

The Measurement Process

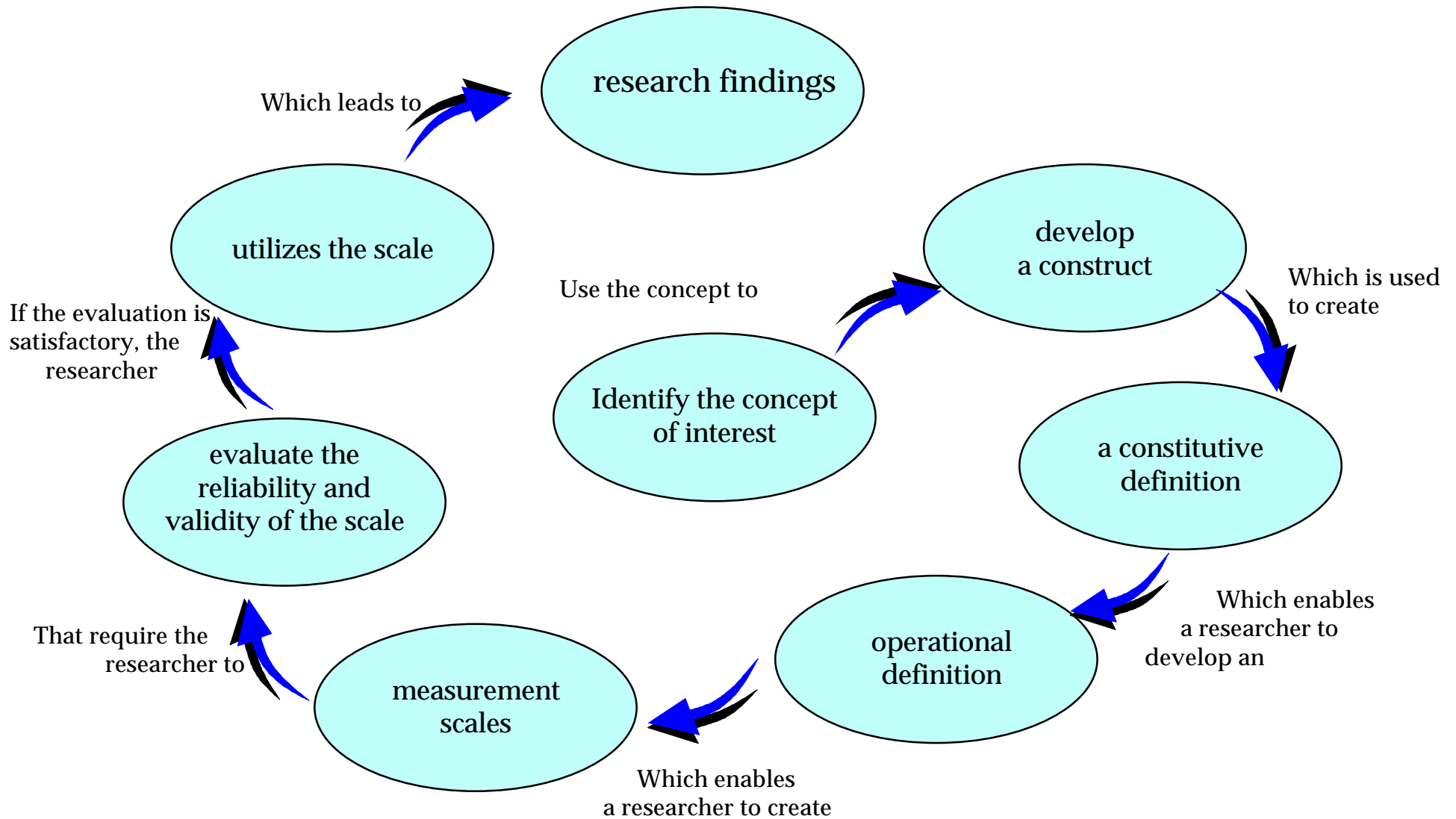


TABLE 10.1

Constitutive and Operational Definitions of Role Ambiguity

Constitutive Definition

Role ambiguity is a direct function of the discrepancy between the information available to the person and that which is required for adequate performance of a role. It is the difference between a person's actual state of knowledge and that which provides adequate satisfaction of one's personal needs and values.

