

Lebanese University

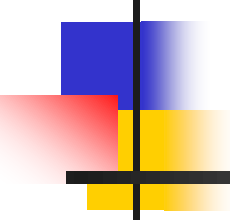
Faculty of Information (BRANCH II)

MARKETING RESEARCH

DATA SCIENCE PROGRAM

1st Semester 2023-2024

Dr. Ziad F. Haddad

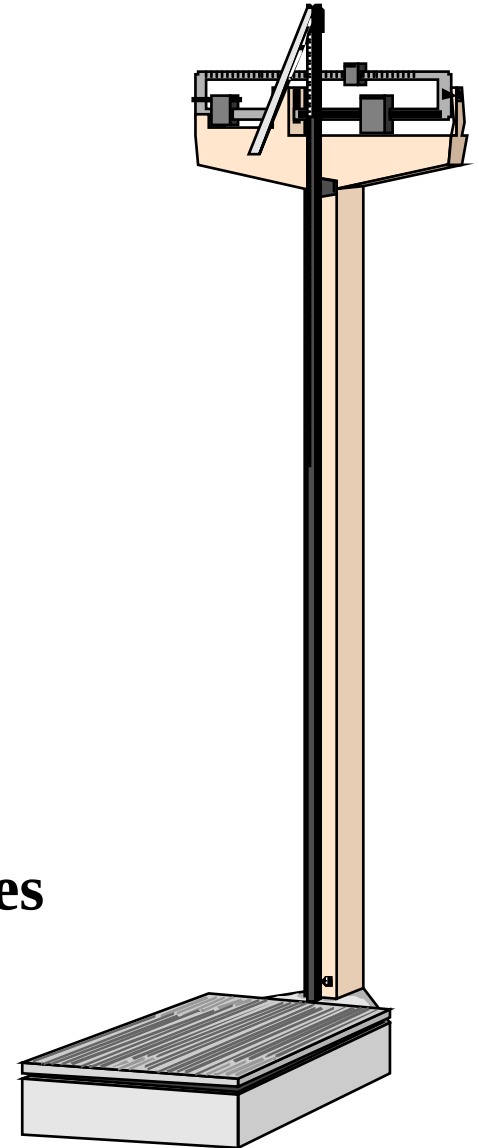


Chapter Seven

Measurement and Scaling

Chapter Outline

- 1) Overview**
- 2) Measurement and Scaling**
- 3) Primary Scales of Measurement**
 - i. Nominal Scale**
 - ii. Ordinal Scale**
 - iii. Interval Scale**
 - iv. Ratio Scale**
- 4) A Comparison of Scaling Techniques**



Chapter Outline

5) Comparative Scaling Techniques

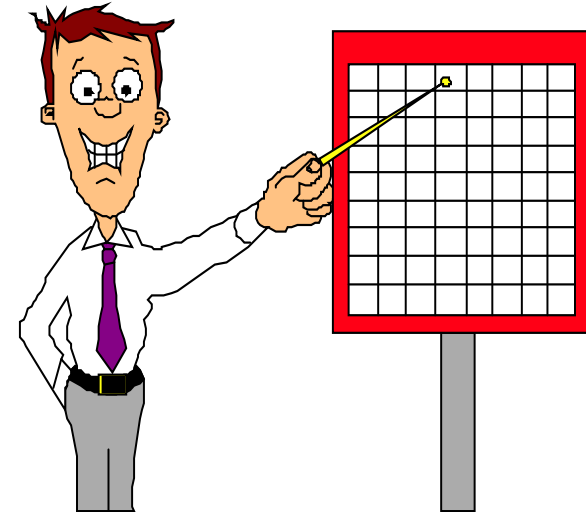
- i. Paired Comparison
- ii. Rank Order Scaling
- iii. Constant Sum Scaling

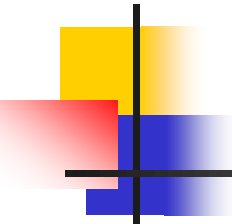
6) Non-comparative Scaling Techniques

7) Continuous Rating Scale

8) Itemized Rating Scale

- i. Likert Scale
- ii. Semantic Differential Scale
- iii. Stapel Scale



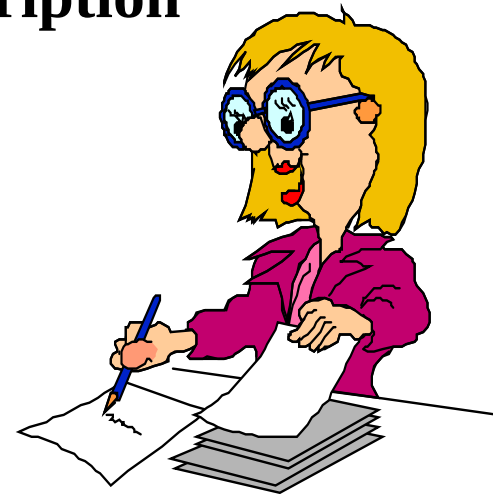


Chapter Outline

9) Non-comparative Itemized Rating Scale Decisions

- i. Number of Scale Categories**
- ii. Balanced vs. Unbalanced Scales**
- iii. Odd or Even Number of Categories**
- iv. Forced vs. Non-forced Scales**
- v. Nature and Degree of Verbal Description**
- vi. Physical Form or Configuration**

