The Q-Sort method: Use in Landscape Assessment Research and Landscape Planning[1]

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Abstract: The assessment of visual quality inherently involves the measurement of perceptual response to landscape. The Q-Sort Method is a psychometric technique which produces reliable and valid interval measurements of people's perceptions of landscape visual quality as depicted in photographs. It is readily understood by participants across a wide range of age groups and cultural backgrounds, and it provides data which can be mapped within a region and/or statistically compared to various social and physical dimensions.

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The Need for Psychometric Methods

The assessment of visual resource values in landscape planning encompasses, by definition, an investigation of a fundamental relationship between an observer and a landscape being observed. Litton, et. al {1974) suggests that aesthetic response to landscape is produced by the interaction of three factors: Characteristics of the observer (e.g., viewing and/or use expectations, environmental disposition, ethnic and demographic characteristics, etc.); characteristics of the landscape being observed; and the physical and behavioral context in which the observation occurs.

In the course of several centuries of practice, landscape architects and others have developed a body of theory to deal explicity with aesthetic response to landscape. Much of this theory is based on the premise that the visual field received by the human eye consists of patterns of lines, planes, forms, textures, colors, light and spaces which all may vary according to direction or orientation, shape and size. Pleasing composition is hypothesized to occur when these design elements, with all of their infinite variations, are selected and organized according to the principles of unity, variety, dominance, balance and rhythm (see Craves 1951). At the risk of over-simplifying a fairly complex set of relationships, it is theorized that the basic goal of good composition is to provide enough variety to hold interest, command attention and provide stimulation within a unified context that forces all parts of a design to read as a single entity.

Developed in part to predict perceptual response to (and guide design of) small parcels of land, these theories have recently been extended to the assessment of visual quality in large scale regional landscapes (Zube, et al. 1972; Fines 1968; Litton, et al. 1974; and USDA - Forest Service 1974). All of these models are based on two underlying assumptions:

1. The assessment of visual quality can be explained predominately in terms of the physical elements of the landscape being evaluated; and
2. The perception of landscape visual quality is consistent across all socio-economic and cultural classes in society.

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The testing of these assumptions has been attempted in several recent landscape perception studies. General support exists for the assumption of concordance among the perceptions of diverse groups of people (Daniel and Boster 1976; Zube 1973; and Zube et al. 1974). However, discretion must be exercised in the extension of these findings throughout society. For example, in a comparison of the perceptual responses of 13 demographically defined groups to landscapes in the Connecticut River Valley, Zube et al. (1974) found strong agreement among the perceptual response patterns of all but one group. Inner-city residents of Hartford, Connecticut consistently gave responses that varied from those of the remaining 12 groups.

Several studies have attempted to develop empirical models to explain perceptual responses to landscape in terms of the physical dimensions of the landscape being observed (Shafer, et al. 1969; Zube et al. 1974; Crystal and Brush, 1978). From a research perspective, the findings are impressive. The predictive strengths of these models vary from 66 to 77 percent. However, in a management context, the application of even the strongest of these models means that 23 percent of the time, the model user will not be able to predict accurately perceptual responses.

The existence of idiosyncratic perceptions of landscape values among certain groups in society and the relative inaccuracies inherent in current landscape perception models suggest the need for psychometric methods that will enable the visual resource manager to inventory quickly and accurately the perceptions of people observing the resource being managed. Schomaker (1978) notes that, in addition to providing a means for testing the assumptions of visual resource management models, psychometric methods also possess strong utility as a tool for participatory planning and decision-making.

Purposes of Paper

The purposes of this paper are to present:

1. Desired attributes of psychometric methods for use in landscape planning and landscape assessment research.

2. The Q-Sort Method as a psychometric method for assessing visual quality in the landscape.

3. An analysis of the strengths and weaknesses of the Q-Sort Method.

DESIRED ATTRIBUTES OF PSYCHOMETRIC METHODS FOR LANDSCAPE ASSESSMENT

In a research context, Daniel and Roster (1976) note that psychometric methods for landscape assessment must be both reliable and valid measures of people's perceptual responses to landscape. In a management context, one should add the dimension of utility as a desirable characteristic of psychometric methods. Resource managers face the dilemma of obtaining accuracy in landscape measurement at a. reasonable cost.