Operational Definition

The amount of uncertainty (ranging from very uncertain to very certain on a five-point scale) an individual feels regarding job role responsibilities and expectations from other employees and customers.

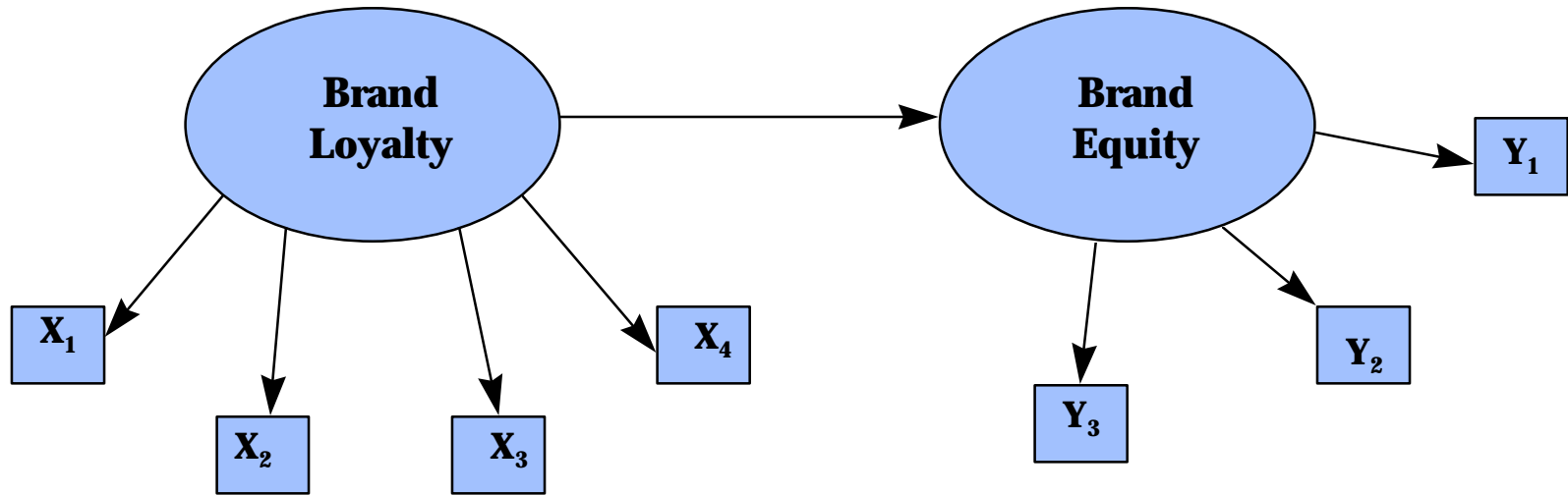
Measurement Scale

The measurement scale consists of a 45-item scale with each item assessed by a five-point scale with category labels: 1 = very certain, 2 = certain, 3 = neutral, 4 = uncertain, 5 = very uncertain. A sample of the 45 items is:

- How much freedom of action I am expected to have
 - How I am expected to handle nonroutine activities on the job
 - The sheer amount of work I am expected to do
 - To what extent my boss is open to hearing my point of view
 - How satisfied my boss is with me
 - How managers in other departments expect me to interact with them
 - What managers in other departments think about the job I perform
 - How I am expected to interact with my customers
 - How I should behave (with customers) while on the job
 - If I am expected to lie a little to win customer confidence
 - If I am expected to hide my company's foul-ups from my customers
 - About how much time my family feels I should spend on the job
 - To what extent my family expects me to share my job-related problems
 - How my coworkers expect me to behave while on the job
 - How much information my coworkers expect me to convey to my boss
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SOURCE: Adapted from Jagdip Singh and Gary K. Rhoads, "Boundary Role Ambiguity in Marketing-Oriented Positions: A Multi-dimensional Multifaceted Operationalization," *Journal of Marketing Research* 28 (August 1991): 328-338.

