# Chapter 10

# MEASUREMENT AND SCALING IN MARKETING RESEARCH

Scaling is the generation of a broadly defined continuum on which measured objects are located (Peterson, 2000, p. 62). In Chapter 9, we established that some sort of scale—nominal, ordinal, interval, ratio—is necessarily involved every time a measurement is made.

This chapter continues our discussion of how scales are developed and how some of the more common scaling techniques and models can be used. The chapter focuses on broad concepts of attitude scaling—the study of scaling for the measurement of managerial and consumer or buyer perception, preference, and motivation. All attitude (and other psychological) measurement procedures are concerned with having people—consumers, purchasing agents, marketing managers, or whomever—respond to certain stimuli according to specified sets of instructions. The stimuli may be alternative products or services, advertising copy themes, package designs, brand names, sales presentations, and so on. The response may involve which copy theme is more pleasing than another, which package design is more appealing than another, what do each of the brand names mean, which adjectives best describe each salesperson, and so on.

Scaling procedures can be classified in terms of the measurement properties of the final scale (nominal, ordinal, interval, or ratio), the task that the subject is asked to perform, or in still other ways, such as whether the emphasis is to be placed on subject, stimuli, or both (Torgerson, 1958).

This chapter begins with a discussion of various methods for collecting ordinal-scaled data (paired comparisons, rankings, ratings, etc.) in terms of their mechanics and assumptions regarding their scale properties. Then specific procedures for developing the actual scales that measure stimuli and/or respondents are discussed. Techniques such as Thurstone Case V scaling, semantic differential, the Likert summated scale, and the Thurstone differential scale are illustrated. The chapter concludes with some issues and limitations of scaling.

## DATA COLLECTION METHODS

Scaling methods may be classified by the level of scaling used to collect the data. In ordinal measurement methods, it is assumed that the basic data are only ordinal-scaled. Often, however,

some type of model is then applied to transform the ordinal data into an interval scale. For example, ordinal-scaled data with a given mean and standard deviation can be converted into a standard-score scale, with a mean of zero and a standard deviation of 1.0. A more general procedure allows researchers to convert to a common scale with any specified mean and standard deviation, say a mean of 50 and a standard deviation of 10 (Guilford & Fruchter, 1973). The form of distribution will not change. This procedure does not normalize the distribution; there are other procedures to do this.

In *metric measurement* methods, the respondent makes direct numerical judgments and it is assumed that the data are either interval- or ratio-scaled. In this method, models are also used at times to further refine the data. Models are typically directed toward finding the scale values most consistent with the input data. (Often the model will involve nothing more than a simple averaging of the original numerical responses.)

## Ordinal Measurement Methods

The variety of ordinal measurement methods includes a number of techniques:

- Paired comparisons
- Ranking procedures
- Ordered-category sorting
- Rating techniques

We discuss each of these data collection procedures in turn.

### *Paired Comparisons*

As the name suggests, paired comparisons require the respondent to choose one of a pair of stimuli that "has more of," "dominates," "precedes," "wins over," or "exceeds" the other with respect to some designated property of interest. If, for example, six laundry detergent brands are to be compared for "sudsiness", a full set of paired comparisons (if order of presentation is not considered) would involve $(6 \times 5) / 2$, or 15, paired comparisons. Respondents are asked which one of each pair has the most sudsiness. Obviously each respondent would have to have used each brand, perhaps set up using an experiment design. A question format for paired comparisons is shown in Table 10.1. The order of presentation of the pairs and which item of a pair is shown first typically are determined randomly. The following are the brand names (and numbers): Arrow (1), Zip (2), Dept (3), Advance (4), Crown (5), and Mountain (6).

The upper panel of Figure 10.1 illustrates how paired-comparison responses may be recorded for a single respondent. As noted from the figure, Brand 2 (Zip) dominates all the other five brands. This is shown by the fact that all of its paired comparisons with the remaining stimuli involve ls (arbitrarily letting row dominate column) in the table of original data. In the lower panel of Figure 10.1, rows and columns of the original table have been permutated to yield the stimulus rank over: 2, 1, 5, 6, 4, 3, from most suds to least suds. The total number of votes received by each brand appears in the last column.

These hypothetical data are characterized by the fact that the respondent was transitive in making judgments, leading (after row and column permutation) to the triangular response pattern of ls shown in the lower panel of the figure.

**Table 10.1** Example of Paired Comparisons Question

For each of the pairs of laundry detergent brands shown below, indicate which one has the most sudsiness:

| | | | | |
|---|---|---|---|---|
| a. | Arrow | ____ | Zip | ____ |
| b. | Arrow | ____ | Advance | ____ |
| c. | Dept | ____ | Arrow | ____ |
| d. | Crown | ____ | Arrow | ____ |
| e. | Arrow | ____ | Mountain | ____ |
| | | . | | |
| | | . | | |
| | | . | | |
| o. | Crown | ____ | Mountain | ____ |

Brand

| Brand | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | X | 0 | 1 | 1 | 1 | 1 |
| 2 | 1 | X | 1 | 1 | 1 | 1 |
| 3 | 0 | 0 | X | 0 | 0 | 0 |
| 4 | 0 | 0 | 1 | X | 0 | 0 |
| 5 | 0 | 0 | 1 | 1 | X | 1 |
| 6 | 0 | 0 | 1 | 1 | 0 | X |

Original Data

Brand

| Brand | 2 | 1 | 5 | 6 | 4 | 3 | Sum |
|---|---|---|---|---|---|---|---|
| 2 | X | 1 | 1 | 1 | 1 | 1 | 5 |
| 1 | 0 | X | 1 | 1 | 1 | 1 | 4 |
| 5 | 0 | 0 | X | 1 | 1 | 1 | 3 |
| 6 | 0 | 0 | 0 | X | 1 | 1 | 2 |
| 4 | 0 | 0 | 0 | 0 | X | 1 | 1 |
| 3 | 0 | 0 | 0 | 0 | 0 | X | 0 |

(Permutated Rows and Columns)

* A cell value of 1 implies that the row brand exceeds the column brand, "0," otherwise

**Figure 10.1** Paired-Comparison Responses for a Single Subject*

But what if the judgments are not transitive? For example, the respondent may say that Brand 2 exceeds Brand 1, Brand 1 exceeds Brand 5, and Brand 5 exceeds Brand 2, leading to what is called a circular triad. The presence of circular triads in a subject's data requires the researcher to examine two questions: (a) how serious are the subject's violations of transitivity; and (b) if not too serious, how can the data be made transitive with the fewest number of alterations in the original paired-comparisons table?

Kendall (1962) has developed summary measures and statistical tests regarding the incidence of tolerable levels of intransitivity. One may compute a coefficient of consistency and test this measure against the null hypothesis that the respondent is responding randomly. Slater (1961) and Phillips (1967) have described ways of finding the best rank order (one that least disturbs the original paired-comparison judgments) in the presence of intransitive data. Of course, the motivation for using paired comparisons in the first place stems from the researcher's interest in the consistency of respondents' choices; otherwise, the researcher might just as well have the respondent rank the six brands, thereby reducing labor (but forcing consistency within that set of choices). Obviously, from such a direct ranking, paired-preferences can be developed.

Other than the transitivity issue for more than two alternatives, there is a possibility that respondents' judgments are not consistent or stable in that they prefer Brand A to B on one trial but Brand B to A on another. In this situation there exists an underlying preference probability distribution and multiple judgments are needed (Gottlieb, n.d.)

Implicit in the preceding discussion has been the assumption that the respondent must force a choice between each pair of brands. Variations in the method of paired comparisons allow the subject to express indifference between members of the pair (i.e., to "tie" the stimuli with respect to the property level of interest) or, after having chosen between members of the pair, to indicate on an intensity scale how much the chosen member of the pair exceeds the other with regard to some designated property, such as sudsiness.

For another approach to paired comparison data collection see Exhibit 10.1.

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## **EXHIBIT 10.1** Method of Choices

This method provides a procedure for indirectly arriving at paired-comparison proportions of the form $p(B>A)$. Each respondent is presented with a set of $n$ stimuli and is asked to indicate which one appears greatest or largest on, or has the most of, the attribute or characteristic being studied. The resulting data are the frequency with which each stimulus was the first choice. For any two stimuli $X$ and $Y$, the sum of the two frequencies gives the total number or observations in which we know the result of comparing the two stimuli. The proportions of times that $X$ appeared greater than $Y$ is given by

$$p(X > Y) = \frac{f(x)}{f(x) + f(y)}$$

where $f(x)$ is the number of times $X$ was first choice and $f(y)$ is the number of times $Y$ was first choice.

For example, if stimulus $X$ was the first choice of 10 respondents and stimulus $Y$ the favored choice of 15 respondents.

$$p(X > Y) = \frac{10}{10 + 15} = .40$$

All pairs of the stimuli can be analyzed in this manner to arrive at the matrix of preference proportions.

This method has some deficiencies. In the first place, full use is not made of the ranked data that may be available—only top rankings are considered. Second, each proportion is based on different subsets of respondents. In addition, the number of observations upon which each proportion is based will differ. Third, those stimuli that never receive a first choice cannot be scaled. Finally, this method does not provide for appropriate goodness-of-fit tests (Torgerson, 1958).

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### *Ranking Procedures*

Ranking procedures require the respondent to order stimuli with respect to some designated property of interest. For example, instead of using the paired-comparison technique for determining the perceived order of six laundry detergents with respect to sudsiness, each respondent might have been asked to directly rank the detergents with respect to that property. Similarly, ranking can be used to determine key attributes for services.

In a survey conducted during the 1990s, Subaru of America asked new Subaru car purchasers questions regarding the purchase and delivery processes. One question required a ranking procedure:

> From the following list, please choose the three most important factors (other than price or deal) that attracted you to shop at this Subaru dealership. Please rank these three factors in order of importance to you by writing the number 1 in the box which was most important, followed by numbers 2 and 3 in the appropriate boxes. Rank three boxes only.
>
| | | | |
|---|---|---|---|
| a) Location ___ | b) Previous experience ___ | c) Experiences of others ___ | d) Dealer's reputation ___ |
| e) Had specific model you wanted ___ | f) Financing ___ | g) Advertising reputation ___ | h) Service ___ |

Subaru could just as easily have asked respondents to rank all eight items. One major concern in asking a ranking question is whether the number of items is too many for a person to be able to make distinctions. If it is desired that a respondent rank all items, and there are many to rank, one procedure would be to have the respondents first sort the items into a number of piles (each of which has a relatively small and equal number of items, that go from high to low. Then, the request is made to rank within each pile. Unfortunately, there is no set number of items that constitutes a maximum that people can easily handle. This will vary depending upon the stimuli (items) to be ranked, and where groupings (piles), or other aid is used.

A variety of ordering methods may be used to order $k$ items from a full set of $n$ items. These procedures, denoted by Coombs (1964) as "order $k/n$" ($k$ out of $n$), expand the repertory of ordering methods quite markedly. At the extremes, "order 1/2" involves a paired comparison, while "order $(n-1)/n$" involves a full rank order. The various ordering methods may pre-specify the value of $k$ ("order the top three out of six brands with respect to sudsiness") as illustrated by the Subaru study, or allow $k$ to be chosen by the respondent ("select those of the six brands that seem to exhibit the most sudsiness, and rank them").