10) Multi-item Scales



Chapter Outline

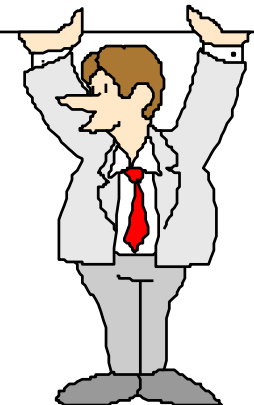
11) Scale Evaluation

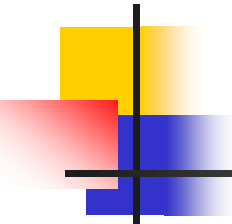
- i. Measurement Accuracy
- ii. Reliability
- iii. Validity
- iv. Relationship between Reliability and Validity
- v. Generalizability

Reliable? Valid?

Generalizable?

12) Choosing a Scaling Technique

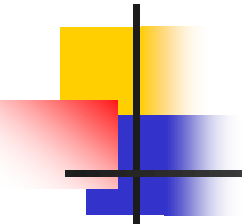




Measurement and Scaling

Measurement means assigning numbers or other symbols to characteristics of objects according to certain pre-specified rules.

- **One-to-one** correspondence between the numbers and the characteristics being measured.
- The rules for assigning numbers should be **standardized** and applied **uniformly**.
- **Rules** must not change over objects or time.



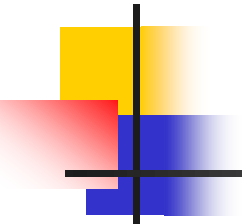
Scale Characteristics

Description

By description, we mean the unique labels or descriptors that are used to designate each value of the scale. All scales possess description.

Order

By order, we mean the relative sizes or positions of the descriptors. Order is denoted by descriptors such as greater than, less than, and equal to.



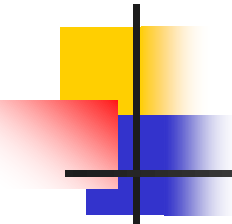
Scale Characteristics

Distance

The characteristic of distance means that absolute differences between the scale descriptors are known and may be expressed in units.

Origin

The origin characteristic means that the scale has a unique or fixed beginning or true zero point.



Measurement and Scaling

Scaling involves creating a continuum upon which measured objects are located.

Consider an attitude scale from 1 to 100. Each respondent is assigned a number from 1 to 100, with 1 = Extremely Unfavorable, and 100 = Extremely Favorable.

Measurement is the actual assignment of a number from 1 to 100 to each respondent. **Scaling** is the process of placing the respondents on a continuum with respect to their attitude toward department stores.

Primary Scales of Measurement

Scale Nominal

Numbers
Assigned
to Runners



Finish

Ordinal

Rank Order
of Winners



Third
place



Second
place



First
place

Finish

Interval

Performance
Rating on a
0 to 10 Scale

8.2

9.1

9.6

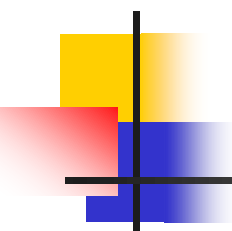
Ratio

Time to
Finish, in
Seconds

15.2

14.1

13.4



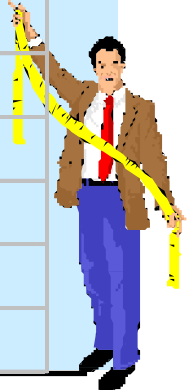
Primary Scales of Measurement

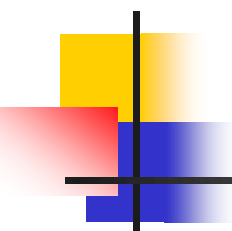
Nominal Scale

- The numbers serve only as labels or tags for identifying and classifying objects.
- When used for identification, there is a strict one-to-one correspondence between the numbers and the objects.
- The numbers do not reflect the amount of the characteristic possessed by the objects.
- The only permissible operation on the numbers in a nominal scale is counting.
- Only a limited number of statistics, all of which are based on frequency counts, are permissible, e.g., percentages, and mode.

Illustration of Primary Scales of Measurement

Nominal Scale		Ordinal Scale		Interval Scale		Ratio Scale
No. Store		Preference Rankings		Preference Ratings		\$ spent last 3 months
				1-7	11-17	
1. Parisian		7	79	5	15	0
2. Macy's		2	25	7	17	200
3. Kmart		8	82	4	14	0
4. Kohl's		3	30	6	16	100
5. J.C. Penney		1	10	7	17	250
6. Neiman Marcus		5	53	5	15	35
7. Marshalls		9	95	4	14	0
8. Saks Fifth Avenue		6	61	5	15	100
9. Sears		4	45	6	16	0
10. Wal-Mart		10	115	2	12	10

