

Adaptation of Sensory Evaluation Technique to Collection of Real Estate Data

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Abstract

Scarcity of data on office property has resulted into various methods of data collection by office real estate researchers. Some of these methods have been found to have shortcomings. Therefore this paper proposes adaptation of sensory evaluation as an alternative technique to collection of office data. Five estate surveyors and valuers are trained as assessors in sensory evaluation of office attributes. The training of the assessors spanned four Saturdays. At the end of the training pilot survey was conducted to evaluate discriminating ability and inter-raters reliability of the assessors. The assessors discriminating ability and consensus on measurement of attributes were found to be adequate. It was concluded that sensory evaluation technique can be used in collection of real estate data.

Keywords: Sensory Evaluation, Measurement, Discriminating Ability, Inter-rater Reliability.

1. Introduction

Data on office property is not readily available; various methods that have been used to measure office attributes include presence or absence of attributes, on site assessment of attributes, interview of focus group and stake holders in office property and rating scales. Earliest office studies used dummy variables to represent office quality factors.^{1; 2} Some studies assessed office quality factors based on nominal scale and one quality standard for each office factor.^{3; 4; 5} Dummy variable and nominal scale only measure presence or absence of one quality standard of factors in consideration. They cannot measure gradation in quality standards of office factors. Measurement of variations in qualities of an office factor is important in portraying true quality differentiations Related to assignment of nominal scores to office factor by analysts is assignment of self defined weights to office quality factors.³ The basis upon which the weights are determined is not stipulated, this can preclude replication of the method which is a fundamental quality of scientific studies.

Assessments based on descriptive quality of office factors normally stipulate quality categories for each of the factors without assigning any scores to the quality categories.^{6; 7; 8} Descriptive stipulation of quality categories for of office factors can pose problem of statistical analysis as most statistical analysis require assignment of numerical values to variables. Moreover, only one quality standard are stipulated for each of the factors that can

preclude consideration of possible variations in qualities of the factors that are necessary for portraying true quality differences.

Related to descriptive categorisation of office quality factors is rating scale that assessed the quality of office factors without assigning rating scores to the rating categories.⁹ The rating categories ranged from poor to excellent without assigning any score to the rating categories. Their assessment method is an improvement to measurement by dummy variable, nominal scale and descriptive stipulation of quality standards as gradation in quality standard are taken into consideration. However, not assigning scores to rating categories is a defect of their method. Rating categories without assignment of scores cannot be subjected to statistical analysis such as computation of reliability and validity of scale items.

Other reported rating scale methods used to assess office quality factors include Service Tool Method (STM), Real Estate Norm (REN) and Building Quality Assessment (BQA).² STM involved non-expert to assess the discrepancies between office users' needs and qualities of 340 CBD offices attributes using rating scale with rating categories ranging from 1 – 9. REN also involved non-expert to assess users' needs and other property management services using 135 office attributes on a scale categories ranging from 1-5. BQA involved experts to assess the qualities of 129 attributes CBD offices based on site inspection using rating scale with categories ranging from 1 – 10. One shortcoming related to both REN and STM is that the non-experts are not trained before they are used; this could lead to improper use of the scale that can in turn introduce errors in their assessments. The common shortcoming to the three scales is that the validity and reliability of the scale that can be used to assess the adequacy of the scale are not reported.

Professional groups of office building owners, office users, office property managers and designers were used to assess the importance of office attributes in contributing to quality of CBD offices.² The rating scale used has rating categories ranging from equal importance to absolute importance with rating scores ranging from 1 – 5. Although the members of the focus group are familiar with office property attributes and self administered questionnaires are used to clarify issues that might not be understandable to the respondents. Nevertheless, the content validity and inter-raters' reliability of the scale that could be used to assess the adequacy of scale item and consistency of the raters are not reported.

