
Restaurant & Cafeteria								41.4%		
1	Satisfaction level with the provided space for Seating	9	0.	8	11.	4	16.	5.5	1.8	20%
Seating Area and Rest Area								20%		
Overall Satisfaction level of Respondent								54%		

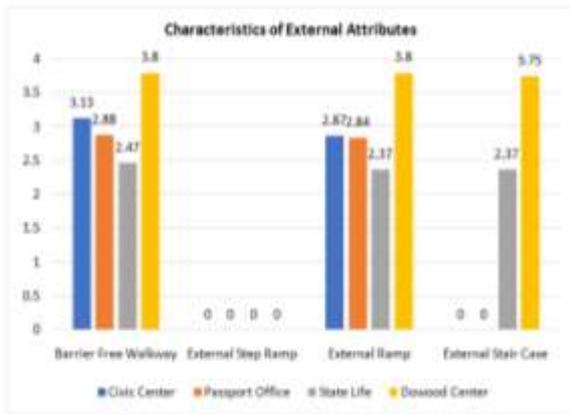


Fig. 2 Characteristics of External Attributes

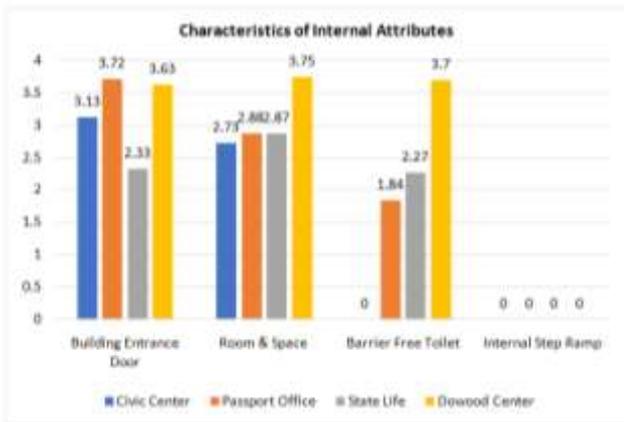


Fig 3 Bar chart of Characteristic of Internal Attributes

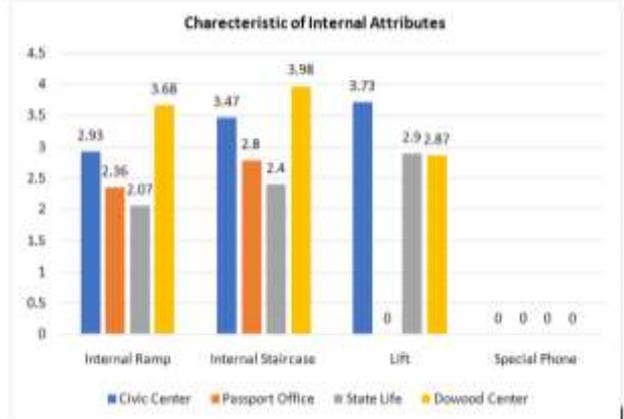


Fig 4 Bar chart of Characteristic of Internal Attributes

Hyderabad is one of the largest city of Sindh, which is ranked at 2nd In Area and Population too, while it is ranked at 7th in the entire country in both aspects. District of Hyderabad has four Talukas. Currently, the city of Hyderabad is facing immense problems related to the public satisfaction level and in the future the population of

Hyderabad will cross the line and reach at 0.9 million, in accordance with the last census of 2017 in Pakistan.

The total population of the District, Hyderabad, is 1.7 million, among which the 60.07% had become the urbanized area that makes it 2nd most urbanized district of Sindh after Karachi in accordance with the (2007-2027).

The researcher selected 4 public buildings, office of National Database and Registration Authority (NADRA), Civic Center, Passport Office and Dawood center are selected to analysis, the key feature that can improve and enhance the satisfaction level for all.

TABLE 4

Sample Size							
S. No	Building Types	Names of Building	Estimated visitors/Week	Estimated Visitor/day	Sample size	Fraction of Respondent Selection	Random number to select a respondent
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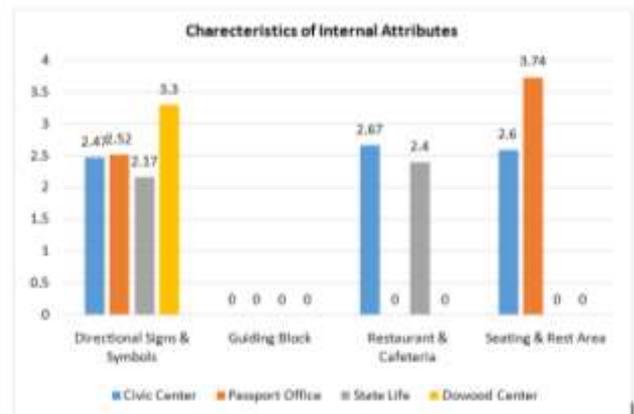


Fig 5 Bar chart of Characteristic of Internal Attributes

10. Conclusion

This study evaluated the performance of four selected public buildings at Hyderabad city. This information can be used to improve the level of satisfaction of respondents. It examines that how many respondents are satisfied at what level and what are the important variables that may increase the satisfaction level of visitors in four public buildings general public facilities. The respondents are moderately satisfied with the existing provision in four public buildings. All the external and internal attributes of building regarding the public facilities such as external barrier free pedestrian walkway, External step ramps, External ramp, External staircase, Building entrance foyer Door, Room & spaces, Barrier free toilet, Internal step ramp, Internal Ramp,

Internal Staircase, Lift, Special Phone, Directional signage & symbol, guiding block, Restaurant & cafeteria, Seating and rest areas were found negatively, moderately and positively correlated with respondents satisfaction. However, the attributes like Barrier Free Toilet, Restaurant & Cafeteria, and Seating & Rest area were found negatively correlated with overall respondents' satisfaction. While the attributes like Guiding Block, External Step Ramp and Special Phone are of great concern and were found highly negative respond with the overall level of respondents' satisfaction because these particular three attributes were not found in any building at all that reflects the glaring satisfaction deficit among respondents and the satisfaction of respondents variance in all four public buildings. However, the development of new public buildings and public offices in Hyderabad needs continue satisfaction related investigation of public satisfaction with the reference of provided facilities and it must bring in use for the satisfaction level of the new public need. Hence, this research tilted to fill the gap that currently exists in the public building's condition in Pakistan. Furthermore, this study provides main variables of respondents' satisfaction which will guide the private agencies and government. Moreover, it will improve the overall condition of government and private building by providing a policy framework.

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