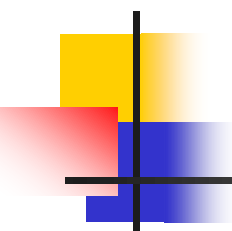




Primary Scales of Measurement

Ordinal Scale

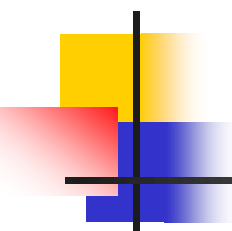
- **A ranking scale in which numbers are assigned to objects to indicate the relative extent to which the objects possess some characteristic.**
- **Can determine whether an object has more or less of a characteristic than some other object, but not how much more or less.**
- **Any series of numbers can be assigned that preserve the ordered relationships between the objects.**
- **In addition to the counting operation allowable for nominal scale data, ordinal scales permit the use of statistics. e.g. median.**



Primary Scales of Measurement

Interval Scale

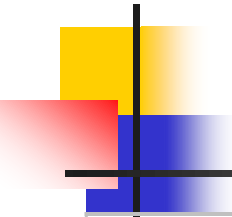
- Numerically equal distances on the scale represent equal values in the characteristic being measured.
- It permits comparison of the differences between objects.
- Any positive linear transformation of the form $y = a + bx$ will preserve the properties of the scale.
- It is meaningful to take ratios of scale values.
- Statistical techniques that may be used include all of those that can be applied to nominal and ordinal data, and in addition the arithmetic mean, standard deviation, and other statistics commonly used in marketing research.



Primary Scales of Measurement

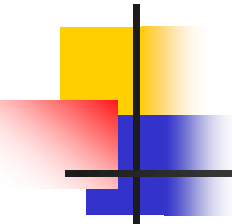
Ratio Scale

- Possesses all the properties of the nominal, ordinal, and interval scales.
- It has an absolute zero point.
- It is meaningful to compute ratios of scale values.
- Only proportionate transformations of the form $y = a + bx$, where a & b positive constants, are allowed.
- All statistical techniques can be applied to ratio data.

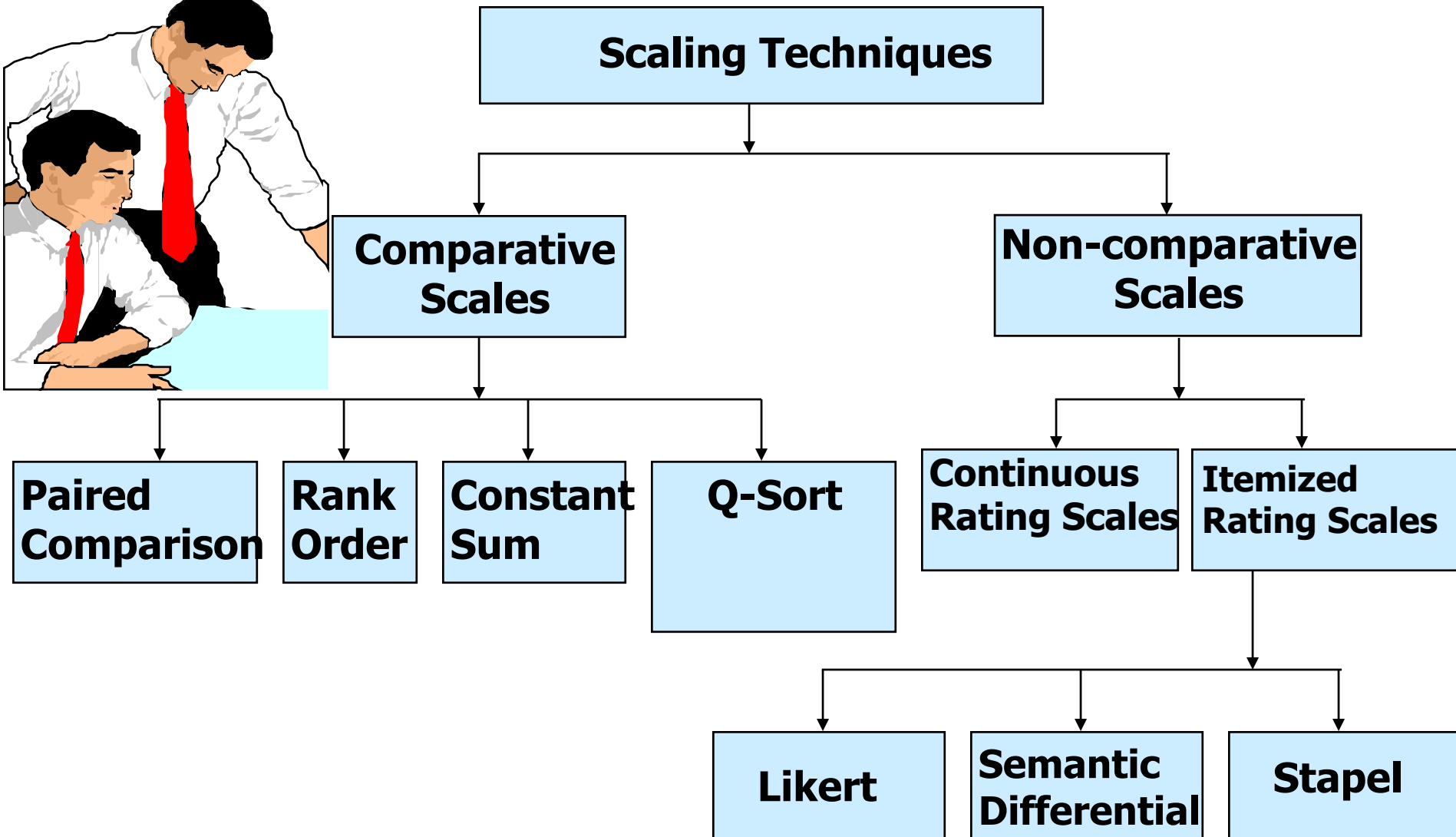
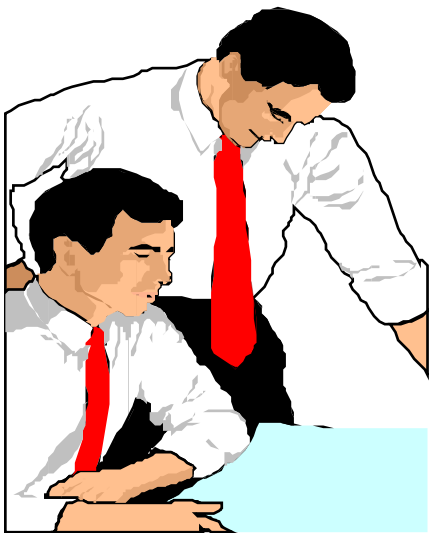