### *Ordered-Category Sorting*

Various data collection procedures are available that have as their purpose the assignment of a set of stimuli to a set of ordered categories. For example, if 15 varieties of laundry detergents represented the stimulus set, the respondent might be asked to complete the following task:

> Please sort the 15 detergents into three sudsiness categories: (1) high suds, (2) moderate suds, and (3) low suds. Next, order the brands within each category from most suds to least suds.

Sorting procedures vary with regard to the following characteristics:

- The free versus forced assignment of stimuli to each category
- The assumption of equal intervals between category boundaries versus the weaker assumption of category boundaries that are merely ordered with regard to the attribute of interest

In ordinal measurement methods one assumes only an ordering of category boundaries. The assumption of equal intervals separating boundaries is part of the interval/ratio measurement set of methods. Ordered-category sorting appears especially useful when the researcher is dealing with a relatively large number of stimuli (over 15 or so) and it is believed that a subject's discrimination abilities do not justify a strict (no ties allowed) ranking of the stimulus objects. If the equal-intervals assumption is not made, it then becomes the job of the researcher to scale these responses (by application of various models) to achieve stronger scales, if so desired.

### *Rating Techniques*

Some data collection methods, most notably rating scales, are ambiguous. In some cases, the responses are considered by the researcher to be only ordinal, while in other cases, the researcher treats them as interval- or ratio-scaled. The flexibility of rating procedures makes them appropriate for either the ordinal or interval/ratio measurement data collection methods.

Rating measurement methods represent one of the most popular and easily applied data collection methods in marketing research (Peterson, 2000). The task typically involves having a respondent place that which is being rated (a person, object, or concept) along a continuum or in one of an ordered set of categories. Ratings allow the respondent to register a degree or an amount of a characteristic or attribute directly on a scale. The task of rating is used in a variety of scaling approaches, such as the semantic differential and the Likert summated scale.

Rating scales can be either monadic or comparative. In monadic scaling, each object is measured (rated) by itself, independently of any other objects being rated. In contrast, comparative scaling objects are evaluated in comparison with other objects. For example, an in-flight survey conducted by a major airline asked the following questions:

> Please rate the service you received from the airline reservations agent.

| | Among the Best | Better Than Most | About the Same as Most | Not as Good as Most | Among the Worst |
|---|---|---|---|---|---|
| Courtesy/friendliness | _____ | _____ | _____ | _____ | _____ |
| Knowledge/helpfulness | _____ | _____ | _____ | _____ | _____ |
| Efficiency on completing transaction | _____ | _____ | _____ | _____ | _____ |

The rating is monadic. The airlines then asked respondents another question:

Please rate today's fight attendants compared to flight attendants on other airlines on each of the following items.

- Courtesy/friendliness
- Assistance in cabin before departure
- Responsiveness to your needs
- Availability throughout flight
- Professional appearance
- Tray pick up after meal

Ratings would again be completed using the same five response alternatives shown above—among the best, better than most, about the same as most, not as good as most, among the worst. In this application, the rating is comparative.

Ratings are used very widely because they are easier and faster to administer and yield data that are amenable to being analyzed as if they are interval-scaled. But there is a risk that when the particular attributes are worded positively or are positive constructs, such as values, respondents will end-pile their ratings toward the positive end of the scale—this leads to little differentiation among the scores. Such lack of differentiation may potentially affect the statistical properties of the items being rated and the ability to detect relationships with other variables. McCarty and Shrum (2000) offer an alternative to simple rating. They compared two approaches to assessing personal values using rating scales. Simple ratings were compared to an approach where respondents first picked their most and least important values (or attributes or factors), and then rated them (most to least). The remainder of the values was then rated. Their results indicate that, compared with a simple rating of values, the most-least procedure reduces the level of end-piling and increases the differentiation of values ratings, both in terms of dispersion and the number of different rating points used.

Rating methods can take several forms:

1. Numerical
2. Graphic
3. Verbal

Often two or more of these formats appear together, as illustrated in Figure 10.2. As shown in Panel (a) of the figure, the respondent is given both a series of integers (1 through 7) and verbal descriptions of the degree of "gentleness/harshness." The respondent would then be asked to circle the number associated with the descriptive statement that comes closest to his or her feelings about the gentleness/harshness of the brand(s) of say, dishwasher detergent, being rated. In Panel (b) of Figure 10.2, the need is only to check the appropriate category that best expresses feelings about some attitude statement regarding dishwashing detergents, whereas in Panel (e) the category checked represents the importance of characteristics of a retail store.

In Panel (c), the figure represents a graduated thermometer scale with both numerical assignments and a (limited) set of descriptive statements. This illustrates another type of rating device. A so-called "feelings thermometer" is illustrated in Exhibit 10.2 (see p. 380) and is a type of pure numerical scale. A pure numerical version would ask respondents to rate objects on some characteristic using a scale of, say, 1 to 10, (or 1 to 100), where the number 10 (100) represents the most favorable (or most unfavorable) position. It is assumed that this numerical scale has

more than ordinal properties. This scale may properly be viewed as a metric measurement (quantitative judgment) method. Panel (d) attempts to anchor the scale using a comparison with the "average" brands. Many other types of rating methods are in use (Haley & Case, 1979).

One type of itemized rating scale that has merit in cases where leniency error may be troublesome is the behaviorally-anchored rating scale, or BARS (see Exhibit 10.3 on p. 381). This scale uses behavioral incidents to define each position on the rating scale rather than verbal, graphic, or numeric labels. The underlying premise is that response biases may emerge since scale positions on most graphic rating scales are vague and undefined. Thus, providing specific behavioral anchors can reduce leniency errors and increase discriminability. Developing scales such as these requires a great amount of testing and refinement to find the right anchors for the situation under examination.

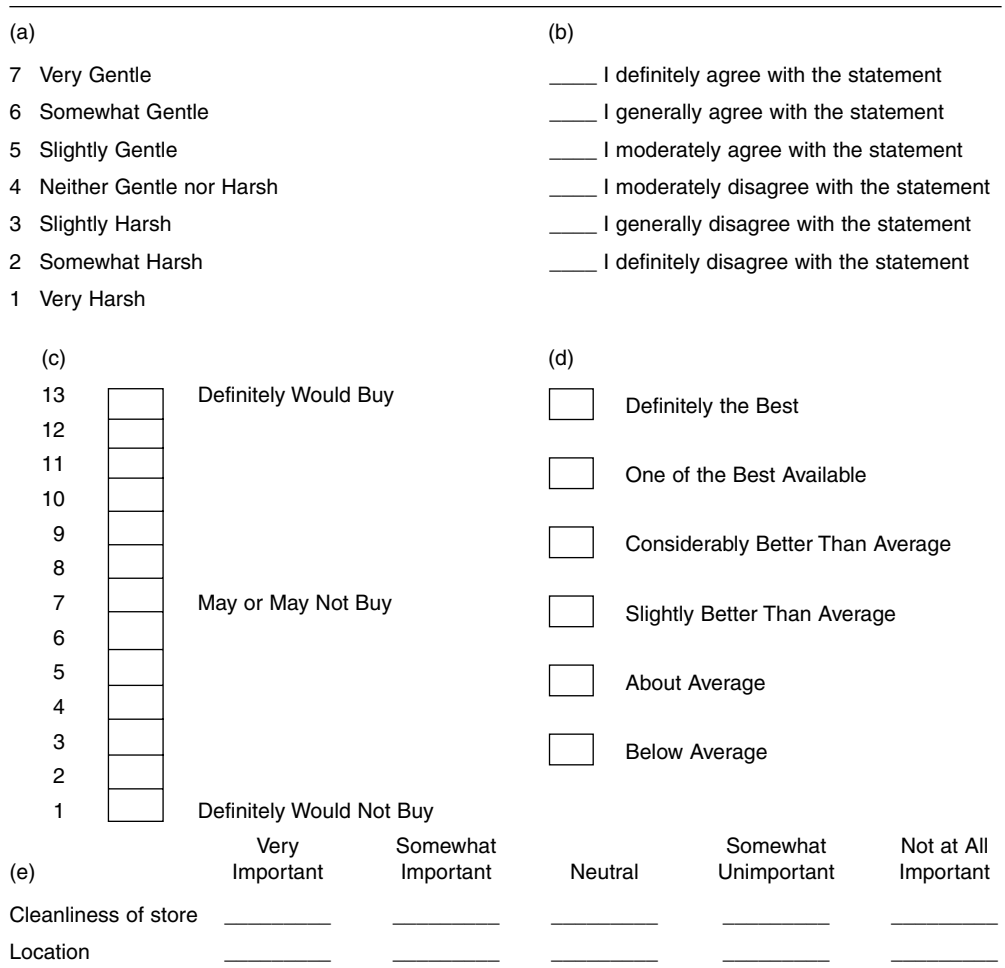



**Figure 10.2** Examples of Rating Scales Used in Marketing Research

The basic process of BARS scale development consists of four steps:

1. Construct definition—the construct being measured must be explicitly defined and the key dimensions identified.
2. Item generation—statements must be generated describing actual behaviors that would illustrate specific levels of the construct for each dimension identified.
3. Item testing—items must be tested; the purpose is to be able to unambiguously fit behavioral statements to dimensions.
4. Scale construction—the process of laying out the scale with behavioral statements as anchors follows item testing.

In following this process, sets of judges are used. It should be clear that developing BARS is a time-consuming and costly task. Thus, they should be reserved for those applied settings where they can minimize the errors they are designed to curtail, especially leniency error. As an example, families with elderly members were surveyed to determine their need for in home health-care services. BARS was used for one critical measure of how well elderly members of the household were able to perform everyday living activities:

Now about your ability to perform everyday living activities. Which of the following best describes your everyday living capacities:

- You can perform all physical activities of daily living without assistance. (Excellent capacity)
- You can perform all physical activities without assistance, but may need some help with the heavy work (such as laundry and housekeeping). (Good capacity)
- You regularly require help with certain physical activities or heavy work, but can get through any single day without help. (Moderate capacity)
- You need help each day, but not necessarily throughout the day or night. (Severely impaired capacity)
- You need help throughout the day and night to carry out the activities of daily living. (Completely impaired capacity)

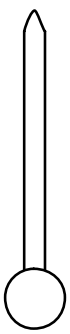
In many instances where rating scales are used, the researcher assumes not only that the items are capable of being ranked, but also that the descriptive levels of progress are in equal-interval steps psychologically. That is, the numerical correspondences shown in Panels (a) and (c) of Figure 10.2 may be treated—sometimes erroneously—as interval- or ratio-scaled data. Even in cases represented by Panels (b), (d), and (e), it is not unusual to find that the researcher assigns successive integer values to the various category descriptions and subsequently works with the data as though the responses *were* interval-scaled.

Treating rating scales as interval or even ratio measurements is a practice that is well documented and widespread. Research shows that there is little error in treating the data as being of a higher level of measurement than it is. Research evidence supports this practice, in that often when ordinal data are treated as interval and parametric analysis are used, the conclusions reached are the same as when the data are treated as ordinal and tested using non-parametric analyses.