Reliability of Psychometric Measurements

For a psychometric method to be reliable, it must be capable of producing consistent results in different applications to the same landscape. Different applications to the same or similar observer populations must also produce consistent results (Daniel and Boster, 1976). Reliability in the context of landscape assessment has several dimensions including:

1. If slightly different views of the same landscape are presented to the same population of observers, will the method produce consistent evaluations?

2. If the same landscapes and views are presented to randomly selected sub-sets of the same population, will the responses be consistent?

3. To what extent does the range of landscapes being presented to an observer affect the observer's evaluation of a given landscape? For example, if the presentation of five landscapes as part of larger collection of 10 landscapes significantly alters the relative values that would normally he ascribed to these five landscapes when presented as a discrete set, the measurement system is probably unreliable.

Validity of Psychometric Methods

The use of any measurement system implies an assurance that the system does, in fact, measure that quality it purports to measure. For example, measurement of air temperature requires the use of a thermometer; a hygrometer will produce measurements of a quality related to air temperature, but it will not measure temperature. Psychometric methods of visual quality assessment must elicit evaluative responses to the visual attributes of landscape. They must avoid confusing visual quality assessments with observer preferences or assessments of resource use potentials (Craik 1970).

In addition to actually measuring the quality they purport to measure, psychometric methods of landscape assessment must also provide meaningful differentiation in the measurement of visual quality. They must do more than sort the beautiful from the ugly. They must provide guidance in the evaluation of landscapes in the middle of the beautiful-ugly continuum, a spot shared by a large majority of the nation's landscape.

Finally, any underlying assumptions involved in the use of a psychometric method must be explicitly stated and tested for validity.

Utility of Psychometric Methods

To have value as a research and/or planning tool in landscape assessment, psychometric methods must be both reliable and valid; but they must be useful to the manager/researcher and understandable by the people whose perceptions the methods elicit.

Utility for the Manager/Researcher

From a management perspective psychometric methods of landscape assessment can be evaluated in terms of the extent to which their results are compatible with and/or comparable to other methods of resource assessment. Does a given method produce results which are mappable and/or capable of being included in resource management decision-making? Researchers are interested in the nature of the data produced by a method (nominal, ordinal, interval or ratio) and the extent to which the results of a given method can be statistically analyzed and related to other aspects of the aesthetic experience (i.e., various landscape and/or human dimensions).

For both managers and researchers, questions concerning ease of administration and total cost are relevant. How much previous knowledge and/or training is required to administer a given method adequately? What are the costs of obtaining usable data from the method in terms of materials, data analysis sophistication and time?

Participant Understanding

The utility of any psychometric method ultimately depends upon the extent to which it can efficiently elicit perceptual responses. Methods requiring lengthy explanations or the completion of many complex tasks may frustrate participants, lowering the quality as well as quantity of responses. Methods involving use of abstract concepts may prove unsuitable for use with certain demographically or culturally determined groups of people. Furthermore, instructions for the use of psychometric methods must be understandable, and participation in landscape assessment projects employing psychometric methods must be at least nonthreatening and, ideally, enjoyable.

DESCRIPTION OF THE Q-SORT METHOD

Evolution from Personality Assessment Research

The Q-Sort Method originated as a technique of personality assessment (Stephenson, 1953,and further described in Block, 1961). For personality assessments, descriptions and evaluations of a subject's personality are obtained from a group of trained panelists. A series of personality description statements are typed separately on cards. Each panelist is given a set of the cards and asked to consider the extent to which each statement is characteristic of the subject being evaluated. Each panelist sorts the cards into a prescribed number of piles ranging from most descriptive to least descriptive of the subject. The piles represent points along a continuum describing relevance to the subject. Each pile is assigned a numerical value which is ascribed to all statements placed in the pile. Upon completion of the sorting of statements by all panelists, the values assigned to each statement are summed across panelists. A mean value is calculated for each statement to indicate the extent to which it is characteristic of the subject in the combined perceptions of panelists. Various statistical analyses (e.g., correlation, regression, and factor analysis) are applied to the mean values to explore personality dimensions of an individual and to compare personalities of different subjects.

Use of the Q-Sort Method (the prefixing letter "Q" has no special significance) requires resolution of two fundamental issues: how many piles should be used?; and should any limits be placed on the distribution of the sorted items among the piles, and if so, what is the most desirable structure of this distribution? Miller (1956) postulates that none of the human senses can discriminate sensory perceptions into more than five to nine categories. This suggests that nine might he an upper limit on the number of piles. Lower limits must be established on the basis of the number of items to be sorted and the level of differentiation that is desired among items. As the number of piles increases, so does the potential for finer discrimination among items.