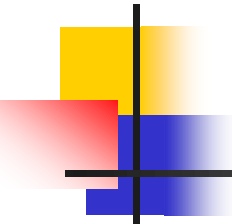
Primary Scales of Measurement

Scale	Basic Characteristics	Common Examples	Marketing Examples	<u>Permissible Statistics</u>	
				Descriptive	Inferential
Nominal	Numbers identify & classify objects	Social Security nos., numbering of football players	Brand nos., store types	Percentages, mode	Chi-square, binomial test
Ordinal	Nos. indicate the relative positions of objects but not the magnitude of differences between them	Quality rankings, rankings of teams in a tournament	Preference rankings, market position, social class	median	Rank-order correlation, ANOVA
Interval	Differences between objects	Temperature (Fahrenheit)	Attitudes, opinions, index	mean, standard deviation	correlation, t tests, regres
Ratio	Zero point is fixed, ratios of scale values can be compared	Length, weight	Age, sales, income, costs	mean	Coefficient of variation



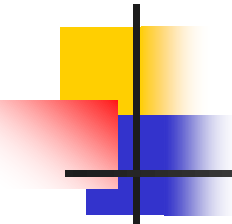
A Classification of Scaling Techniques





A Comparison of Scaling Techniques

- **Comparative scales** involve the direct comparison of stimulus objects. Comparative scale data must be interpreted in relative terms and have only ordinal or rank order properties.
- In **non-comparative scales**, each object is scaled independently of the others in the stimulus set. The resulting data are generally assumed to be interval or ratio scaled.



Comparative Scaling Techniques

Paired Comparison Scaling

- **A respondent is presented with two objects and asked to select one according to some criterion.**
- **The data obtained are ordinal in nature.**
- **Paired comparison scaling is the most widely used comparative scaling technique.**

Obtaining Shampoo Preferences Using Paired Comparisons

Instructions: We are going to present you with ten pairs of shampoo brands. For each pair, please indicate which one of the two brands of shampoo you prefer for personal use.

Recording Form:



	Palmolive	Herb al	Well a	Head & Shoulders	Pert
Palmolive		0	0	1	0
Herbal	1 ^a		0	1	0
Wella	1	1		1	1
Head & Shoulders	0	0	0		0
Pert	1	1	0	1	
Number of Times Preferred ^b	3	2	0	4	1

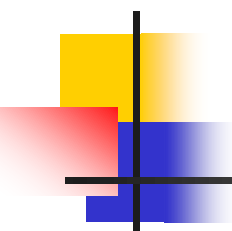
^aA 1 in a particular box means that the brand in that column was preferred over the brand in the corresponding row. A 0 means that the row brand was preferred over the column brand. ^bThe number of times a brand was preferred is obtained by summing the 1's in each column.

Paired Comparison Selling

The most common method of taste testing is **paired comparison**. The consumer is asked to sample two different products and select the one with the most appealing taste. The test is done in private and a minimum of 1,000 responses is considered an adequate sample. A **blind taste test** for a soft drink, where imagery, self-perception and brand reputation are very important factors in the consumer's purchasing decision, may not be a good indicator of performance in the marketplace. The introduction of New Coke illustrates this point. New Coke was heavily favored in blind paired comparison taste tests, but its introduction was less than successful, because image plays a major role in the purchase of Coke.

A paired comparison taste test





Comparative Scaling Techniques

Rank Order Scaling

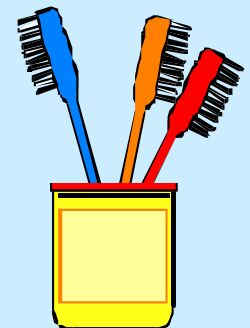
- Respondents are presented with several objects simultaneously and asked to order or rank them according to some criterion.
- It is possible that the respondent may dislike the brand ranked 1 in an absolute sense.
- Furthermore, rank order scaling also results in ordinal data.
- Only $(n - 1)$ scaling decisions need be made in rank order scaling.