The Use of Abstract (Unobservable) Constructs to Aid Measurement in Marketing



X₁ = Last brand purchased

X₂ = Brand purchased most often

X₃ = Proportion of purchases (in last month) of brand

X₄ = Most preferred brand

Y₁ = Length of uninterrupted purchases of brand

Y₂ = Price incentive needed to switch to other brand

The Measurement Process

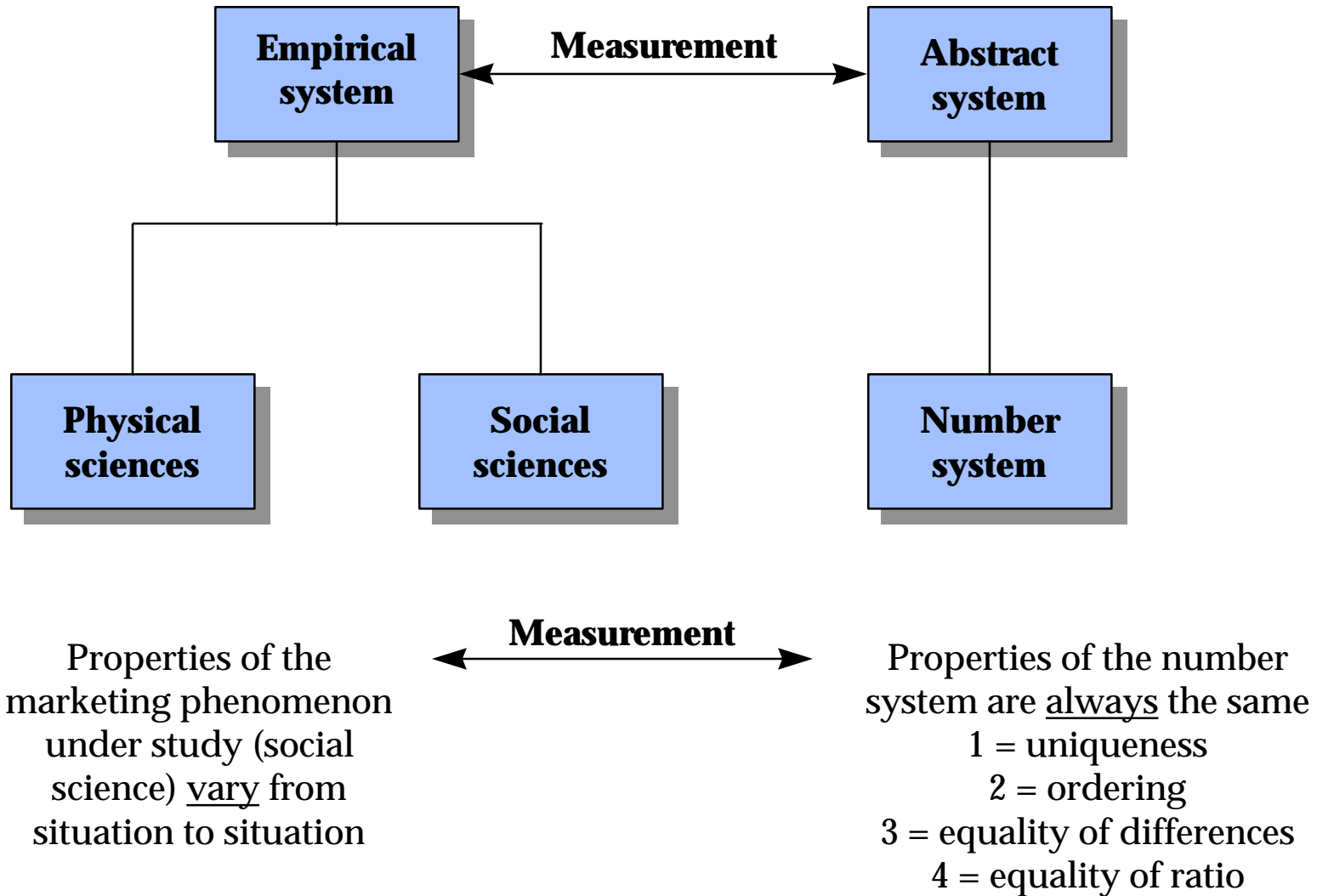


TABLE 10.2**The Four Major Levels of Measurement**

LEVEL	DESCRIPTION*	BASIC EMPIRICAL OPERATIONS	TYPICAL USAGE	TYPICAL DESCRIPTIVE STATISTICS
Nominal	Uses numerals to identify objects, individuals, events, or groups	Determination of equality/inequality	Classification (male/female; buyer/nonbuyer)	Frequency counts, percentages/modes
Ordinal	In addition to identification, the numerals provide information about the relative amount of some characteristic posed by an event, object, etc.	Determination of greater or less	Rankings/ratings (preferences for hotels, banks, etc., social class; ratings of foods based upon fat content, cholesterol)	Median (mean and variance metric)
Interval	Possesses all the properties of nominal and ordinal scales plus the intervals between consecutive points are equal	Determination of equality of intervals	Preferred measure of complex concepts/constructs (temperature scale; air pressure scale; level of knowledge about brands)	Mean/variance