## **EXHIBIT 10.2** A Rating Thermometer

Sudman and Bradburn (1983, p. 159) present the following rating thermometer, with an introductory statement, "We'd also like to get your feelings about some groups in American society. When I read the name of a group, we'd like you to rate it with what we call a feeling thermometer. It is on Page 19 of your booklet. Ratings between 50° and 100° mean that you feel

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A | Big Business | | | | S | Labor unions | | | |
| B | Poor people | | | | T | Young people | | | |
| C | Liberals | | | | U | Conservatives | | | |
| D | Southerners | | | | V | Women's liberation movement | | | |
| E | Hispanics/Mexican Americans | | | | W | People who use marijuana | | | |
| F | Catholics | | | | X | Black militants | | | |
| G | Radical students | | | | Y | Jews | | | |
| H | Policemen | | | | Z | Civil rights leaders | | | |
| J | Older people | | | | AA | Protestants | | | |
| K | Women | | | | BB | Workingmen | | | |
| M | The military | | | | CC | Whites | | | |
| N | Blacks | | | | DD | Men | | | |
| P | Democrats | | | | EE | Middle-class people | | | |
| Q | People on welfare | | | | FF | Businessmen | | | |
| R | Republicans | | | | | | | | |



100° Very warm or favorable feeling
85° Quite warm or favorable feeling
70° Fairly warm or favorable feeling
60° A bit more warm or favorable than cold feeling
50° No feeling at all
40° A bit more cold or unfavorable than warm feeling
30° Fairly cold or unfavorable feeling
15° Quite cold or unfavorable feeling
0° Very cold or unfavorable feeling

favorably and warm toward the group; ratings between 0° and 50° mean that you don't feel favorably and warm toward the group and that you don't care too much for that group. If you don't feel particularly warm or cold toward a group, you would rate them a 50°. If we come to a group you don't know much about, just tell me and we'll move on to the next one. Our first group is Big Business—how warm would you say you feel toward them? (Write number of degrees or DK (don't know) in boxes provided below.)"

Research on use of the feeling thermometer tends to validate its use, even though must of the variance is left unexplained (Wilcox, Sigelman, & Cook, 1989). This may be due to random noise, idiosyncratic factors hard to measure by the survey method, and a type of response set that parallels some respondents' habitual tendency to answer "yes" regardless of question type. The primary effects observed were shown to be substantively interpretable.

Since the scale has been shown to be valid for evaluating social and other types of groups, it should be of usefulness to marketing researchers. Oftentimes, target groups, segments, and so forth, are evaluated along different dimensions of interest to the marketing manager.

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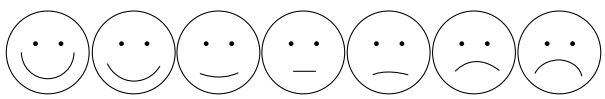
## **EXHIBIT 10.3** Measuring Preferences of Young Children Calls for Creativity

The children's market is a multibillion dollar market in direct purchasing power and an even greater market in purchasing influence. Thus, it is important that companies wishing to gain a competitive advantage in understanding and responding to children's preferences be able to measure such preferences. In a fairly recent study of companies marketing to children, the development of better measurement technique was identified as a major priority for future research by a majority of responding companies.

Among the areas of most concern are better scaling techniques for measuring children's product preferences. Widely used approaches for assessing children's preferences are itemized rating scales using a series of stars (a scale from 1 to 5 stars) or a series of facial expressions (a scale anchored at one end with a happy face and at the other end with a sad face), as illustrated below:

***A. Facial Scale***




***B. Star Scale***

***** **** *** ** *

Children are asked to indicate how much they like a product, or how much they like a particular feature of a product, by pointing to one of the visual anchors on the scale. These responses are then analyzed to determine which products children like best and which features they prefer in particular products.

Although these scales have done well in varied research applications, there are some problems that emerge, particularly when used with young children under the age of eight. A major potential problem is leniency error. This error emerges when young children consistently use the extreme positions (usually on the positive side) with relatively little use of intermediate scale positions. If this is done for all products tested, the overall sensitivity of existing (traditional) rating scales is lowered, resulting in inconclusive findings about children's preferences. Regardless of the reasons for this bias—and there are some alternative explanations—it is important that its potential for existence be acknowledged and reduced.

One type of scale that has been introduced to reduce leniency error in young children's ratings is an itemized rating scale based on the concept of behaviorally-anchored rating scales (BARS).


Behaviorally-anchored rating scales use critical behavioral incidents to define various positions on the rating scale, instead of the more usual verbal labels or graphic devices such as stars or faces. The use of behavioral anchors would appear to be useful in studying children's markets since they provide a familiar and concrete way of expressing preferences and can be readily displayed in a visual format for young children.

One illustration of behaviorally-anchored scales is a study of children's preferences for cereals in which the scale used pictures depicting sharing and shopping behavior, rather than verbal descriptions of behavior. The children studied were less than eight years of age. These two BARS were effective in lowering leniency bias when tested against the more usual facial and star scales.

The extent to which creative researchers can develop such scales for use in children's markets is almost limitless. When older children are of concern, the more traditional type of BARS (with verbalized descriptions of behavior for each scale position) can be used (Karsten & John, 1991).

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In Chapter 9 we illustrated some of the problems associated with treating ordinal data as interval- or ratio-scaled data. Although methods are available for scaling the stimuli under weaker assumptions about the intervals that separate category labels (as mentioned earlier under ordered-category sorting), in practice these methods are often cumbersome to use and, accordingly, may not justify the time and effort associated with their application. However, this should not negate the importance of being aware of the implicit assumptions that one

**Table 10.2** Issues in Constructing a Scale

1. Should negative numbers be used?
2. How many categories should be included?
3. Related to the number of categories is: Should there be an odd number or an even number? That is, should a neutral alternative be provided?
4. Should the scale be balanced or unbalanced?
5. Is it desirable to not force a substantive response by giving an opportunity to indicate "don't know," "no opinion," or something similar?
6. What does one do about halo effects—that is, the tendency of raters to ascribe favorable property levels to all attributes of a stimulus object if they happen to like a particular object in general?
7. How does one examine raters' biases—for example, the tendency to use extreme values or, perhaps, only the middle range of the response scale, or to overestimate the desirable features of the things they like (i.e., the generosity error)?
8. How should descriptive adjectives for rating categories be selected?
9. How anchoring phrases for the scale's origin should be chosen?

makes about the scale properties of rating instruments when certain statistical techniques are used to summarize and interrelate the response data.

Table 10.2 identifies nine questions that must be identified and answered when a scale is constructed.

These questions may be related. For example, questions 2 and 3 are obviously related. Similarly questions 2 and 7 also appear to be related. A series of experiments involving the middle response alternative in general—neutral scale item, middle position of the scale, and so forth—showed that (a) people are more likely to select it when it is part of the scale than they are to volunteer it; (b) the order in which it is presented in the scale question and response set can make a difference in results; and (c) people who choose the middle alternative when available would not necessarily answer the question in the same way that others do if forced to choose sides on the matter of concern (Bishop, 1987).

More recent research on the neutral option is inconclusive (Nowlis, Kahn, & Dhar, 2002). A conclusion is reached that consumer responses can be significantly altered by excluding a neutral position when respondents are ambivalent. Further, the study showed that scales excluding this option produce a different response from scales that include it. The question to be answered is which of the two scales—neutral-included or neutral-excluded—is likely to best reflect the underlying attitudes. Unfortunately, the researchers were reluctant to state which would most accurately reflect the truth. Since it has not been shown that there are errors made when a neutral option is provided, our suggestion is that it always be included, unless the researcher has a compelling reason to not do so (e.g., the problem situation/sample mix is such that each sample member can be expected to have a non-neutral attitude). Expected voting in a survey of voters is an example.

Question 4 deals with an interesting issue. *Balance* refers to having an equal number of negative response alternatives as positive ones. Or the alternatives may just be in opposite directions from some mid-point. When using importance scales for attributes, the alternatives provided may be "very important," "important," "neither important nor unimportant," "unimportant," and "very unimportant," or additional categories may be included. Thomas Semon (2001) has questioned the use of balance (or symmetry, as he calls it) in importance

scales. He argues that importance is not a bipolar concept. Importance ranges from some positive amount to none, not a negative amount. Although this appears to have conceptual appeal, researchers continue to successfully use importance scales from some mid-point—specified or implied. There would seem to be three keys to successful importance scale use:

1. Isolating any findings of unimportance
2. Recognizing that importance is ordinally scaled
3. Accurately interpreting the relative nature of importance findings

Answers to questions such as these will vary by the researcher's approach, and by the problem being studied. For example, there are many alternative response categories that can be used to measure satisfaction. Table 10.3 shows just a few. The effects of research design on reliability and validity of rating scales are discussed in two excellent review papers (Churchill and Peter, 1984; Peter and Churchill, 1986).

In summary, rating methods—depending on the assumptions of the researcher—can be considered to lead to ordinal-, interval-, or even ratio-scaled responses. The latter two scales are taken up next. We shall see that rating methods figure prominently in the development of quantitative-judgment scales.

## Ratio/Interval Procedures

Direct-judgment estimates, fractionation, constant sum, and rating methods (if the researcher wishes to assume more than ordinal properties about respondents' judgments) are all variants of ratio/interval procedures or metric measurement methods.

### *Direct-Judgment Methods*

In direct-judgment methods, the respondent is asked to give a numerical rating to each stimulus with respect to some designated attribute. In the unlimited-response category subcase, the respondent is free to choose his or her own number or, in graphical methods, to insert a tick mark along some line that represents his or her judgment about the magnitude of the

**Table 10.3** Alternative Scales for Measuring Satisfaction

1. A numerical scale from 1 to 7 where 1 = completely satisfied and 7 = completely dissatisfied
2. A percentage scale using the following categories: 91–100, 81–90, 71–80, 61–70, 51–60
3. A verbal scale using the following choices: very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied, uncertain
4. A verbal scale using the following: very satisfied, somewhat satisfied, unsatisfied, very unsatisfied
5. A verbal scale using the following: completely satisfied, very satisfied, fairly satisfied, somewhat dissatisfied, very dissatisfied
6. A verbal scale using the following: very satisfied, quite satisfied, not very satisfied, not at all satisfied
7. A verbal scale using the following: very satisfied, somewhat satisfied, not at all satisfied

stimulus relative to some reference points. This is illustrated in Panel (a) of Figure 10.3 for the rating of Brand A.

This is a simplified version of a magnitude scale, which is based on psychological scaling (Lodge, 1981). It is an alternative to category scaling. This method has been studied for use in a semantic differential context (to be discussed later in this chapter) and was found to have advantages in individual measurement without affecting aggregate properties of the measurement (Albaum, Best, & Hawkins, 1981). Another study showed that these unlimited response scales, also known as continuous-rating scales, appear to be insensitive to fluctuations in the length of the line used (Hubbard, Little, & Allen, 1989).

The limited-response category subcase is illustrated by Panel (b) in Figure 10.3. Here the respondent is limited to choosing one of seven categories. We note that in this instance the direct-judgment method is nothing more than a straight rating procedure, with the important addition that the ratings are now treated as either interval- or ratio-scaled data (depending on the application) rather than as simple ratings.