Preference for Toothpaste Brands Using Rank Order Scaling

Instructions: Rank the various brands of toothpaste in order of preference. Begin by picking out the one brand that you like most and assign it a number 10. Then find the second most preferred brand and assign it a number 9. Continue this procedure until you have ranked all the brands of toothpaste in order of preference. The least preferred brand should be assigned a rank of 1.

No two brands should receive the same rank number.

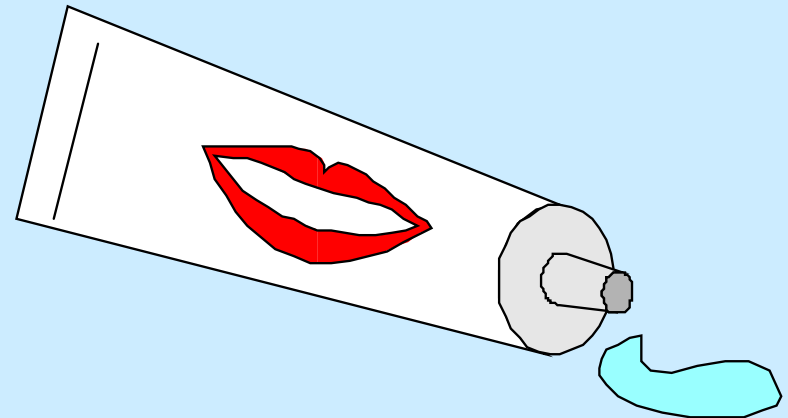
The criterion of preference is entirely up to you. There is no right or wrong answer. Just try to be consistent.

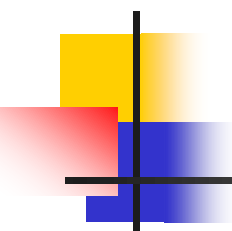


Preference for Toothpaste Brands Using Rank Order Scaling

Form

<u>Brand</u>	<u>Rank Order</u>
1. Crest	_____
2. Colgate	_____
3. Kolinos	_____
4. Sensodine	_____
5. Fluocaril	_____
6. Oral B	_____
7. Close Up	_____
8. Mentadene	_____
9. Extra White	_____
10. Signal	_____





Comparative Scaling Techniques

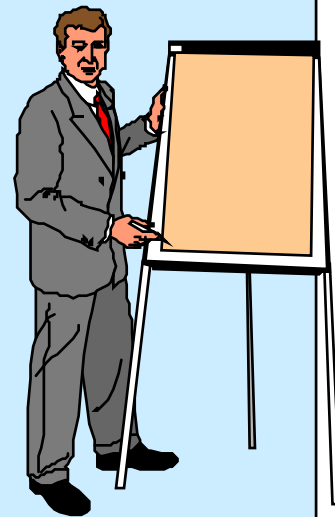
Constant Sum Scaling

- Respondents allocate a constant sum of units, such as 100 points to attributes of a product to reflect their importance.
- If an attribute is unimportant, the respondent assigns it zero points.
- If an attribute is twice as important as some other attribute, it receives twice as many points.
- The sum of all the points is 100. Hence, the name of the scale.

Importance of Bathing Soap Attributes Using a Constant Sum Scale

Instructions

On the next slide, there are eight attributes of bathing soaps. Please allocate 100 points among the attributes so that your allocation reflects the relative importance you attach to each attribute. The more points an attribute receives, the more important the attribute is. If an attribute is not at all important, assign it zero points. If an attribute is twice as important as some other attribute, it should receive twice as many points.



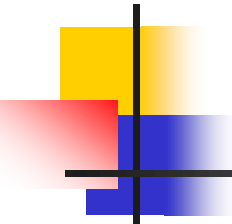
Importance of Bathing Soap Attributes Using a Constant Sum Scale

Form

Average Responses of Three Segments

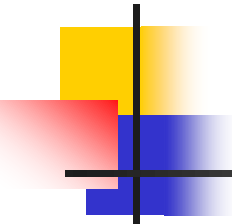
Attribute	Segment I	Segment II	Segment III
1. Mildness	8	2	4
2. Lather	2	4	17
3. Shrinkage	3	9	7
4. Price	53	17	9
5. Fragrance	9	0	19
6. Packaging	7	5	9
7. Moisturizing	5	3	20
8. Cleaning Power	13	60	15
Sum	100	100	100





Non-Comparative Scaling Techniques

- Respondents evaluate only one object at a time, and for this reason **non-comparative scales** are often referred to as monadic scales.
- Non-comparative techniques consist of **continuous** and **itemized rating scales**.



Continuous Rating Scale

Respondents rate the objects by placing a mark at the appropriate position on a line that runs from one extreme of the criterion variable to the other. The form of the continuous scale may vary considerably.

How would you rate ABC as a department store?