Ratio	Incorporates all the properties of nominal, ordinal, and interval scales plus it includes an absolute zero point	Determination of equality of ratios	When precision instruments are available (sales; number of on-time arrivals; age)	Geometric mean/harmonic mean

* Because higher levels of measurement contain all the properties of lower levels, we can convert higher level scales into lower level ones (i.e., ratio to interval or ordinal or nominal; or interval to ordinal or nominal; or ordinal to nominal).

SOURCE: Adapted from S.S. Stevens, "On the Theory of Scales of Measurement," _____ *Science* 103 (June 7, 1946), pp. 677-680.

Measurement Scales

Some characteristics are present for some measurement scales.
We need to know which scales have which characteristics.

Characteristic	Scale
None	Nominal
Rank order	Ordinal
Rank order and interval	Interval
Rank order, interval, and ratio	Ratio

Examples of Acceptable Alternative Measurements

NOMINAL

A	B	C
1	7	9
2	13	4
41	2	6

ORDINAL

A	B	C
1	2	3
1	3	7
1	3	30
1	2	12

RATIO

A	B	C
0	1	2
0	2	4
0	8	16

INTERVAL

A	B	C	D
0	1	2	3
7	9	11	13
5	9	13	17
10	20	30	40

One Variable, All Measurement Levels

Many variables can be measured at any level of measurement. Example: *Age*

Nominal

Are you older than 30?

- Yes
- No

Ordinal

How old are you?

- <30
- 30-40
- >40

Interval

How old are you?

- 21-30
- 31-40
- 41-50
- 51-60
- 61-70

Ratio

How old are you?

Ordinal or Interval?

Ordinal rating of characteristic: **Likert Scales**

Example:

How certain are you of your grade this term?