*Direct Judgment:*

(a) Unlimited-Response Categories

(Brand A) ↙

*Direct Judgment:*

(b) Limited-Response Categories

| | |
|---|---|
| 7 | Like very much |
| 6 | |
| 5 | (Brand A) |
| 4 | |
| 3 | |
| 2 | |
| 1 | Don't like at all |

(c) Fractionation

"Compare each brand to the standard: Brand A is assumed to be 1.0"

Relative degree of sudsiness compared to Brand A

| Brand | Response |
|---|---|
| B | 0.75 |
| C | 0.80 |
| D | 2.4 |
| E | 0.5 |

(d) Constant Sum

"Assign 100 points across the five brands so as to reflect your relative degree of liking for them"

| Brand | Response |
|---|---|
| A | 20 |
| B | 25 |
| C | 10 |
| D | 5 |
| E | 40 |
| | 100 |

**Figure 10.3** Some illustrations of Interval-Ratio Scale

If the respondent has several items to rate, either the unlimited- or limited-response category procedures can be employed. In the former case, the respondent arranges the stimuli (usually described on small cards) along a sort board, provided by the researcher, so that each is separated according to a subjective distance relative to the others. In the latter case, one assigns cards to the designated category on the sort board that best matches one's evaluation of the stimulus.

### *Fractionation*

Fractionation is a procedure in which the respondent is given two stimuli at a time (e.g., a standard laundry detergent and a test brand) and asked to give some numerical estimate of the ratio between them, with respect to some attribute, such as sudsiness.

The respondent may answer that the test brand, in his or her judgment, is three-fourths as sudsy as the standard. After this is done, a new test brand is compared with the same standard, and so on, until all test items are judged. Panel (c) in Figure 10.3 illustrates this procedure.

In other cases where the test item can be more or less continuously varied by the respondent, the respondent is asked to vary the test item so that it represents some designated ratio of the standard. For example, if the attribute is sweetness of lemonade, the respondent may be asked to add more sweetener until the test item is "twice as sweet" as the standard.

### *Constant Sum*

Constant-sum methods have become quite popular in marketing research, primarily because of their simplicity and ease of instructions. In constant-sum methods the respondent is given some number of points—typically 10 or 100—and asked to distribute them over the alternatives in a way that reflects their relative magnitude of some attitudinal characteristic. Panel (d) of Figure 10.3 shows an illustration of the constant-sum procedure. Constant sum forces the respondent to allocate his or her evaluations and effectively standardizes each scale across persons, since all scores must add to the same constant. As such, the constant-sum procedure requires the respondent to make a comparative evaluation of the stimuli. Generally, it is assumed that a subjective ratio scale is obtained by this method.

In a study of its customers and noncustomers, a local bank asked the following question:

> Please divide 100 points among the characteristics listed below to indicate how important each is to you in doing business with a financial institution. The more important a trait is to you, the more points you should give it. You may give as many or as few points as you like.

| | Number of Points |
|---|---|
| The bank is locally owned | _____ |
| Friendly, helpful personnel | _____ |
| Conveniently located | _____ |
| Offers a full range of financial services | _____ |
| Price of its services | _____ |
| Decisions are made locally | _____ |
| Must total to | 100 |

To sum it up, unlike ordinal measurement methods, the major assumption underlying ratio/interval measurement methods is that a unit of measurement can be constructed directly

from respondents' estimates about scale values associated with a set of stimuli. The respondent's report is taken at face value and any variation in repeated estimates (over test occasions within respondent or over respondents) is treated as error; repeated estimates are usually averaged over persons and/or occasions.

The problems associated with interval-ratio scaling methods include the following:

1. Respondents' subjective scale units may differ across each other, across testing occasions, or both.
2. Respondents' subjective origins (zero points) may differ across each other, across occasions, or both.
3. Unit and origin may shift over stimulus items within a single occasion.

These problems should not be treated lightly, particularly when data for several subjects are being averaged.

In addition, researchers should be aware of the constraints placed on the respondent's response format. For example, if asked to rate laundry detergents on a five-point scale, ranging from 1 ("least sudsy"), to 3 ("moderate sudsy"), to 5 ("sudsiest"), the respondent may not be capable of accurately carrying out the task. That is, one's subjective distance between the sudsiest detergent and the moderate detergent(s) may not equal one's perception of the distance between the moderate detergent(s) and the least sudsy detergent.

Most ratings measurement methods have the virtue of being easy to apply. Moreover, little additional work beyond averaging is required to obtain the unit of measurement directly. Indeed, if a unique origin can be established (e.g., a zero level of the property), then the researcher obtains both an absolute origin and a measurement unit. As such, a subjective ratio scale is obtained.

## TECHNIQUES FOR SCALING STIMULI

Any of the data collection methods just described—whether for the measurement of ranking or ratings data—produce a set of raw-data responses. In the case of ranking methods, the raw data, describing ordinal-scaled judgments, usually undergo a further transformation (via a scaling model) to produce set of scale values that are interval-scaled. Technically speaking, the raw data obtained from ratings methods also require an intervening model. However, in this case the model may be no more elaborate than averaging the raw data across respondents and/or response occasions.

Thurstone's Case V method is a popular model for dealing with ordinal data obtained from ranking methods. Osgood's semantic differential is an illustration of a procedure for dealing with raw data obtained from interval-ratio scale ratings methods. We consider each of these techniques in turn.

### Case V Scaling

Thurstone's Case V Scaling model, based on his law of comparative judgment, permits the construction of a unidimensional interval scale using responses from ordinal measurement methods, such as paired comparisons (Thurstone, 1959). This model can also be used to scale

ranked data or ordered-category sorts. Several subcases of Thurstone's model have been developed. We shall first describe the general case and then concentrate on Case V, a special version particularly amenable to application in marketing situations.

Essentially, Thurstone's procedure involves deriving an interval scale from comparative judgments of the type "A is fancier than B," "A is more prestigious than B," "A is preferred to B," and so on. Scale values may be estimated from data in which one individual makes many repeated judgments on each pair of a set of stimuli or from data obtained from a group of individuals with few or no replications per person.

The concept that underlies the model of comparative judgment on which Case V scaling is based is simple to describe. Suppose that we have a group of respondents, almost all of whom prefer A to B. Then the proportion of total comparisons (no ties allowed) in which A is preferred to B will be close to 100 percent. Suppose, however, that when B is compared with C, only 55 percent of the group prefers B to C. Intuitively, we might think that the difference between the scale values associated with A and B should be much larger than the difference between the scale values associated with B and C. Under certain assumptions, Thurstone's model of comparative judgment provides a means to develop an interval scale from these stimulus-comparison proportions.

An example should make the Case V procedure easier to follow. Assume that 100 homemakers were asked to compare five brands of canned tomato juice with respect to "overall goodness of flavor." The homemakers sipped a sample of each brand paired with a sample of every other brand (a total of 10 pairs) from paper cups that were marked merely with identifying numbers. Table 10.4 shows the empirically observed proportion for each comparison.

From this table we see that 69 percent of the respondents preferred Juice C to Juice A and the remainder, 31 percent preferred Juice A to Juice C (if we arbitrarily let column dominate row). It is customary to set self-comparisons (the main-diagonal entries of Table 10.4) to 0.5; this has no effect on the resulting scale values (Edwards, 1957). From the data of this table we next prepare Table 10.5, which summarizes the *Z*-values appropriate for each proportion. These *Z*-values were obtained from Table A.1 in Appendix A at the end of this book. If the proportion is less than 0.5, the *Z*-value carries a negative sign; if the proportion is greater than 0.5, the *Z*-value carries a positive sign. The *Z*-values are standard unit variates associated with a given proportion of total area under the normal curve. The Thurstonian model assumes normally distributed scale differences in mean = 0 and standard deviation = 1.0.

For example, from Table 10.4 we note that the proportion of respondents preferring Juice B over Juice A is 0.82. We wish to know the *Z*-value appropriate thereto. This value labeled *Z* in the standard unit normal table of Table A.1 is 0.92. That is, 82 percent of the total area under the normal curve is between $Z = -\infty$ and $Z = 0.92$. All remaining entries in Table 10.5 are obtained in a similar manner, a minus sign being prefixed to the *Z*-value when the proportion is *less* than 0.5.

Column totals are next found for the entries in Table 10.5. Scale values are obtained from the column sums by taking a simple average of each column's *Z*-values. For example, from Table 10.5, we note that the sum of the *Z*s for the first column (Juice A) is –0.36. The average *Z* for column A is simply:

$$Z = -\frac{0.36}{5} = -0.072$$

**Table 10.4** Observed Proportions Preferring Brand *X* (Top of Table) to Brand Y (Side of Table)

| | *Preferred Brand* | | | | |
|---|---|---|---|---|---|
| *Brand* | *A* | *B* | *C* | *D* | *E* |
| A | 0.50 | 0.82 | 0.69 | 0.25 | 0.35 |
| B | 0.18 | 0.50 | 0.27 | 0.07 | 0.15 |
| C | 0.31 | 0.73 | 0.50 | 0.16 | 0.25 |
| D | 0.75 | 0.93 | 0.84 | 0.50 | 0.59 |
| E | 0.65 | 0.85 | 0.75 | 0.41 | 0.50 |

**Table 10.5** *Z*-Values Related to Preference Proportions in Table 10.4

| | *Brand* | | | | |
|---|---|---|---|---|---|
| *Brand* | *A* | *B* | *C* | *D* | *E* |
| A | 0 | 0.92 | 0.50 | –0.67 | –0.39 |
| B | –0.92 | 0 | –0.61 | –1.48 | –1.04 |
| C | –0.50 | 0.61 | 0 | –0.99 | –0.67 |
| D | 0.67 | 1.48 | 0.99 | 0 | 0.23 |
| E | 0.39 | 1.04 | 0.67 | –0.23 | 0 |
| Total | –0.36 | 4.05 | 1.55 | –3.37 | –1.87 |
| Mean (Z) | –0.072 | 0.810 | 0.310 | –0.674 | –0.374 |
| R | 0.602 | 1.484 | 0.984 | 0 | 0.300 |

This scale value expresses Juice A as a deviation from the mean of all five scale values. The mean of the five values, as computed from the full row of *Z*s, will always be zero under this procedure. Similarly, we find the average *Z*-value for each of the remaining four columns of Table 10.5.

Next, since the zero point of an interval scale is arbitrary, we can transform the minimum scale so that it becomes zero. We will let Juice D ($R_D = Z_D = -0.674$) be the reference point (or origin) of zero by adding .674. We then simply add 0.674 to each of the other *Z*-values to obtain the Case V scale values of the other four brands. These are denoted by *R* and appear in the last row of Table 10.5.

The scale values of Juices A through E indicate the preference ordering

$$B > C > A > E > D$$

Moreover, assuming that an interval scale exists, we can say, for example, that the difference in "goodness of flavor" between Juices B and A is 2.3 times the difference in "goodness of flavor" between Juices C and A, since

$$B - A = 2.3\ (C - A)$$

$$1.484 - 0.602 = 2.3\ (0.984 - 0.602)$$

$$0.882 = 2.3\ (0.382)$$

(within rounding error).

The test of this model is how well scale values can be used to work backward—that is, to predict the original proportions. The Case V model appears to fit the data in the example quite well. For any specific brand, the highest mean absolute proportion discrepancy is 0.025 (Juice A). Moreover, the overall mean absolute discrepancy is only .02 (rounded). Even the simplest version (Case V) of the Thurstonian model leads to fairly accurate predictions. The $R^*$ scale values of the Case V model preserve the original rank ordering of the original proportions data.