Version 1

Probably the worst -----I----- Probably the best

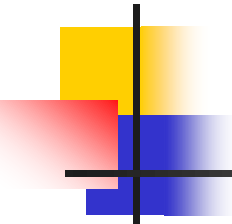
Version 2

Probably the worst -----I----- Probably the best
0 10 20 30 40 50 60 70 80 90 100

Version 3

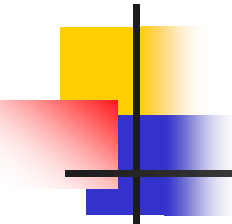
Very bad Neither good Very good
nor bad

Probably the worst -----I----- Probably the best
0 10 20 30 40 50 60 70 80 90 100



Itemized Rating Scales

- **The respondents are provided with a scale that has a number or brief description associated with each category.**
- **The categories are ordered in terms of scale position, and the respondents are required to select the specified category that best describes the object being rated.**
- **The commonly used itemized rating scales are the Likert, semantic differential, and Stapel scales.**

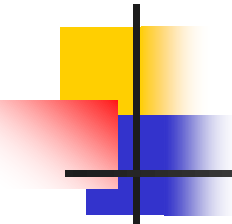


Likert Scale

The Likert scale requires the respondents to indicate a degree of agreement or disagreement with each of a series of statements about the stimulus objects.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1. ABC sells high quality merchandise.	1	2	3	4	5
2. ABC has poor in-store service.	1	2	3	4	5
3. I like to shop at ABC.	1	2	3	4	5

- **The analysis can be conducted on an item-by-item basis (profile analysis), or a total (summated) score can be calculated.**



Semantic Differential Scale

The semantic differential is a seven-point rating scale with end points associated with bipolar labels that have semantic meaning.

ABC IS:

Powerful --:--:--:--:-X-:--:--: Weak

Unreliable --:--:--:--:-X-:--: Reliable

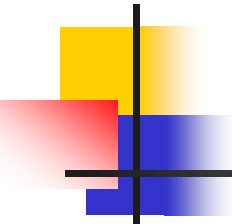
Modern --:--:--:--:-X-: Old-fashioned

- The negative adjective or phrase sometimes appears at the left side of the scale and sometimes at the right.
- This controls the tendency of some respondents, particularly those with very positive or very negative attitudes, to mark the right- or left-hand sides without reading the labels.
- Individual items on a semantic differential scale may be scored on either a -3 to +3 or a 1 to 7 scale.

A Semantic Differential Scale for Measuring Self-Concepts, Person Concepts, and Product Concepts

- 1) Excitable :---:---:---:---:---:---:---: Calm
- 2) Uncomfortable :---:---:---:---:---:---:---: Comfortable
- 3) Dominating :---:---:---:---:---:---:---: Submissive
- 4) Pleasant :---:---:---:---:---:---:---: Unpleasant
- 5) Organized :---:---:---:---:---:---:---: Unorganized
- 6) Rational :---:---:---:---:---:---:---: Emotional
- 7) Youthful :---:---:---:---:---:---:---: Mature
- 8) Formal :---:---:---:---:---:---:---: Informal
- 9) Complex :---:---:---:---:---:---:---: Simple
- 10) Colorless :---:---:---:---:---:---:---: Colorful





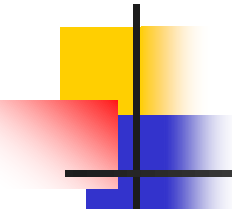
Stapel Scale

The Stapel scale is a unipolar rating scale with ten categories numbered from -5 to +5, without a neutral point (zero). This scale is usually presented vertically.

ABC

+5	+5
+4	+4
+3	+3
+2	+2X
+1	+1
HIGH QUALITY	POOR SERVICE
-1	-1
-2	-2
-3	-3
-4X	-4
-5	-5

The data obtained by using a Stapel scale can be analyzed in the same way as semantic differential data.



Basic Non-comparative Scales

Scale	Basic Characteristics	Examples	Advantages	Disadvantages
Continuous Rating Scale	Place a mark on a continuous line	Reaction to TV commercials	Easy to construct	Scoring can be mishandled unless computerized
Itemized Rating Scales				
Likert Scale	Degrees of agreement on a 1 (strongly disagree) to 5 (strongly agree) scale	Measurement of attitudes	Easy to construct, administer, and understand	More time - consuming
Semantic Differential	Seven - point scale with bipolar labels	Brand, product, and company images	Versatile	Controversy as to whether the data are interval
Stapel Scale	Unipolar ten - point scale, - 5 to +5, without a neutral point (zero)	Measurement of attitudes and images	Easy to construct, administer over telephone	Confusing and difficult to apply

Summary of Itemized Scale Decisions

1) Number of categories

Although there is no single, optimal number, traditional guidelines suggest that there should be between five and nine categories

2) Balanced vs. unbalanced

In general, the scale should be balanced to obtain objective data

3) Odd/even no. of categories

If a neutral or indifferent scale response is possible from at least some of the respondents, an odd number of categories should be used

4) Forced vs. non-forced

In situations where the respondents are expected to have no opinion, the accuracy of the data may be improved by a non-forced scale

5) Verbal description

An argument can be made for labeling all or many scale categories. The category descriptions should be located as close to the response categories as possible

6) Physical form

A number of options should be tried and the best to be selected



Balanced and Unbalanced Scales

Balanced Scale

Jovan Musk for Men is

Extremely good	_____
Very good	_____
Good	_____
Bad	_____
Very bad	_____
Extremely bad	_____

Unbalanced Scale

Jovan Musk for Men is

Extremely good	_____
Very good	_____
Good	_____
Somewhat good	_____
Bad	_____
Very bad	_____



Rating Scale Configurations

A variety of scale configurations may be employed to measure the gentleness of Persil detergent. Some examples include:

Persil detergent is:

1) Very harsh --- --- --- --- --- --- --- Very gentle

2) Very harsh 1 2 3 4 5 6 7 Very gentle

3) . Very harsh

.