2. Review of Sensory Evaluation Technique

2.1 Introduction

Sensory evaluation technique is a method used to measure human perception of product and service quality. It is a science that uses senses of sight, smell, taste, touch and hearing to measure, analyze and interpret perceived sensations.^{10; 11} Measurement of product attributes and dimensions could be measured by sensory evaluation approach.^{10; 12; 13} Office property has been observed to be complex products as they composed tangible and intangible characteristics.¹⁴ The tangible characteristics are structural components such as walls, floors, ceilings etc. While intangible characteristics are constructs or abstract dimensions of physical components such as: appearance (size, shape, color); value (monetary or social); quality (aesthetic and functional efficiency) etc. Therefore sensory evaluation technique could be an effective method to measure office attributes and dimensions.

Sensory evaluation technique involves quantitative descriptive analysis (QDA) that can be used to adequately measure dimensions of office characteristics that may vary between offices. Related empirical studies to this approach in real estate used field inspection to assess the quality of house surroundings such as landscaping, privacy, traffic noise, view and neighbourhood condition on a continuous scale with scores ranging from 1-5.¹⁵ Another related study used visual appraisal to assess building qualities, in which field observers are used to rate the quality of buildings based on seven points scale ranging from highly appropriate to very inappropriate.¹⁶ The building quality dimensions used are context, routes,

interface and grouping with statements generated to measure the dimensions. His rating technique generated ordinal scores.

Quantitative descriptive analysis (QDA) involves training of individuals to be able to identify, perceive and quantify sensory properties of a product and to use line scale as a measuring instrument.^{13; 17; 18} The essence of training is to reduce variability in the assessors assessments.¹¹ Quantitative descriptive analysis is developed because the existing rating scales can only produce nominal and ordinal levels of measurement that cannot meet the assumptions of multivariate statistics. Line scale that is used as instrument of measurement in QDA is able to produce interval level of measurement, a requirement for using multivariate statistics.¹⁷ A line scale is also considered superior to categorical scale as it can reduce bias by not limiting the respondents to few categories as it provides a wider continuum to accommodate more independent judgment from respondents.^{12; 18}

A line scale is normally a horizontal line of 15cm long with anchor points located at 1.5cm from each end of the scale, with or without middle anchor point. The left anchor normally represents the lowest score (lowest intensity) and scale magnitude increases towards the right anchor that represents the highest score (highest intensity). The middle anchor is to guide the respondent to locate the middle point of the scale. The respondent evaluation of an attribute is indicated on the scale by placing a vertical line along the scale. The score for the respondent is extracted by measuring the distance from the left anchor to the vertical line.^{17; 18} Figure 3.2 is a diagram of line scale with the left anchor of “Very Low”, the middle anchor of “Moderate” and the right anchor of “Very High”.

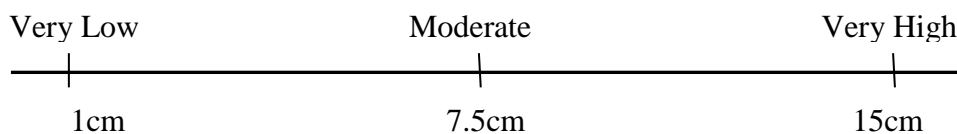


Figure 1: Line Scale

Source: 17

2.2 Implementation of QDA

Training and selection of assessors (data collection personnel) are important steps in sensory evaluation technique. The steps involved in implementation of QDA according to are:^{19; 13}

- a) Recruit subjects for sensory evaluation training
- b) Screen the subjects to assess their sensitivity to product differences.
- c) Train the selected subjects on sensory evaluation and use of line scale,
- d) Generate variable descriptors.
- e) Develop line scale using the descriptors.
- f) Test the sensory evaluation ability of the assessors.
- g) Select the final assessors to be used in sensory evaluation based on their performance in the test.