Use of forced distributions (i.e., prescribing the number of items that must be placed in each pile) as opposed to unforced or free distributions has been criticized as an unnecessary and unnatural constraint on panelist decision-making. In defending the use of forced distributions in personality studies employing the Q-Sort Method, Block (1961, p. 78) notes:

1. The unforced Q-sorting procedure obscures recognition of the correspondences existing among evaluations of personality where the forced Q-sorting procedure permits a clear assessment of the degree of equivalence.

2. The unforced Q-sorting tends to provide fewer discriminations than the forced Q-sorting procedure and consequently is more susceptible to the Barnum effect, the tendency to say very general and very generally true things about an individual.

3. The unforced Q-sorting is not more reliable than the forced Q-sorting, even though with the latter procedure judges are forced to make discriminations they otherwise are inclined not to offer.

4. The unforced Q-sorting does not appear to provide information not also available and more easily accessible through the forced Q-sorting procedure.

S. The unforced Q-sorting procedure provides data which are unwieldy and at times impossible to work with where the forced Q-sorting procedure provides data in a convenient and readily processible form.

Block also notes (1961, p. 79) that the form of this distribution is not critical. He has found a unimodal distribution most useful because it forces more decisions at the extremes of the concept being explored.

Adaptation of the Q-Sort Method to Landscape Assessment

In adapting the Q-Sort Method for use in landscape assessment, the subject of evaluation shifts from an individual's personality to a concept describing visual response to the landscape. Terms such as scenic quality (Zube, et al., 1974) scenic beauty (Daniel and Roster 1976) or simply beauty (Zube and McLaughlin 1978) have been used as descriptors of this concept. Rather than sorting personality description cards based on their relevance to an individual's personality, panelists sort landscapes according to the extent of their scenic value, scenic beauty, etc. In contrast to its personality assessment counterpart, the landscape assessment Q-Sort Method does not insist upon high levels of training among panelists. Part of its utility is that it is readily adaptable for use by just about everyone with visual acuity.

An explicit and valid (Shafer and Richards 1974; Zube et al. 1974) assumption inherent in the use of the Q-Sort Method is that visual response to landscape photographs is consistent with visual response to actual landscapes. The physical impossibility of comparing and sorting large numbers of actual landscapes in the field makes this a necessary assumption. Regular and wide-angle or panoramic photographs may all be used. Photographs are enlarged (e.g. to a 5" x 7" format) and mounted on cardboard for durability. Depending upon the extensiveness of the assessment project, multiple sets of the mounted photographs may be developed.

Panelists are given a photographic deck and asked to sort the photographs into a predetermined distribution based on the scenic or visual quality associated with the landscape depicted in each photo. In studies involving 307 subjects sorting 56 photographs into seven piles, the authors (Zube et al. 1974) have found the following per-pile distribution and set of instructions to be useful.

Pile	1	2	3	4	5	6	7
Number of Photographs	3	7	11	14	11	7	3

> Please sort the fifty-six photographs into seven piles according to the scenic quality of the landscapes in the photos. In pile number 7, place the three landscapes that you think have the highest scenic quality. In pile number 1, place the three landscapes that you think have the lowest scenic quality. From the remaining fifty landscapes place the seven with the highest scenic quality in pile number 6 and the seven with the lowest scenic quality in pile number 2. You will now have the thirty-six landscapes; place the eleven with the highest scenic quality in pile

number 5 and the eleven with the lowest scenic quality in pile number 3. Place the remaining fourteen landscapes in pile number 4. The number of photographs to be placed in each pile also appears on the pile identification cards on the table in front of you. You may rearrange the photographs until you are satisfied with their placement, but make sure you place the specified number of photographs in each pile.

Values are assigned to the piles along the the continuum of lowest scenic quality (value = 1) to highest scenic quality (value = 7). The values assigned each photograph are summed across panelists, and a mean scenic quality value is calculated for each photograph.

EVALUATION OF THE Q-SORT METHOD

As described previously, psychometric methods of landscape assessment must possess three inherent characteristics: Reliability (the ability to produce consistent results); validity (they must measure the concept they purport to measure); and utility (both to the method's user and to its participants). As described below, the Q-Sort Method possesses varying amounts of all three attributes.