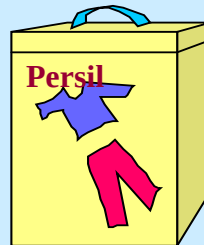
.

. Neither harsh nor gentle

.

.

. Very gentle



4) _____
 Very Harsh Somewhat Neither harsh Somewhat Gentle Very
 harsh harsh Harsh nor gentle gentle gentle

5)

-3	-2	-1	0	+1	+2	+3
Very harsh			Neither harsh nor gentle			Very gentle

Some Unique Rating Scale Configurations

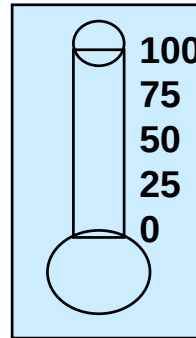
Thermometer Scale

Instructions: Please indicate how much you like McDonald's hamburgers by coloring in the thermometer. Start at the bottom and color up to the temperature level that best indicates how strong your preference is.

Form:

Like very
much

Dislike
very much



Smiling Face Scale

Instructions: Please point to the face that shows how much you like the Barbie Doll. If you do not like the Barbie Doll at all, you would point to Face 1. If you liked it very much, you would point to Face 5.

Form:



1



2



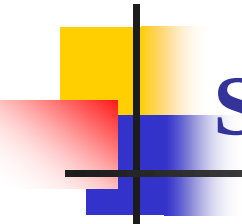
3



4

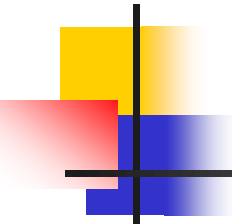


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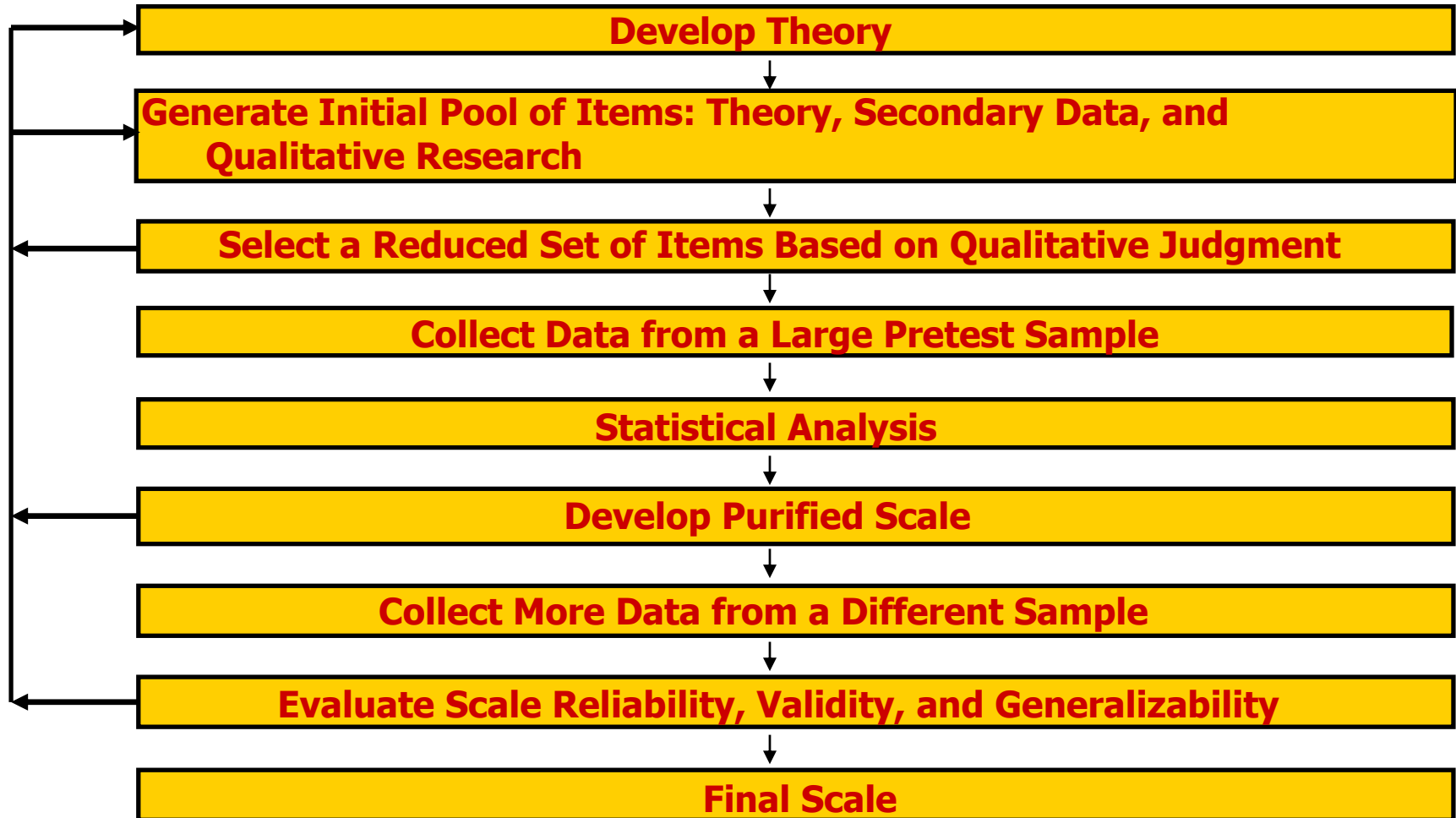