Implementation of quantitative descriptive analysis requires recruitment of subjects to be used in assessment or evaluation of objects. As a guide the initial recruitment should be 150 percent of the required number of assessors as it is reported from experiences that 30 percent of the initial recruits usually fail the screening tests.^{18; 20} Initial recruitment is based on subjects' availability, interest, health, sensitivity to product differences and prior knowledge of the products to be evaluated.^{18; 19} Subjects are thereafter screened on 18-30 different products discriminating tests, to assess subject sensitivity to product differences. The subjects that are able to identify above 65 percent in the screening discriminating tests are selected for

training.^{12; 18; 19} Training of the subjects starts with product orientation in which the subjects are required to generate descriptors of the attributes of the product that are to be measured.¹⁸

Reference samples can be provided to guide the assessors in generating the descriptors. The second stage in training is decision and agreement among the assessors on precise definition of descriptors and the number of descriptors to be used. The descriptors generated are normally used to develop line scale meant for measuring attributes.^{18; 21; 22}

The third stage in training of the assessors is to instruct them on the usage of line scale and developed descriptors by using sample products. The duration of the training sessions is normally determined by the complexity of the products and the stage at which the assessors have acquired enough competence in the usage of the line scale.¹² The fourth stage in training is the evaluation of their performance in which the assessors are given products to evaluate using the line scale. Evaluation is to determine individual assessor's ability to discriminate, to respond consistently and to agree with other assessors' descriptors scores.^{17; 23; 24} Assessor that is found not to be competent enough in use of scale in sensory evaluation is normally subjected to further training.

Evaluation is a measure of reliability and validity of the assessors, the descriptors and the line scale as measuring instrument. Therefore evaluation is a crucial step in qualitative descriptive analysis and statistical methods are used in evaluation. Evaluation of individual assessor's ability to discriminate between products using a descriptor requires estimation of One-Way or Two-Way Analysis of Variance (ANOVA) on replicated scores of products that exhibit differences in intensity. If the *F* statistic test for difference in mean scores for the products is significant, then an assessor can be adjudged to have discriminating ability.^{18; 19; 24; 25}

Evaluation of an assessor's ability to respond consistently is measured by computing the standard deviation (SD) of assessor's scores from replicated tests. A large figure of standard deviation indicates that the assessor is not consistent in scoring. Sometimes ANOVA or mean square error (MSE) statistics could also be used to evaluate an assessor scoring reliability.¹⁸

Evaluating individual assessor's ability to agree with the panel on descriptors' scores is an assessment of validity of the descriptors and accuracy of the assessor. If the scores for a descriptor varied a lot among the assessors for the same products; it might be that the descriptor could not discriminate variation in intensity or the descriptor is not well understood by the panel.¹⁸ If the scores of an assessor for descriptors are different from that of other assessors, it means that he has low discriminating ability. The simple method of testing consensus of scores among the assessors is to compute the mean and standard deviation of scores for each assessors and each descriptor and compare them with the whole panel mean and standard deviation. If the difference in statistics is not much, it can be concluded that there is consensus in scores.^{12; 18}

Correlation coefficient between individual product mean score for an assessor and the mean score for the rest of the assessors can be computed. Correlation coefficient greater than 0.5 percent indicate consensus in scores among the assessors.^{18; 25}

The method of sensory evaluation method will be adapted in training the assessors to collect data for this study.

3. Materials and Method

Training of assessors was based on adapted sensory evaluation technique QDA training as discussed in Section 2. Table 3.1 contains definition of variables used that include variable names, symbols and description.

Five assessors with qualifications ranging from higher diploma to first degree in estate management with professional registration with minimum of four years experience were used. The valuers used as assessors were workers in the Federal Ministry of Works and Environment Abuja. The training sessions were organized for a period of four Saturdays

beginning from 9th January 2010 to 30th January 2010. The material used for training included six laptop computers, sample photographs of office buildings, the draft questionnaires and a station wagon car that can accommodate six persons.

The training sessions were conducted in the meeting room of an estate surveyor and valuer office in Abuja. At the beginning of the first session the sample photographs and the questionnaires were saved in the laptop computer for each of the assessors. The purpose of the training was introduced; this was followed by scrolling through the sample photographs and the questionnaires. The copies of questionnaires are presented to the assessors to determine the relevancy of their items to office quality in the study area. Some items of questionnaires that they did not agree to be relevant to the office market in the study area were removed from questionnaires. The line scale was introduced and the method of administering line scale was also discussed.