Another approach to obtain numerical scores from rankings is shown in Exhibit 10.4.

## **EXHIBIT 10.4** Converting Ranks into Scale Values

Another approach to convert ranks into numerical scores is based on the assumption that true differences between adjacent objects ranked near the extremes tend to be larger than differences between objects falling near the middle of the rank. Specifically, we can view relative differences among ranked objects as being similar to differences between the standardized or *Z*-values falling at the boundary points of *N*–1 equally probable intervals falling in the midrange of a normal distribution. We would like the interval between each adjacent pair of ranks (e.g., 1 and 2, 7 and 8) to define an interval corresponding to 100/*N* of cases in a normal distribution. Finally, we arbitrarily set 100/2*N* as the percentage of cases in a normal distribution to be cut below the value of the object ranked *I* and above the value of the object ranked *N*.

We can proceed as follows. For any stimulus object (such as a brand of soap) that has been ranked *j*, we find from the normal tables the *Z*-score cutting off the lower proportion of the area under the normal curve. Using this procedure we determine the *Z*-values for 10 brands of soap (A–J) as follow:

| *Brand* | *Rank* | *Percentile* | *Z-Value* |
|---|---|---|---|
| C | 1 | 5 | –1.65 |
| E | 2 | 15 | –1.04 |
| A | 3 | 25 | –.67 |
| D | 4 | 35 | –.39 |
| F | 5 | 45 | –.13 |
| H | 6 | 55 | .13 |
| G | 7 | 65 | .39 |
| J | 8 | 75 | .67 |
| I | 9 | 85 | 1.04 |
| B | 10 | 95 | 1.65 |

For Brand E, for example, we find that the lower (2 – 5)/10 or .15 proportion of the area under the normal curve corresponds to a *Z*-value of –1.04. The end result is that the original ranks have been transformed into scale values, which can then be treated as if they were intervally-scaled.

This exposition has assumed a single evaluator. More realistically, a sample of people will do the rankings, thus creating for each brand a distribution of ranks. Each brand's scale value will then be an average *Z*-value, as shown below:

**Rankings Given to Ten Objects by Fifty Judges**

| *Brand* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Rank* | *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *z* |
| 1 | 20 | 6 | 2 | 12 | 0 | 0 | 0 | 10 | 0 | 0 | –1.65 |
| 2 | 6 | 5 | 27 | 10 | 2 | 0 | 0 | 0 | 0 | 0 | –1.04 |
| 3 | 2 | 27 | 15 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | –.67 |
| 4 | 12 | 10 | 6 | 7 | 15 | 0 | 0 | 0 | 0 | 0 | –.39 |
| 5 | 10 | 0 | 0 | 15 | 17 | 8 | 0 | 0 | 0 | 0 | –.13 |
| 6 | 0 | 0 | 0 | 0 | 10 | 17 | 21 | 2 | 0 | 0 | .13 |
| 7 | 0 | 0 | 0 | 0 | 0 | 10 | 7 | 33 | 0 | 0 | .39 |
| 8 | 0 | 0 | 0 | 0 | 6 | 0 | 10 | 5 | 27 | 2 | .67 |
| 9 | 0 | 0 | 0 | 0 | 0 | 15 | 12 | 0 | 23 | 0 | 1.04 |
| 10 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 1.65 |
| | –.931 | | –.875 | | –.096 | | .493 | | .840 | | |
| | | –.676 | | –.778 | | .413 | | –.0004 | | 1.61 | |
| | | | | | | | | | | scale= value | average *Z*-Value |

Although perhaps not as refined as the Thurstone law of comparative judgment, this technique is computationally simpler and gives results comparable with paired-comparison methods. The objects judged by this method can be viewed as being intervally-scaled where the unit is one standard deviation in the distribution of true values over all possible objects on this scale.

SOURCE: Adapted from Hays, 1967, pp. 35–39.

## The Semantic Differential

The semantic differential (Osgood, Suci, & Tannenbaum, 1957) is a ratings procedure that results in (assumed interval) scales that are often further analyzed by such techniques as factor analysis (see Chapter 19). Unlike the Case V model, the semantic differential provides no way to test the adequacy of the scaling model itself. It is simply assumed that the raw data are interval-scaled; the intent of the semantic differential is to obtain these raw data for later processing by various multivariate models.

The semantic differential procedure permits the researcher to measure both the direction and the intensity of respondents' attitudes (i.e., measure psychological meaning) toward such

| **Extremely** | | | | | | | | **Extremely** |
|---|---|---|---|---|---|---|---|---|
| Powerful | X | | | | | | | Weak |
| Reliable | | | X | | | | | Unreliable |
| Modern | | | X | | | | | Old-fashioned |
| Warm | | | | | X | | | Cold |
| Careful | | X | | | | | | Careless |

**Figure 10.4** Corporate Profile Obtained by Means of the Semantic Differential

concepts as corporate image, advertising image, brand or service image, and country image. One way this is done is to ask the respondent to describe the concept by means of ratings on a set of bipolar adjectives, as illustrated in Figure 10.4.

As shown in Figure 10.4, the respondent may be given a set of pairs of antonyms, the extremes of each pair being separated by seven intervals that are assumed to be equal. For each pair of adjectives (e.g., powerful/weak), the respondent is asked to judge the concept along the seven-point scale with descriptive phrases:

- *Extremely* powerful
- *Very* powerful
- *Slightly* powerful
- *Neither* powerful nor weak
- *Slightly* weak
- *Very* weak
- *Extremely* weak

This is repeated for the other pairs of terms.
In Figure 10.4, a subject evaluated a corporation and scored the company on each scale:

- Extremely powerful
- Slightly reliable
- Slightly modern
- Slightly cold
- Very careful

In practice, however, profiles would be built up for a large sample of respondents, with many more bipolar adjectives being used than given here.

By assigning a set of integer values, such as +3, +2, +1, 0, –1, –2, –3, to the seven gradations of each bipolar scale in Figure 10.5, the responses can be quantified under the assumption of equal-appearing intervals. These scale values, in turn, can be averaged across respondents to develop semantic differential profiles. For example, Figure 10.5 shows a profile comparing evaluations of Companies X and Y. The average score for the respondents show that the Company X is perceived as very weak, unreliable, old-fashioned, and careless,

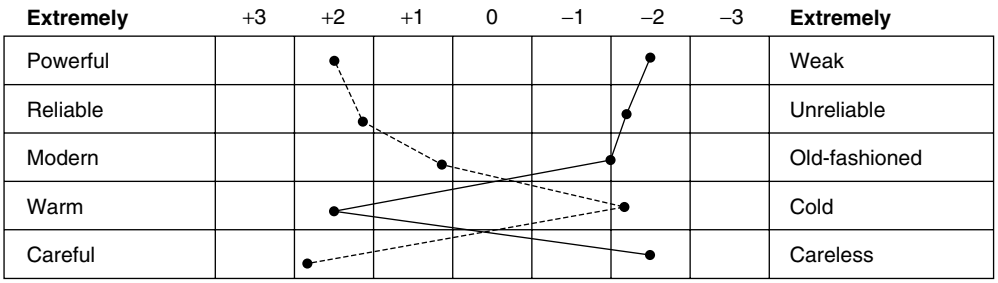


**Figure 10.5** Average-Respondent Profile Comparisons of Companies X and Y via the Semantic Differential

NOTE: Company X = _____
Company Y = ----------

but rather warm. Company Y is perceived as powerful, reliable, and careful, but rather cold as well; it is almost neutral with respect to the modern/old-fashioned scale.

In marketing research applications, the semantic differential often uses bipolar descriptive phrases rather than simple adjectives, or a combination of both types. These scales are developed for particular context areas, so the scales have more meaning to respondents, thus leading usually to a high degree of reliability.

To illustrate, a supermarket chain was interested in knowing how the general public perceived it and one of its major competitors. Table 10.6 lists the semantic differential scale items used in this study. Both descriptive terms and so-called phrases were used. One thing to note about these scales is that polarity is mixed; for some items the negative term is on the left, while for others it is on the right (and vice-versa for the positive item). This is a form of reversed polarity and is done to reduce the effects of, or even to eliminate, acquiescence bias or yea-saying, and halo effects. The idea is to force respondents to read each item and make independent judgments about each item.

The same type of questions presented in Table 10.2 as being applicable to rating scale use also apply to the semantic differential. In addition, the researcher must select an overall format for presentation of the scales. Figure 10.6 illustrates (in the context of evaluating national retailers in the United States) the four major approaches, from which there are many specific variations.

The traditional approach is shown in Panel (a) of Figure 10.6. The object of concern, Kmart, is rated on all attribute dimensions before the next object, Wal-Mart, is rated on these dimensions. Panel (b) illustrates a modified traditional format, in that Kmart and Wal-Mart, and Sears are evaluated on a single attribute (dull/exciting) before the next attribute (high quality/low quality) is introduced into the measurement process. Panel (c) illustrates what is called the graphic positioning scale (Narayana, 1977) in which all objects (i.e., Sears, Kmart and Ward's) are evaluated on the same scale by some graphical means (usually letters) to reflect relative perceptual placement. Finally, Panel (d) illustrates the numerical comparative scale (Golden, Brockett, Albaum, & Zatarain, 1992). Respondents make their judgments for Kmart, Wal-Mart, and Sears on one attribute before moving to the next one.

The number and type of stimuli to evaluate and the method of administration (personal interview, mail, telephone) should determine at least which format the researcher should

**Table 10.6** Scale Items Used in Comparative Study of Supermarkets

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inconvenient location | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Convenient location |
| Low prices | ____ | ____ | ____ | ____ | ____ | ____ | ____ | High prices |
| Pleasant atmosphere | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Unpleasant atmosphere |
| Low quality products | ____ | ____ | ____ | ____ | ____ | ____ | ____ | High quality atmosphere |
| Modern | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Old-fashioned |
| Unfriendly clerks | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Friendly clerks |
| Sophisticated customers | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Unsophisticated customers |
| Cluttered | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Spacious |
| Fast check-out | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Slow check-out |
| Unorganized layout | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Well organized layout |
| Enjoyable shopping experience | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Unenjoyable shopping experience |
| Bad reputation | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Good reputation |
| Good service | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Bad service |
| Unhelpful clerks | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Helpful clerks |
| Dull | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Exciting |
| Good selection of products | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Bad selection of products |
| Dirty | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Clean |
| Like | ____ | ____ | ____ | ____ | ____ | ____ | ____ | Dislike |

use. Comparative studies of these formats are inconclusive and seem to indicate small differences in the content provided in the quality, including reliability, of the data obtained. Therefore, choice of a format may be appropriately made on the basis of other considerations, such as ease of subject understanding, ease of coding and interpretation for the researcher, ease of production and display, and cost. If a large number of stimuli are to be evaluated, this would tend to favor use of the graphic positioning or numerical comparative scales.