Some Commonly Used Scales in Marketing

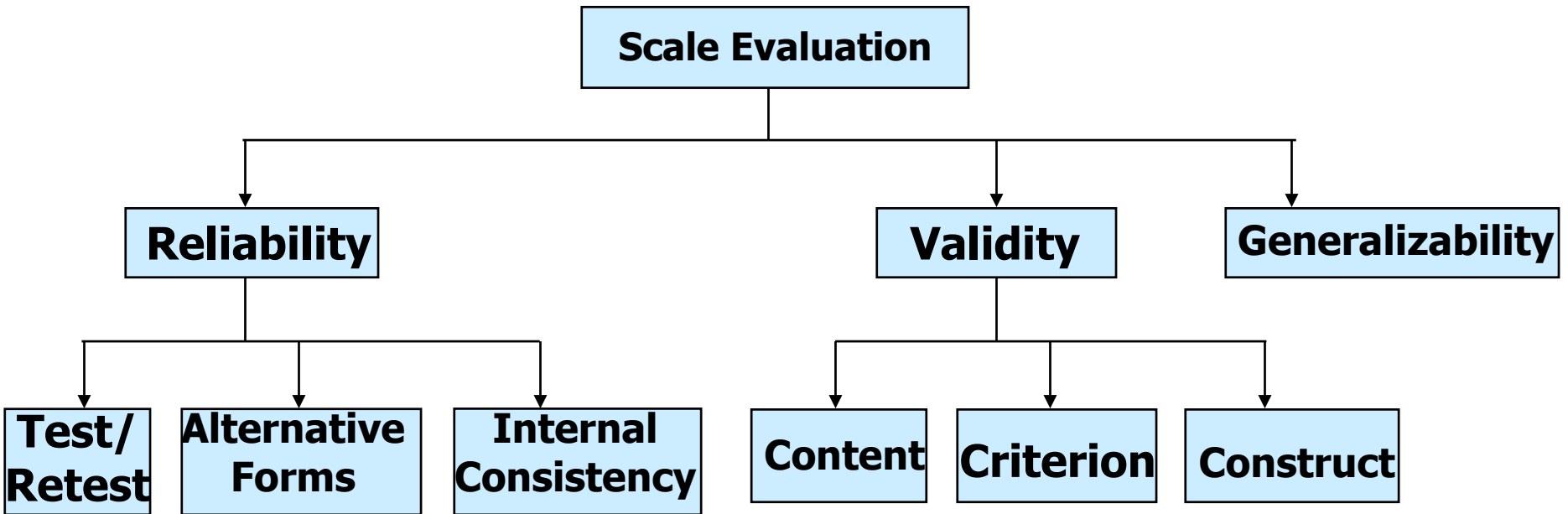
CONSTRUCT	SCALE DESCRIPTORS				
Attitude	Very Bad	Bad	Neither Bad Nor Good	Good	Very Good
Importance	Not at All Importa	Not Important	Neutral	Important	Very Important
Satisfaction	Very Dissatisfied	Dissatisfied	Neither Dissat. Nor Satisfied	Satisfied	Very Satisfied
Purchase Intent	Definitely will Not Buy	Probably Will No Buy	Might or Might Not Buy	Probably Will Buy	Definitely Will Buy
Purchase Freq	Never	Rarely	Sometimes	Often	Very Often

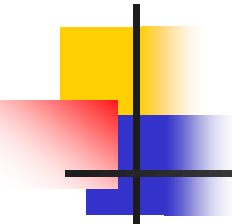


Development of a Multi-item Scale



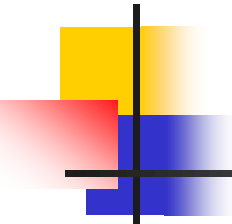
Scale Evaluation





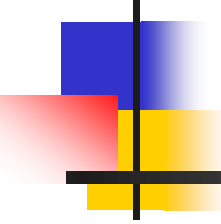
Reliability

- **Reliability** can be defined as the extent to which measures are free from random error.
- In **test-retest reliability**, respondents are administered identical sets of scale items at two different times and the degree of similarity between the two measurements is determined.
- In **alternative-forms reliability**, two equivalent forms of the scale are constructed and the same respondents are measured at two different times, with a different form being used each time.



Validity

- The **validity** of a scale may be defined as the extent to which differences in observed scale scores reflect true differences among objects on the characteristic being measured, rather than systematic or random error.
- **Content validity** is a subjective but systematic evaluation of how well the content of a scale represents the measurement task at hand.



Next: Chapter Eight

Questionnaire & Form Design