- very certain
- certain
- neutral
- uncertain
- very uncertain

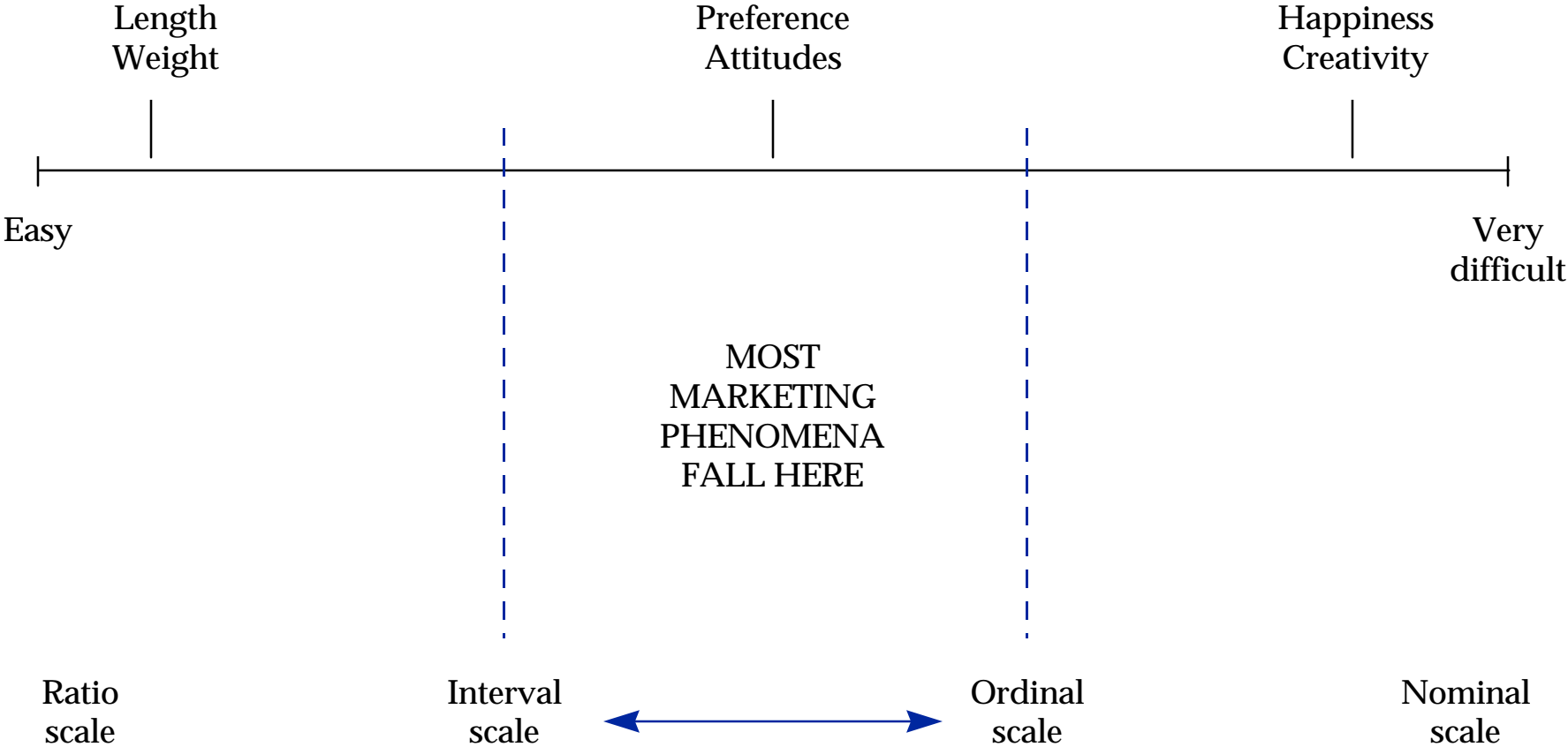
If the intervals between categories can be assumed to be equal, then the data are treated as interval, not as ordinal.

TABLE 10.2**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.	Lord & Taylor	7	79	5	15	0
2.	Macy's	2	25	7	17	200
3.	Kmart	8	82	7	17	0
4.	Rich's	3	30	6	16	100
5.	J.C. Penney	1	10	7	17	250
6.	Neiman-Marcus	5	53	5	15	35
7.	Target	9	95	4	14	0
8.	Saks Fifth Ave	6	61	5	15	100
9.	Sears	4	45	6	16	0
10.	Woolworth	10	115	2	12	10

Physical sciences

Social sciences



Difficulty of the measurement process.