A recent study raises a question of whether the semantic differential, as used in a single-stage format asking for both direction and strength (amount), leads to a central tendency error (Yu, Albaum, & Swenson, 2003). This error is one in which there is reluctance on the part of respondents to give extreme responses. A two-stage approach is suggested in which respondents are first asked to indicate one of the adjectives or phrases from a pair and then they are asked to

**(a)**

Kmart

Friendly X Unfriendly

Modern X Old-fashioned

**(b)**

| | Dull | | | | | | Exciting |
|---|---|---|---|---|---|---|---|
| Kmart | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Wal-Mart | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Sears | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**(c)**

Friendly S W K Unfriendly

Modern K W S Old-fashioned

**(d)**

| | | | | | | | | | Kmart | Wal-Mart | Sears |
|---|---|---|---|---|---|---|---|---|---|---|---|
| High Quality | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Low Quality | 3 | 5 | 4 |
| Dull | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Exciting | 6 | 4 | 2 |

**Figure 10.6** Formats of the Semantic Differential

indicate "how much." For example, in a study of shoppers at supermarkets, this format of the semantic differential can be used as follows:

> For each of the descriptors shown below please tick the term which best describes
>
> ABC Food Stores.
>
> ____ Inconvenient location ____ Convenient location ____ Neither
>
> If you ticked one of the two terms or phrases (i.e., you did NOT tick "neither"),
>
> Indicate whether it is *very*, *somewhat*, or *slightly* descriptive of ABC.
>
> ____ Very ____ Somewhat ____ Slightly

This study reported that the two-stage format generated a greater proportion of responses in the extreme (i.e., the *very*) categories than did the regular one-stage format. If a researcher is interested primarily in people with extreme views, then the two-stage approach provides better data quality. But if interest is in central tendencies and/or overall distributions such as group means, then the one-stage format is adequate.

### Stapel Scale

A modification of the semantic differential is the Stapel scale (Crespi, 1961). This scale is an even-numbered nonverbal rating scale used in conjunction with single adjectives or phrases, rather than bipolar opposites, to rate an object, concept or person. Figure 10.7 shows the format of this scale, although it is not necessary that the scale have 10 points. Both intensity and direction are measured at the same time. It cannot be assumed that the intervals are equal and that ratings for a respondent are additive. Research has shown no differences in reliability and validity between this scale and the semantic differential (Hawkins, Albaum & Best, 1974; Menzes & Elbert, 1979).

### A Concluding Remark

Currently the semantic differential technique is being used in diverse applications:

- Comparing corporate images, both among suppliers of particular products and against an ideal image of what respondents think a company should be
- Comparing brands and services of competing suppliers
- Determining the attitudinal characteristics of purchasers of particular product classes or brands within a product class, including perceptions of the country of origin for imported products
- Analyzing the effectiveness of advertising and other promotional stimuli toward changing attitudes

The comparatively widespread use of the semantic differential by marketing researchers suggests that this method provides a convenient and reasonably reliable way for developing consumer/buyer attitudes on a wide variety of topics.

## TECHNIQUES FOR SCALING RESPONDENTS

Thurstone's Case V model and Osgood's semantic differential are primarily designed for scaling stimuli—tomato juices, brands of toothpaste, corporate images, retailing services, and the like. Researchers also have available techniques whose primary purpose is to scale respondents along some attitude continuum of interest. There are three better-known procedures for doing this:

1. The summated scale
2. The Q-sort technique
3. The differential scale

Each of these is described in turn.

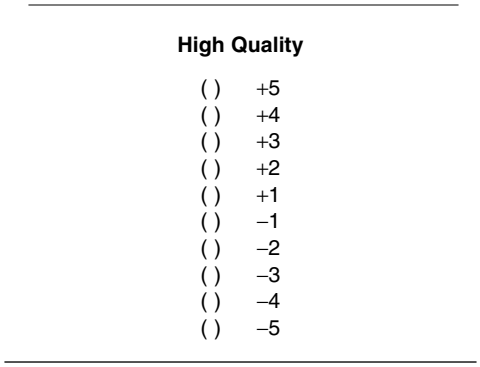


**Figure 10.7** A Stapel Scale

## The Summated Scale

The summated scale was originally proposed by Rensis Likert, a psychologist (Likert, 1967; Kerlinger, 1973). To illustrate, assume that the researcher wishes to scale some characteristic, such as the public's attitude toward travel and vacations. In applying the Likert summated-scale technique, the steps shown in Table 10.7 are typically carried out.

Many researchers using the final Likert summated scale (the one developed after the pretest) assume only ordinal properties regarding the placement of respondents along the attitude continuum of interest. Nonetheless, two respondents could have the same total score even though their response patterns to individual items were quite different. That is, the process of obtaining a single (summated) score ignores the details of just which items were agreed with and which ones were not. Moreover, the total score is sensitive to how the respondent reacts to the descriptive intensity scale.

Respondents' reactions to the items may be affected by the polarity of the items. That is, when developing a set of items for use, the researcher needs to consider the possibility of acquiescence bias, or agreement, arising. Polarity refers to the positiveness or negativeness of the statement used in a scale. Often, a researcher will reverse the polarity of some items in the set (i.e., word items negatively) as a way to overcome this bias. Having positively and negatively worded statements hopefully forces respondents with strong positive or negative attitudes to use both ends of a scale, but the cost may be losing unidimensonality of the scale (Herche & Engelland, 1996). This suggests a trade-off is necessary: unidimensional measurement with acquiescence bias versus nonbiased measurement tainted by suspect unidimensionality. The latter is preferred in most cases. Thus, a researcher should reverse the polarity of some items and adjust the scoring, as appropriate. That is, a "strongly agree" response to a positive statement and a "strongly disagree" to a negative statement should be scored the same, and so forth.

A recent study of five cultures questions the issue of reverse-worded items, ultimately preferring a mixed-worded Likert format, especially in cross-cultural research on consumers (Wong, Rindfleisch, & Burroughs, 2003). These researchers studied the mixed-worded format for a particular scale—the Material Values Scale (MVS) (Richins & Dawson, 1992). When applied cross-culturally, the mixed-worded format of MVS tended to confound the

**Table 10.7** Steps in Constructing a Likert Scale

1. The researcher assembles a large number (e.g., 75 to 100) of statements concerning the public's sentiments toward travel and vacations.
2. Each of the test items is classified by the researcher as generally "favorable" or "unfavorable" with regard to the attitude under study. No attempt is made to scale the items; however, a pretest is conducted that involves the full set of statements and a limited sample of respondents. Ideally, the initial classification should be checked across several judges.
3. In the pretest the respondent indicates approval (or not) with *every* item, checking one of the following direction-intensity descriptors:
   a. Strongly approve or agree
   b. Approve or agree
   c. Undecided or neither agree nor disagree
   d. Disapprove or disagree
   e. Strongly disapprove or disagree
4. Each response is given a numerical weight (e.g., +2, +1, 0, −1, −2). It could be +1 to +5.
5. The individual's *total-attitude score* is represented by the algebraic summation of weights associated with the items checked. In the scoring process, weights are assigned such that the direction of attitude—favorable to unfavorable—is consistent over items. For example, if a + 2 were assigned to "strongly approve/agree" for favorable items, a + 2 should be assigned to "strongly disapprove/disagree" for unfavorable items.
6. On the basis of the results of the pretest, the analyst selects only those items that appear to discriminate well between high and low *total* scorers. This may be done by first finding the highest and lowest quartiles of subjects on the basis of *total* score. Then, the mean differences on each *specific* item are compared between these high and low groups (excluding the middle 50 percent of subjects).
7. The 20 to 25 items finally selected are those that have discriminated "best" (i.e., exhibited the greatest differences in mean values) between high versus low total scorers in the pretest.
8. Steps 3 through 5 are then repeated in the main study.

scale's applicability. Translation errors, variable response biases, and substantive cultural differences all can lead to confounding. To correct for this, adapting the statements into a set of nondirectional questions will lead to largely alleviating the problems associated with mixed-wording scales (Wong, Rindfleisch, & Burroughs, 2003). As an illustration, a nondirectional format for one item of MVS would be

"How much pleasure do you get from buying things? [Very little . . . A great deal]"

In contrast, the normal Likert format for this item is

"Buying things gives me a lot of pleasure [strongly agree, agree, neither agree nor disagree, disagree, strongly disagree]"

To further illustrate the use of the Likert scale, a set of seven statements regarding travel and vacations used in a study by a travel company are shown in Figure 10.8. Assume now that each of the seven test items has been classified as "favorable" (items 1, 3, and 7) or

In this part of the questionnaire we are interested in your opinions about vacations. There are no right or wrong answers to any of these statements. What we would like you to do is simply read each statement as it appears. Then indicate the extent of your agreement or disagreement by circling the number that best describes your reaction to the statement: strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), strongly disagree (1).

| | Please circle the number that best describes your reaction | | | | |
|---|---|---|---|---|---|
| | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree |
| 1. In the winter I need to go south to the sun. | 5 | 4 | 3 | 2 | 1 |
| 2. When you take trips with the children you're not really on vacation. | 5 | 4 | 3 | 2 | 1 |
| 3. I look for travel bargains. | 5 | 4 | 3 | 2 | 1 |
| 4. I "hate" to spend money. | 5 | 4 | 3 | 2 | 1 |
| 5. I do not like the fresh air and out-of-doors. | 5 | 4 | 3 | 2 | 1 |
| 6. I would feel lost if I were alone in a foreign country | 5 | 4 | 3 | 2 | 1 |
| 7. A good vacation shortens the year and makes life longer. | 5 | 4 | 3 | 2 | 1 |

**Figure 10.8** A Direction-Intensity Scale for Measuring Attitudes Toward Travel and Vacations

"unfavorable" (items 2, 4, 5, and 6). Each subject would be asked to circle the number that most represents his or her agreement with the statement. We may use the weights +2 for "strongly agree," +1 for "agree," 0 for "neither," –1 for "disagree," and –2 for "strongly-disagree." Since, by previous classification, items 1, 3, 7 are "favorable" statements, we would use the preceding weights with no modification. However, on items 2, 4, 5, and 6 ("unfavorable" statements), we would reverse the order of the weights so as to maintain a consistent direction. Thus, in these items, +2 would stand for "strongly disagree," and so on.

Suppose that a subject evaluated the seven items in the following way:

| Item | Response | |
|---|---|---|
| 1 | Strongly agree | +2 |
| 2 | Disagree | +1 |
| 3 | Agree | +1 |
| 4 | Strongly disagree | +2 |
| 5 | Disagree | +1 |
| 6 | Strongly disagree | +2 |
| 7 | Strongly agree | +2 |

The respondent would receive a total score of

$$+2+1+1+2+1+2+2=11$$

Suppose that another respondent responded to the seven items by marking (1) strongly disagree, (2) neither, (3) disagree, (4) strongly agree, (5) strongly disagree, (6) strongly agree, and (7) neither. This person's score would be

$$-2+0-1-2-2-2+0=-9$$

This listing indicates that the second respondent would be ranked "lower" than the first—that is, as having a less-favorable attitude regarding travel and vacations. However, as indicated earlier, a given total score may have different meanings.

Some final comments are in order. When using this format, Likert (1967) stated that a key criterion for statement preparation and selection should be that all statements be expressions of desired behavior and not statements of fact. In practice this has not always been done. The problem seems to be that two persons with decidedly different attitudes may agree on fact. Thus, their reaction to a statement of fact is no indication of fact. Pragmatically, a researcher may use this approach for fact so long as it is recognized that direction is the only meaningful measure obtained.