Table 3.1: Definition of Variable

No	Variable	Symbol	Description
1	Location	LOCA	Attributes included agglomeration, access road quality, public transportation, security and safety of neighborhood and proximity to complementary uses
2	Façade Presentation	FACPR	Aesthetic qualities of arrangement of structural elements (outer beams, columns and railings), window and door openings; quality of finishes and maintenance standard.
3	Internal Presentation	INPRE	Attributes included aesthetic quality finishes of internal walls, floors, ceilings and their maintenance standard. This only for common areas like entrances lobby and passages.
4	Functionality	FUNC	Attributes are level of open floor design, adequacy of separation of common areas from users workspaces, adequacy of way-finding elements (directional landmarks and signs) and adequacy of conference room
5	Services	SEVR	The attributes are sources and adequacy of supply of electricity, ventilation system, information technology system (IT); and adequacy of internal circulation system (lifts, stair cases passages and lobbies)
6	Surrounding quality	SURQL	The attributes included quality of car park, aesthetic quality of landscaping, cleanliness.
7	Management quality	MANQL	The attributes are users' assessment of effectiveness of property manager and promptness of manager to the request.

Aesthetic evaluation of characteristics of office property was also introduced in the first section as some of the office building characteristics involved aesthetic evaluation. The training started by introducing elements of buildings that contribute to aesthetic value of buildings identified by ²⁶ that include, stone, bricks, wood panels, that are arranged in such a way to form patterns with various visual texture to arouse aesthetic experience of observers. Other elements of aesthetic that include colour, tones composition and shape as identified by ²⁷ were also introduced.

Aesthetic perception training method was based on method of ²⁷ that involved two steps which are identification of elements and recognition of patterns formed by the arrangements of the elements that arouse the interest of observers. The integration of the elements can lead to patterns that are symmetrical, united, homogenous, rhythmical, simple or complex.²⁸ With this initial background, the assessors were instructed to view one office sample photographs in their laptops to view the arrangements of each elements of façade such as railings, columns, beams, windows and finishes to assess the pattern formed by each elements as their pattern arouse their interests. The assessors were then instructed to rate each elements on line scale. The rating scores of the assessors were then compared to assess discrepancies in their scores. Two more sample photographs were used for exercises in façade assessment and field trip to an office for on the site assessment concludes the sessions.

The second Saturday was devoted to training on aesthetic quality of internal wall, floor and ceiling and landscape. Four sessions were used for training with one session for each of the office quality attributes. Explanations were given on the elements such as paint finishes, floor tiles, carpets and rug; wall paints, tiles, carpets and rugs and ceiling board, tiles and paint finishes. The patterns to assess were homogeneity or variation in paint finishes as they contribute to aesthetic quality; arrangements of tiles, carpets mosaic and ceiling boards together with homogeneity and/or variation in tiles ceiling board colors that contribute to aesthetic quality of floors, wall and ceilings. Sample photographs of floors, walls and ceilings were used for illustration. Thereafter assessors were given two sample photographs for each of the floor, wall and ceilings to assess and mark the assessments on line scale.

Also assessors were instructed to focus on landscape elements such as flowers and trees within office surroundings. They were to consider shapes, homogeneity and variation in colours, arrangements that portrays visual pattern that stimulate affections to assess landscape aesthetic quality. Sample photographs of office surroundings with landscape were used for illustrations. Thereafter two sample photographs of office surroundings with landscape installed in the laptops were presented to the assessors to assess as an exercise. The day session came to an end after field trip to do on the site assessment of office attributes discussed in the training sessions.

The third Saturday sessions involved instructions and field trips. Instructions in the first session involved instruction on wayfinding elements such as directional signs and office plan indicating different space uses and door labels that guide visitors to locate particular office space and user. Sample photographs were used as illustration materials and instructions were that assessor should use the signs to locate three office users within an office and assess the easiness at which the sings have assisted them in locating the users. Other items of questionnaires that photographs cannot portray such as cleanliness of office surroundings, location attributes, and interview of office users on quality of services, amenities and management are discussed in the second session. One office was visited to demonstrate the use of questionnaires on wayfinding and instructions on other questionnaires items. Two other offices were visited for assessors exercise on the day instructions. After going through the assessments of the assessors' assessment of items that showed wide discrepancies among the assessors' scores were discussed to enhance their understanding.