Reliability of the Q-Sort

Method Effects of View Variation

The effects of slight variation in view presentation on the consistency of results produced by the Q-Sort Method have not been rigorously tested. However, in a deck of 56 photographs sorted by 307 subjects, Zube et al. (1974) included three sets of essentially matching landscape pairs. In each case, photographs were taken either across the street from each other or from two points separated only by a few yards distance. All three pairs were obtained from relatively homogeneous landscapes (in terms of land form and land use/cover). The scenic quality means of each photograph within all three pairs, as obtained from the sortings of 307 participants are consistent. For one pair, the means are identical.

Pair Number	Scenic Quality Mean[3/]	
	Photo I	Photo II
I	3.48	3.16
1I	2.58	2.58
III	3.82	3.76

Effects of Subject Variation

To examine the consistency of the Q-Sort Method when used by different sub-sets of the same population, Zube et al. (1974) asked three matching pairs of subject groupings to sort the same deck of 56 photographs. While no two groups of people are ever going to be completely identical, it was assumed that people in a similar occupational status exhibit commonality. Pair I contained two groups (N=27 and 33, respectively) of men and women who are employed as natural resource managers by various government agencies (e.g., Soil Conservation Service and USDA-Forest Service). The second paring contained two groups (N=27 and 28) of male and female clerical personnel working for the same company. Pair III contained two groups (N=22 and 23) of professional landscape architects and students of landscape architecture. As illustrated below, strong correlations exist between each matched pair, implying that strong consistency was obtained in separate application of the Q-Sort Method to subsets of the same population.

Population Group	Correlation Coefficients[4/] of Paired Groups
Natural Resource Managers	.96
Clerical Personnel	.85
Landscape Architects	.94

Effects of Contextual Variation

The absolute value of the scenic quality means produced by the sorting procedures are hound to he affected by two factors: the number of piles into which the photographs are sorted (this determines the potential range of the means); and the range of landscapes included in the photographic deck. However, the absolute values of any psychometric method of landscape assessment indicate nothing other

[3/] Potential range of Means is 1 to 7. Actual range for 56 landscapes is 1.44 to 6.45, as derived from 307 subjects.

[4/] Pearsons r. ($p \leq .001$).

than the position of a given landscape with respect to other landscapes. The real issue is whether the relative positioning of landscapes (as measured by the psychometric method) is altered by the context (i.e. range of landscapes) with which they are presented.

To answer this question, Anderson et al. (1976) included the 56 photographs initially developed by Zube et al.(1974) in a deck of 217 photographs. The larger deck of photographs was sorted by 30 participants into seven piles with a per-pile distribution as follows:

Pile	1	2	3	4	5	6	7
Number of Photographs	15	25	40	57	40	25	15

The correlation coefficient (Pearson's r) between the mean scenic quality values of the 56 photographs obtained from the initial study (N=307) and the values obtained for the same photographs from the subsequent study (N=30) is .92 ($p<.001$). Thus, the relative positioning of the 56 landscapes was unaltered by the expanded context in which they were subsequently evaluated.

Validity of the Q-Sort Method

As a Measure of Visual Quality

Visual quality is an abstract concept. As such, it is difficult to determine whether a psychometric method actually measures visual quality in the landscape. One approach to this issue is to compare the results obtained from one method to those obtained from other methods when the same views of the same landscapes are shown to the same subjects.

In their study of scenic quality in the Connecticut River Valley, Zube et al. (1974) used three formats to elicit perceptions of scenic quality. Eight panoramic photographs of rural landscapes were shown to 184 subjects. The subjects were asked to describe each landscape using a series of seven point semantic scales (Osgood et al. 1957). Included in this scale was the continuum beautiful-ugly. After completing the scales for all photographs, subjects were asked to rank-order the eight scenes from highest to lowest scenic quality. Finally, wide angle photographs of each scene were included in a deck of 56 photographs Q-sorted by each subject following the Q-Sorting procedures described earlier.

A mean semantic scale response to each panoramic photograph was calculated over all 184 subjects. Mean scenic quality values for each of the eight photographs were also calculated based on results of the Q-Sort. Both sets of means were rank-ordered and compared to each other and to the rank-ordering of the panoramic photographs. The Q-Sort data are highly correlated with those of both the semantic scale and the panoramic photograph rank-ordering. These data suggest that the Q-Sort Method is measuring a concept similar to those involved in the use of the beautiful-ugly scale and the straight rank ordering for scenic quality.