The second concern is that the traditional presentation of a Likert scale is one-stage, with both intensity and direction combined; this may lead to an underreporting of extreme positions. This is a type of form-related error known as a *central tendency error*. As stated earlier, a central tendency error represents reluctance on the part of respondents to either give extreme scores or use the extreme position on an individual scale item. To compensate for this situation, a two-stage format, whereby direction and intensity are separate evaluations, can be used. Respondents are first asked to indicate agree, disagree, or neither. Then they are asked how strongly they feel about their response. The limited research on this phenomenon showed that in three separate studies, the two-stage format generated a greater proportion of extreme responses (on both ends) in all cases but four single scales and did a better job in predicting preferences (Albaum, 1997).

One impact of using a two-stage format is that the length of the measuring instrument will be increased, perhaps leading to greater time and money costs in implementing research projects. The mode of data collection—mail, Internet, telephone, personal—may have an effect on the advisability of using a two-stage format. Two-stage formats are used quite often in studies where telephone interviewing is used for data collection. Perhaps the main justification for using this format is that for researchers interested primarily in respondents holding the most intense (i.e., extreme position) views, the two-stage seems to provide higher data quality. Typically, mean values of a group are not affected that much.

Earlier in this chapter we discussed central tendency errors related to the semantic differential. It is fair to speculate that central tendency errors probably exist for all types of rating scales, and that an appropriate two-stage format would minimize the error. Figure 10.9

gives an example of the one-stage and two-stage formats for satisfaction questions. But, as for the Likert scale and the semantic differential, use should probably be limited to those situations where one wants to know about people with extreme views or those situations where respondents can more easily answer the questions.

## The Q-Sort Technique

The Q-sort technique has aspects in common with the summated scale. Very simply, the task required of a respondent is to sort a number of statements (usually on individual cards) into a predetermined number of categories (usually 11) with a specified number having to be placed in each category.

In illustrating the Q-sort technique, assume that four respondents evaluate the test items dealing with travel and vacations. For purposes of illustration, only three piles will be used. The respondents are asked to sort items into:

| MOST AGREED WITH (TWO ITEMS) | NEUTRAL ABOUT (THREE ITEMS) | LEAST AGREED WITH (TWO ITEMS) |
|---|---|---|
| +1 | 0 | –1 |

The numbers represent the number of items that the respondents must place into piles 1, 2, and 3, respectively. That is, they may first select the two items that they most agree with; these go in pile 1. Next, they select the two statements that they least agree with; these go in pile 3. The remaining three items are placed in pile 2. The numbers below the line represent scale values. Suppose that the responses of the four respondents, A, B, C, and D, result in the following scale values:

| | *Respondent* | | | |
|---|---|---|---|---|
| *Item* | *A* | *B* | *C* | *D* |
| 1 | +1 | +1 | −1 | −1 |
| 2 | 0 | 0 | 0 | 0 |
| 3 | +1 | 0 | 0 | −1 |
| 4 | −1 | −1 | +1 | +1 |
| 5 | 0 | 0 | 0 | 0 |
| 6 | −1 | −1 | +1 | +1 |
| 7 | 0 | +1 | −1 | −1 |

As can be noted, the respondent pairs A & B and C & D seem "most alike" of the six distinct pairs that could be considered. We could, of course, actually correlate each respondent's scores with every other respondent and, similar to semantic differential applications, conduct factor or cluster analyses (see Chapter 19) to group the respondents or items. Typically, these additional steps *are* undertaken in Q-sort studies.

ONE-STAGE: Now I'll ask you to give me a number between one and seven that describes how you feel about your health. . . . "One" stands for completely dissatisfied, and "seven" stands for completely satisfied. If you are right in the middle, answer "four." So, the low numbers indicate that you are dissatisfied; the high numbers that you are satisfied.

First, what number comes closest to how satisfied or dissatisfied you are with your health and physical condition in general?

_____ Number

8. Never thought; No feelings

TWO-STAGE: Now, thinking about your health and physical condition in general, would you say you are satisfied, dissatisfied, or somewhere in the middle?

7. Satisfied

1. Dissatisfied

How satisfied are you with your health and physical condition—completely satisfied, mostly, or somewhat?

How dissatisfied are your with your health and physical condition—completely dissatisfied, mostly, or somewhat?

7. Completely

6. Mostly

5. Somewhat

1. Completely

2. Mostly

3. Somewhat

4. In the middle.

If you had to choose, would you say that you are closer to being satisfied or dissatisfied with your health and physical condition, or are you right in the middle?

5. Satisfied

3. Dissatisfied

4. In the middle

**Figure 10.9** Examples of One- and Two-Stage Satisfaction Questions

SOURCE: From Miller, P. V., "Alternate Question Forms for Attitude Scale Questions in Telephone Interviews, *Public Opinion Quarterly, 48,* copyright © 1984. Reprinted with permission of The University of Chicago Press.

## The Differential Scale

When using a differential scale, it is assumed that a respondent will agree with only a subset, say one or two, of the items statements about an object, a concept, a person, and so forth. The items agreed with correspond to the respondent's position on the dimension being

measured, while the items disagreed with are on either side of those selected. This means that the respondent localizes his or her position.

Each of the items or statements used to construct a differential scale has attached to it a score (that is, a position on the scale) determined by outside judges. Judgments of scale position can be made by one of the following methods: paired-comparisons, equal-appearing intervals, or successive intervals. The most commonly used method is equal-appearing intervals.

To develop this type of scale, the researcher starts with a large number of statements related to the attitude under study. These are given to a number of judges, who are asked to independently sort each statement into one of a specified number of piles (often 11), ranging from most strongly positive or favorable to most strongly negative (i.e., least favorable). The scale value for each statement is assigned by the judges and is usually computed as the median pile, although in some cases the mean is used. A final list of statements consists of statements that have a relatively small dispersion across judges and that cover the range of attitude values. A respondent's attitude score (i.e., scale value) is the mean (or median) of the scale values of the statements with which he or she agrees. By using this procedure, respondents can be rank-ordered according to positiveness of attitude.

Developing differential scales can be time-consuming. In addition, respondents with different attitudes on specific dimensions may end up being classified as similar on an aggregate basis. This is so because of the averaging process used. To illustrate, assume that seven statements about advertising were scaled as follows:

| *Statement* | *Scale Value* |
|---|---|
| 1 | 2.8 |
| 2 | 7.9 |
| 3 | 4.3 |
| 4 | 1.4 |
| 5 | 9.2 |
| 6 | 6.1 |
| 7 | 5.0 |

We assume that the lower the value the more negative a respondent is. Also, we have two respondents who are asked to indicate the two statements they most agree with. If Respondent A agrees with statements 2 and 4, the score assigned that person is 7.9 + 1.4 / 2 = 4.65. Suppose Respondent B agrees with statements 3 and 7. This person's score would be the same—4.3 + 5.0 / 2 = 4.65. A and B would both be classified as near-neutral (on, say, an 11-point scale). But Respondent A has a greater variance, as he or she is quite negative on one aspect but positive on another. B, on the other hand, is relatively neutral on both. This example illustrates that a researcher must be careful when interpreting the score of differential scales. Although aggregates may be of interest, the researcher—and the manager as well—should not ignore the individual items themselves.

## SCALING BOTH STIMULI AND RESPONDENTS

When both stimuli and respondents can be scaled, this is called the response approach to scaling. One approach to this involves cumulative scales. Cumulative scales are constructed of a

set of items with which the respondent indicates agreement or disagreement. If a cumulative scale exists, the items included are unidimensional. This means that they are related to each other such that (in the ideal case) a respondent who responds favorably to Item 2 also responds favorably to Item 1; one who responds favorably to Item 4 also responds favorably to Items 1, 2, and 3, and so on. This scale is based on the cumulative relation between items and the total scores of individuals. An individual's score is calculated by counting the number of items answered favorably. The basic idea is that if individuals can be ranked along a unidimensional continuum, then if A is more favorably inclined than B, he or she should endorse all the items that B does plus at least one other item. There is a pattern of item responses that is related to total score. If the scale is truly cumulative, when we know a person's total score we can predict his or her pattern.

In addition, if we know responses to "harder" items, we can predict the response to the easier items. For instance, suppose we gave a respondent three mathematical problems to solve, each of differing difficulty. If he correctly answered the most difficult one, he is likely to answer the other two correctly. On the other hand, a respondent who incorrectly solves the most difficult problem but correctly solves the next most difficult one will most likely answer the least difficult one correctly. In a similar manner, people can be asked attitudinal-oriented questions, and if the patterns of response arrange themselves similarly to the mathematical problem situation, then the questions are unidimensional. Consequently, people can be ranked on the basis of their scale responses. The resulting scale is ordinal.

One of the best-known approaches to cumulative scaling is *scalogram analysis,* developed by Louis Guttman (1985; Manfield, 1971). The technique is designed to determine whether the items used to measure an attitude form a unidimensional scale. That is, if we know a person's rank order on a set of questions, can we predict his or her response to each question in some area of content? Both items and people can be scaled. A so-called universe of content is unidimensional, using the Guttman approach, if it yields a perfect or almost perfect cumulative scale. Unfortunately, scalogram analysis is useful *ex post* and does not help in selecting items that are likely to form a cumulative scale.

To illustrate this approach, assume our interest is in obtaining a measurement of an advertisement's ability to stimulate a consumer to some kind of action. We select four items representing actions that might occur, and we transform these actions into questions that call for a yes/no answer:

- Would you go out of your way to look at this product in a store? (2)
- Would you stop to look at this ad in a magazine? (4)
- Would you buy this product after reading this ad? (1)
- Would you want to show the ad to a friend or a neighbor? (3)

We present this set of questions to a group of respondents, whose task is to indicate "Yes" or "No" to each one. Their responses indicate the relative difficulty of answering "Yes." Assume the ranking of difficulty from most to least is shown by the numbers in parentheses. To determine whether the questions form a cumulative scale, we look at whether a pattern exists such that a respondent who answers "Yes" to a difficult question also answers "Yes" to the less-difficult ones. If a scale exists, then a respondent can be classified into one of five types of respondents depending on his or her response pattern. Table 10.8 shows the response patterns for an ideal cumulative scale. In practice this perfect pattern will not exist.

**Table 10.8** Ideal Pattern From Scaleogram Analysis

| *Type of Respondent* | *"Yes" Answers* | | | | *"No" Answers* | | | | *Scale Score* |
|---|---|---|---|---|---|---|---|---|---|
| | *3* | *1* | *4* | *2* | *3* | *1* | *4* | *2* | |
| 1 | X | X | X | X | | | | | (4) |
| 2 | | X | X | X | X | | | | (3) |
| 3 | | | X | X | X | X | | | (2) |
| 4 | | | | X | X | X | X | | (1) |
| 5 | | | | | X | X | X | X | (0) |

Experience has shown that a cumulative scale will exist if no more than 10 percent of the answers vary from this geometric pattern. We have discussed only the content component of the Guttman scale. There are also components concerned with intensity and location of origin, which are discussed in detail in Guttman (1985), Manfield (1971) and Torgerson (1958).

Our discussion so far has been concerned with unidimensional scales in which stimuli and respondents can be placed along a linear continuum. In multidimensional scaling models, discussed in Chapter 19, the existence of an underlying multidimensional space is assumed. The stimuli in such models are represented by points in a space of several dimensions. Both stimuli and respondents can be scaled. The dimensions of this space represent attributes that are perceived to characterize the stimuli or respondents.