IMPORTANT NOTE: There is a trade-off between assuming interval scale properties and using the statistics for an ordinal scale

Characteristics of Good Measurements

Reliability



The outcome of the measurement process is reproducible. (Similar results are gotten over time and across situations.)

Validity



The measurement process actually measures what it purports to measure.

Sensitivity



The measurement process shows variability in responses when it exists in the stimulus or situation.

Reliability and Validity

$$\begin{aligned}O_M &= T_S + R_E + S_E \\O_M - T_S &= \text{Measurement Error} \\R_E &= \text{Random Error} \\S_E &= \text{Systematic Error}\end{aligned}$$

**Validity of
a Measure**

Extent to which the measurement process is free from **both** R_E and S_E (validity can only be inferred)

**Reliability of
a Measure**

Extent to which the measurement process is free from R_E (a measure must be reliable in order for it to be valid)

TABLE 10.3**Assessing the Reliability of a Measurement Instrument**

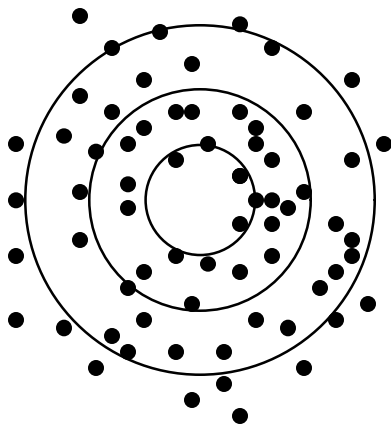
1. **Test-Retest Reliability:** Use the same instrument a second time under nearly the same conditions as possible.
 2. **Equivalent Form Reliability:** Use two instruments that are as similar as possible to measure the same object during the same time period.
 3. **Internal Consistency Reliability:** Compare different samples of items being used to measure a phenomenon during the same time period.
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TABLE 10.5**Assessing the Validity of a Measurement Instrument**

Face Validity	Researchers judge the degree to which a measurement instrument seems to measure what it is supposed to.
Content Validity	The degree to which the instrument items represent the universe of the concept under study.
Criterion-related Validity	<p>The degree to which the measurement instrument can predict a variable that is designated a criterion.</p> <ol style="list-style-type: none">Predictive validity: The extent to which a future level of a criterion variable can be predicted by a current measurement on a scale.Concurrent validity: The extent to which a criterion variable measured at the same point in time as the variable of interest can be predicted by the measurement instrument.
Construct Validity	<p>The degree to which a measure confirms a hypothesis created from a theory based upon the concepts under study.</p> <ol style="list-style-type: none">Convergent validity: The degree of association among different measurement instruments that purport to measure the same concept.Discriminant validity: The lack of association among constructs that are supposed to be different.

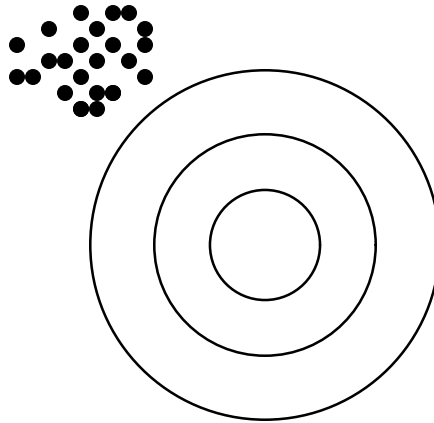
Illustration of Possible Reliability and Validity Situations in Measurement

Situation 1



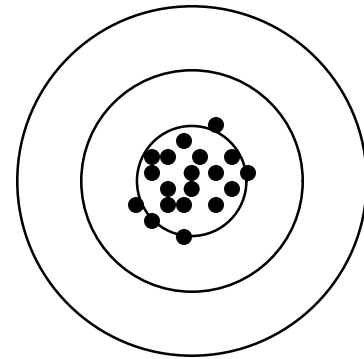
Neither Reliable
Nor Valid

Situation 2



Highly Reliable
But Not Valid

Situation 3



Highly Reliable
and Valid