Mode of Analysis	Correlation Coefficients[5]		
	SS	PA	QS
Semantic Scale (SS)	--	.99	.97
Panoramic Rank-ordering (PA)		--	.97
Q-Sort (QS)			--

To differentiate meaningfully various levels of visual quality, the distribution of values produced by psychometric methods must be distributed among all points on the measurement scale being used. For example, if in evaluating 100 landscapes on a seven point scale, the combined responses of 20 participants produces a. distribution in which 10 landscapes fall on the highest point of the scale, another 10 fall on the lowest point, and the remaining 80 receive a value of four (the midpoint), the scale does nothing more than differentiate the extremely beautiful from the extremely ugly. It provides no guidance in evaluating visual quality between the two extremes.

To a certain extent, the distribution of values produced by the Q-Sort Method will be a function of the distribution that is specified in the sorting instructions. The specification of a forced normal distribution in sorting procedures will tend to provide a normal distribution in responses. The distribution of responses obtained from the sorting of 56 photographs by 307 participants (Zube et al. 1975) is illustrated below. A bell-shaped distribution was prescribed for each participant in the sorting instructions. The pattern of the observed distribution obtained from the combined sortings of all 307 participants resembles that of the individually prescribed distribution except that its kurtosis is higher and it does not cover the highest point on the scale. While a pronounced clustering of values is apparent in the middle points of the scale for the observed distribution, this clustering is spread over three scalar values, indicating a measure of differentiation within the cluster.

[5] Spearman's r.($p\leq .01$)

Scale Value	Percent of Photographs Included	
	Prescribed Distribution for each Participant	Observed Distribution from 307 Participants
0.50-7.0	5.44	0.04
5.50-6.49	12.5	3.6
4.50-5.49	19.6	32.1
3.50-4.49	25.0	37.6
2.50-3.19	19.6	19.6
1.50-2.19	12.;	5.3
0.5 -1.49	5.4	1.8

Utility of the Q-Sort Method

To the User

Within a region where visual resources are being inventoried as a first step in the management process, photographs may he randomly selected following procedures outlined by Daniel and Roster (1976). The photographs could then be Q-Sorted by various types of user groups or by a randomly drawn sample of a given population. The means obtained from the sortings of the photographs by the participants could be treated as data points on a statistical surface that describes visual quality within the region. The characteristics of this statistical surface could then he mapped to illustrate regional variations in visual quality'. Through the use of marker scenes (i.e. scenes that are repeated in various Q-Sort decks of photographs) visual quality variations among regions could be analysed.

In a research context, the perceptions of several typos of subjects as elicited by the Q-Sort Method may he compared. Perception of visual quality may he related to specific human and/or landscape dimensions (e.g., age and education; and topography, vegetation, etc.).

Because subjects essentially administer the Q-Sort Method to themselves, it requires little in the way of administrator training. Other than the photographs, the Q-Sort Method requires no audio-visual equipment. It can be administered in any setting which provides enough room for participants to place the photographs in piles. With some mechanical ingenuity, managers and researchers could readily adapt the Q-Sort Method to an electronic response panel for use at visitors centers, community centers, etc., or for a mail survey format.

Participant Understanding

It has been the experience of the authors and others that most people asked to use Q-Sort procedures have clearly understood and enjoyed the process. The tasks required of participants are relatively simple and concrete. Subjects are asked to sort out the best and the worst from a dock of photographs, set these aside, and complete the same tasks from those that remain until the desired distribution has been obtained. Participants in research conducted by the authors seem to enjoy having the ability to proceed at their own pace, and the character of participant comments spontaneously elicited by the Q-Sort Method is diverse and rich.

CONCLUSIONS

The Q-Sort Method is not a panacea for the visual resource manager or researcher. It is but another of the psychometric methods adapted to study people's perceptions of visual quality in the landscape. Use of the Q-Sort Method relies on an inherent acceptance of photography as a landscape presentation medium and implies a willingness to accept a measure of judgemental interdependence in the sorting process.

Data produced by the Q-Sort Method are both mappable and capable of being used in parametric statistical analysis. It appears to be as reliable and valid a measure of visual quality as most other psychometric methods. The Q-Sort Method is highly transportable, and it is based on intuitively understandable and apparently enjoyable procedures which require little in the way of administrator training. While its present form limits the number of people who may simultaneously used the method, thereby restricting potential sample size, adaptations in the form of electronic response panels or mail surveys can overcome this limitation.

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