The fourth Saturday, pilot survey was done to obtain data from five offices with rent range of ₦5,000.00 – ₦35,0000.00 (Nigerian currency) for validity and reliability estimates. The five properties are categorized into four rent groups. Two offices with rent values of ₦5,000.00 and ₦6,000.00 are grouped together to represent offices with lowest rent and quality. Three other offices with rent values of ₦18,000.00, ₦25,000.00 and ₦35,000.00 were included to represent offices in medium, higher and highest rent hence quality categories respectively. Based on method of ²⁴ One-way analysis of variance was used to assess the criterion validity of the panelists that measured combined discriminating ability of the panelists. The panelists' total scores on seven variables (location, façade presentation, internal presentation, functionality, services, surrounding and management quality) used for site assessment represented independent variable while the above mentioned four office rent groups represented the factors.

4. Results and Discussion

The hypothesis was that if the assessors and variables were good discriminators of office qualities; the panelists' mean scores on the variables for the four categories of offices should differ. The criterion validity test that measured the combined discriminating ability of the assessors was found to be satisfactory. The calculated F ratio was 45.44 and p value of 0.000 with 3 and 21 df. This indicated a significant level beyond 0.05 level of significance. This suggested that panelists and the variables are able to discriminate between the four office quality categories. Post hoc comparison (Scheffe) indicates that the panelists' mean scores on the variables were all different for the four office rent groups. The panelists' mean variable scores for offices in the lowest rent and quality group to the highest rent and quality groups were 390.11, 417.72, 451.24 and 481.54 in that order. Inter-rater reliability that measured the agreement of scores of panelists on each variable used one-way analysis of variance (Armstrong, 1999 and Armstrong et. al., 2004). The statistics tested whether significant differences did exist among the mean scores of the panelists on each variable.

Table 4.1 presents the result of test of inter-rater reliability. It indicated that there were no significant differences in the mean scores of the panelists on each of the seven office variables that required on the site assessment by the panelists. The computed F statistics ranged from 0.52 to 0.18 with all p values greater than 0.05 level of significance. These suggest that there was concordance in the rating scores of the panelists in all the variables.

Table 4.1: ANOVA Test of Inter-raters' Reliability

No	Variable Symbol		Sum of Squares	df	Mean Square	F	Sig.
1	LOCA	Between Groups	55.26	4	13.81	.12	.97
		Within Groups	2256.62	20	112.83		
		Total	2311.88	24			
2	FACPR	Between Groups	17.70	4	4.43	.18	.95
		Within Groups	503.86	20	25.19		
		Total	521.56	24			
3	INPRE	Between Groups	12.89	4	3.22	.08	.98
		Within Groups	776.97	20	38.85		
		Total	789.86	24			
4	FUNC	Between Groups	189.35	4	47.34	.25	.91
		Within Groups	3837.82	20	191.89		
		Total	4027.18	24			
5	SERV	Between Groups	110.97	4	27.74	.05	.99
		Within Groups	10695.98	20	534.80		
		Total	10806.95	24			
6	SURQL	Between Groups	4.44	4	1.11	.05	.99
		Within Groups	424.66	20	21.23		
		Total	429.10	24			
7	MANQL	Between Groups	13.84	4	3.46	.17	.95
		Within Groups	404.43	20	20.22		
		Total	418.27	24			

5. Conclusion

This study adapted sensory evaluation technique to collection of data on office properties by training assessors on sensory evaluation of office attributes. Pilot survey was conducted after the training to assess discriminating ability and inter-raters' reliability of the assessors; the results of the assessments were found to be adequate. This finding suggests that sensory evaluation technique can be adapted in data collection in real estate study.

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