## MULTI-ITEM SCALES

Each of the types of scales discussed in this chapter can be used either alone or part of a multi-item scale used to measure some construct. A multi-item scale consists of a number of closely related individual rating scales whose responses are combined into a single index, composite score, or value (Peterson, 2000). Often the scores are summated to arrive at a total score. Multi-item scales are used when measuring complex psychological constructs that are not easily defined by just one rating scale or captured by just one question.

Figure 10.10 (Spector, 1992) outlines the major steps in constructing a multi-item scale. The first, and perhaps most critical, step is to clearly and precisely define the construct of interest. A scale cannot be developed until it is clear just what the scale is intended to measure. This is followed by design and evaluation of the scale. A pool of items is developed and then subject to analysis to arrive at the initial scale. Along the way, a pilot study is conducted to further refine the scale and move toward the final version. Validation studies are conducted to arrive at the final scale. Of concern is construct validation, in which an assessment is made that the scale measures what it is supposed to measure. At the same time that validity data are collected, normative data can also be collected. Norms describe the distributional characteristics of a given population on the scale. Individual scores on the scale then can be interpreted in relation to the distribution of scores in the population (Spector, 1992, p. 9).

A good multi-item scale is both reliable and valid. Reliability is assessed by the scale's stability (test-retest reliability) and internal consistency reliability (coefficient alpha). These measures have been discussed in Chapter 9. According to Spector (1992), there are several other characteristics of a good multi-item scale:

- The items should be clear, well-written, and contain a single idea.
- The scale must be appropriate to the population of people who use it, such as having an appropriate reading level.
- The items should be kept short and the language simple.
- Consider possible biasing factors and sensitive items.

Table 10.9 gives an example of a multi-item scale developed to measure consumer ethnocentrism within a nation, the CETSCALE (Shimp & Sharma, 1987). This scale is formatted in the Likert scale format. A compilation of multi-item scales frequently used in consumer behavior and marketing research is provided by Bearden and Netemeyer (1999).

Multi-item scales come in all sizes and shapes with varied numbers of items. Often, researchers want to use shorter versions of the scale. For example, the CETSCALE shown in Table 10.9 has a 10-item shorter form as well as the 17-item full version. Richins (in press) has studied short versions of the Material Values Scale, some of which have acceptable psychometric properties when used to measure materialism at a general level. Researchers must be careful when attempting to shorten scales, as psychometric properties and any effects on construct validity of shorter versions must first be assessed.

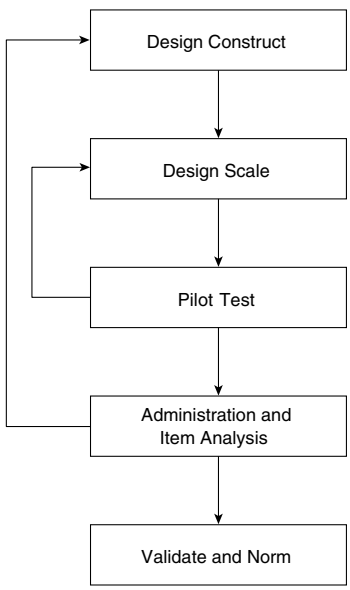


**Figure 10.10** Steps in Developing a Multi-Item Scale

**Table 10.9** Example of Multi-Item Scale: Consumer Ethnocentrism (CETSCALE)

1. American people should always buy American-made products instead of imports.
2. Only those products that are unavailable in the United States should be imported.
3. Buy American-made products. Keep America working.
4. American products first, last and foremost.
5. Purchasing foreign-made products is un-American.
6. It is not right to purchase foreign products.
7. A real American should always buy American-made products.
8. We should purchase products in America instead of letting other countries get rich off us.
9. It is always best to purchase American products.
10. There should be very little trading or purchasing of goods from other countries unless out of necessity.
11. Americans should not buy foreign products, because this hurts American business and causes unemployment.
12. Curbs should be put on all imports.
13. It may cost me in the long run, but I prefer to support American products.
14. Foreigners should not be allowed to put their products on our markets.
15. Foreign products should be taxed heavily to reduce their entry into the United States.
16. We should buy from foreign countries only those products that we cannot obtain within our own country.
17. American consumers who purchase products made in other countries are responsible for putting their fellow Americans out of work.

NOTE: Items composing the 10-item reduced version are items 2, 4 through 8, 11, 13, 16, and 17.

## LIMITATIONS OF SCALING PROCEDURES

Although psychological measurement offers an interesting and potentially rewarding area of study by the marketing researcher, there are some limitations of current scaling techniques in their applicability to marketing problems.

First, it is apparent that more progress has been made in the construction of scales for measuring attitudes along a single dimension than in dealing with the more complex cases of multidimensional attitudes. However, a person's decision to purchase a particular brand usually reflects a response to a variety of stimuli, such as the brand's functional features, package design, advertising messages, corporate image, and so on. Much work still remains to be done on the development of scales to measure multidimensional stimuli.

Second, relatively little development has been done of anything like a general theory of individual buyer behavior that is testable in terms of empirical findings from psychological and sociological studies. In addition to consumer perception and preference studies, we still need to know much more about the influence of other persons (peers, superiors, subordinates) on the buyer decision process, consumer habit formation, and so on. The development of anything close to a general, operationally-based theory will require—at the least—validation of scaling techniques by behavioral-type measures under experimentally controlled conditions.

Finally, predictions from attitude scales, preference ratings, and the like still need to be transformed into measures (sales, market share) of more direct interest to the marketer. We still do not know, in many cases, how to effectively translate verbalized product ratings,

attitudes about corporations, and so on into the behavioral and financial measures required to evaluate the effectiveness of alternative marketing actions.

## SUMMARY

In this chapter, the major objective has been to discuss some of the fundamental concepts of measurement and psychological scaling and their relationship to the gathering and analysis of behavioral data. The chapter first covered variability (ordinal) and quantitative-judgment (ratio/interval) methods of data collection.

Scaling procedures were next commented upon within the framework of stimulus-centered and subject-centered methods. As examples of stimulus-centered techniques, Thurstone's Case V model and Osgood's semantic differential were described in a marketing research context. Subject-centered scaling techniques—the Likert summated scale, Stephenson's Q-sort technique, and Thurstone's differential scale—were also described and illustrated by numerical examples. Next we covered techniques for scaling both stimuli and respondents. Guttman's scalogram analysis and an introduction to the multidimensional nature of attitudes were presented. The chapter concluded with a discussion of multi-item scales and some of the difficult problems associated with testing the validity and reliability of psychological scales.

## ASSIGNMENT MATERIAL

1. Take an article from a current marketing journal and do the following:
   a. Define key terms from an operational standpoint.
   b. Examine the author's justification for the type of measurement scale(s) used.
   c. Criticize the article from the standpoint of its operational usefulness to marketing management.

2. Design and administer a short questionnaire on the topic of student attitudes toward the teaching competence of your university's faculty members. Include questions dealing with paired comparisons, agree-disagree responses, and rating-type scales.
   a. Apply Thurstone's Case V procedure to the paired-comparisons data. Apply also the method of Exhibit 10.4. What can you conclude about these approaches?
   b. Summarize the rating-scale patterns in terms of a semantic differential profile.
   c. Evaluate the usefulness of these procedures in the context of your problem.

3. The Grandma's Own Soup Company was considering the possibility of changing the consistency of its famous tomato soup. Five test soups were prepared, ranging from "very light" to "very heavy consistency". A consumer clinic was held in which 15 housewives ranked each soup (no ties allowed) from 1 (liked best) to 5 (liked least).

The data for this test are as follows:

| Soup | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 2 | 4 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 1 | 2 | 3 | 2 |
| B | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 4 |
| C | 4 | 1 | 4 | 5 | 4 | 5 | 3 | 1 | 5 | 3 | 4 | 4 | 5 | 4 | 5 |
| D | 3 | 3 | 2 | 3 | 3 | 3 | 5 | 4 | 3 | 4 | 2 | 3 | 3 | 1 | 3 |
| E | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 1 |

a. On the basis of a composite (sum of the ranks), what is the rank order of the soups—from best- to least-liked?
b. What, if anything, can be said about how much better Soup B is than Soup E?
c. By going across rows of the above table one can count the number of times one soup of each possible pair is ranked higher than the other soup in the pair. Prepare a table of paired comparisons as derived from the ranked data, express the table entries in terms of proportions, and construct an interval scale, using Thurstone's Case V scaling.
d. What major assumption are we making about the sample of subjects when we construct the interval scale above? Criticize this type of application of the Thurstone comparative judgment technique.
e. Apply the method described in Exhibit 10.4 to the rankings above. What can you conclude about this approach and that of Thurstone Case V?

4. Using the method of choices, construct an interval scale using Thurstone Case V scaling of the data shown in question 3 above. Evaluate the scale you have just derived from the standpoint of efficient use of data.

5. Assume that two groups—a group of housewives and a group of small businessmen—are asked to rate the Mighty Electric Company on the basis of three bipolar adjective pairs:
   - Powerful/weak
   - Reliable/nonreliable
   - Modern/old-fashioned

The frequencies of each group of 100 respondents are shown below (numbers above the horizontal lines refer to housewives' responses; numbers below refer to businessmen's responses):

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Powerful | 20<br>— :<br>40 | 42<br>— :<br>30 | 10<br>— :<br>15 | 5<br>— :<br>5 | 5<br>— :<br>5 | 12<br>— :<br>5 | 7<br>— :<br>0 | Weak |
| Reliable | 52<br>— :<br>20 | 12<br>— :<br>25 | 8<br>— :<br>12 | 10<br>— :<br>22 | 8<br>— :<br>35 | 5<br>— :<br>6 | 5<br>— :<br>0 | Nonreliable |
| Modern | 5<br>— :<br>6 | 14<br>— :<br>20 | 21<br>— :<br>25 | 25<br>— :<br>20 | 20<br>— :<br>12 | 10<br>— :<br>9 | 5<br>— :<br>8 | Old-Fashioned |

a. Using a 7-point scale (where, for example, 7 = extremely powerful and 1 = extremely weak), find a summary rating index for each group of raters for each set of adjective pairs.
b. What assumptions are made by using the integer weights, 7, 6, . . . , 1?
c. In which adjective pairs are the rating indexes between the groups most similar? Most dissimilar?
d. How would your answer to part (a) change if the weights +3, +2, +1, 0, –1, –2, and –3 were used instead of the weights, 7, 6, . . . . , 1? Would rank order between pairs of summary indexes (for each adjective pair) be affected, and if so, how?

6. Select the scaling technique you would recommend be used to obtain measurements for the situations described below. Explain why you chose each.
   a. Measurement of price elasticity of demand for a new product.
   b. Determination of preference of three levels of sweetness for a new product.
   c. Measurement of change of attitude toward a product as the package is changed.
   d. Determination of which respondents have tried a particular brand of product.
   e. Measurement of which of three advertisements has the greatest readership.
   f. Comparison of three retail stores on 15 attributes.
   g. Measurement of the proportion of "triers" who make repeat purchases of a new product.

7. Construct a multi-item scale to measure public satisfaction with local government services. Include at least five items in your scale. Also, develop a single-item measure of public satisfaction with local government services. Administer each of these scales to a group of 25 residents in your local area, including demographic variables of gender, marital status, and age. What can you conclude about any differences that emerge in your findings?



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