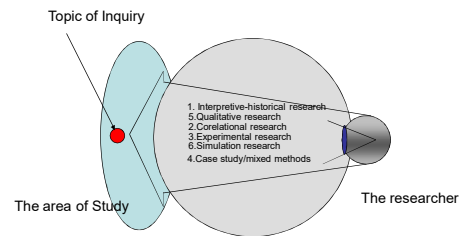


More Common Terms in Research

- Causal relations
- Co-relations
- Causal-comparative (co-relations)
- POPULATION, SAMPLE,
- PARAMETER, STATISTIC, MEASURE VARIABLE
- Independent and Dependent Variables

The Strategy Screen



Groat & Wang

Research Strategies

- Various Research Strategies
 - Interpretive-Historical Research
 - Archival Studies
 - Qualitative Research
 - **Grounded Theory, Ethnography, Interpretivism and Phenomenology**
 - **Co-relational Research**
 - **Survey Research**
 - Experimental and Quasi-experimental Research
 - **Causal Relation**
 - Simulation and Modeling Research
 - Case Studies

Strategy	Form of research Question	Requires Control over behavioral events?	Focus on Contemporary events?
Experiment (Model/Simulation) POSITIVIST	How, Why	Yes	Yes
Survey (Co-relational) POST-POSITIVIST	Who, What, Where, How many, How Much	No	Yes
Case Study MIXED	How, Why	No	Yes
Interpretive-Historical CONSTRUCTIVIST	How, Why	No	No
Qualitative (Grounded Theory, Ethnographical, Interpretive, Phenomenological) CONSTRUCTIVIST	How, Why, What	No	Yes

Co-relational research

Lecture 8

Co-relational research Key Characteristics

- Focus on naturally occurring patterns
 - Real world variables – characteristics of physical features, of people, of activities or of meanings
- Measurement of specific variables
 - Measurement and quantification
 - Levels of measurement precision
 - Nominal/Categorical
 - Ordinal scales/ordering but the interval of difference not equal
 - Interval scale
 - Ratio scale, zero point
- Use of statistics to clarify the pattern of relationships
 - Descriptive statistics
 - Co-relational statistics

Co-relational research Key Characteristics - 1

- Focus on naturally occurring patterns
 - Real world variables – characteristics of physical features, of people, of activities or of meanings
 - Housing and Neighborhood design
 - A survey asking people to respond in a five point scale
 - Community attachment, pedestrianism, social interaction and community identity
 - Specific physical features like community space, open space, cultural space, sports field
 - Living in Single family houses or Apartments
 - Plaza and its design criteria study
 - Plaza users and availability of sitting space by linear space
 - Number of users in good weather and total space available
 - Survey/observation of 18 plazas in NY

Co-relational research Measurement of Variables -2

- Measurement of specific variables
 - Measurement and quantification
 - Feature that distinguishes this method from qualitative research, which looks more at holistic qualities
 - Measurable attributes and attitudes/opinions or variables that be co-related to specify particulars/relations. Physical properties
 - Measurement can proceed only after we define our variable or variables to be studied.
 - A variable is any measured characteristic or attribute that differs for different subjects. Because it can take varying values, it is named a variable. For example, if the height of 30 trees were measured, then height would be a variable.

Co-relational research Measurement

- Measurement is the process of systematically assigning numbers for the purpose of indicating differences among them in the degree to which they possess the characteristic being measured. The result of a measurement is a number – by definition
 - Measurement and quantification
 - SCALE: is a method of measurement
 - SCALE: is a continuum from the highest to the lowest point.
 - All scales do not have a zero point.

Co-relational research Levels of Measurement

- Levels of measurement precision
 - Nominal/Categorical
 - Ordinal scales/ordering but the interval of difference not equal
 - Interval scale
 - Ratio scale, zero point

Nominal/Categorical Measurement

Nominal Measurement:

A nominal scale, as the name implies, is simply some placing of data into categories, without any order or structure.

Do you live in this neighborhood? YES/NO
How do you go to work? Walk/Bicycle/Microbus/Car
What is your religious preference Hindu/Buddhist/Muslim

(There is no order, there is no distance between YES and NO or between walking and car! Thus nominal scale is not a quantitative but a qualitative measure.)

The numbers in nominal measurement are assigned as labels and have no specific numerical value or meaning. No form of mathematical computation (+, - x etc.) may be performed on Nominal measures.

Ordinal Measurement

Ordinal Measurement (2nd Level of precision)

- The simplest ordinal scale is a ranking.
- A scale is ordinal when objects can be assigned order on some characteristic but they cannot be assigned values that represent degree of difference on that characteristic.
- An ordinal scale only lets you interpret gross order and not the relative positional distances.
- When a market researcher asks you to rank 5 types of beer from most flavorful to least flavorful, he/she is asking you to create an ordinal scale of preference. There is no objective distance between any two points on your subjective scale.

No form of mathematical computations may done with numbers representing ordinal measures. All that can be done with such measures is to represent "greater than" or "less than" comparisons.

Eg of Ordinal measurement

Example:

Rank the following job in terms of their social status.

Jobs	Rank of social status
Manager	-----
Professor	-----
Doctor	-----
Engineer	-----

Note: We can say doctors have relatively higher status than manager, but we cannot, however, conclude that doctors have 3 times higher status than the managers.

Interval Measurement (3rd Level of precision)

- An interval scale has equidistant points between each of the scale elements. The standard survey rating scale is an interval scale.
 - When you are asked to rate your satisfaction with a piece of software on a 7 point scale, from Dissatisfied to Satisfied, you are using an interval scale.
- This means that we can interpret differences in the distance along the scale. We contrast this to an ordinal scale where we can only talk about differences in order, not differences in the degree of order.
- This scale assumes that the data have equal intervals. This is like ordinal scale but with constant intervals.

Several kinds of statistical analysis may be performed on measures off this scale. Common statistics used in such measurements are Mean, standard deviation, t-test and f-test (tests of significance)

Ratio Measurement

- A ratio scale is the top level of measurement. It is an interval scale with zero at the bottom end. Any attribute that measures 20 in this scale is understood as twice the quantity of 10 (interval measure of one). The numbers associated with the ratio scale are true numbers with a true zero.
- The simplest example of a ratio scale is the measurement of length.
-
- The common interval scale which is not also a ratio scale is temperature scale. The Centigrade scale has a zero point but it is an arbitrary one (as you can have minus temperature readings). The Farenheit scale has its equivalent point at -32o.
- So, even though temperature looks as if it would be a ratio scale it is an interval scale. Clearly, we cannot talk about *no temperature* - and this would be needed if it were a ratio scale.

Summary: Four Measurements

1. **Nominal Scale** - To identify and classify
highlights the difference by classifying objects.
2. **Ordinal Scale** - To indicate order
Provides some additional information by rank ordering the categories.
3. **Interval Scale** - To indicate equal interval
Provides information on the magnitude of the differences in the variable.
4. **Ratio Scale** - To indicate ratio
Indicate magnitude and proportions of the differences.

Attitude Scale: Likert Scale

- Likert Scale
- A rating scale measuring the strength of agreement with a clear statement. Often administered in the form of a questionnaire used to gauge attitudes or reactions.
- For example:
Question: "I found the software easy to use..."
1 Strongly Disagree
2 Disagree
3 Undecided
4 Agree
5 Strongly Agree

Attitude Scale: Thurstone Scale

- **Thurstone Scale (equal-appearing)** - A way of measuring people's attitudes along a single dimension by asking them to indicate that they agree or disagree with each of a large set of statements (e.g. 100) that are about that attitude. Each item is assigned a scale value.
 - Example:
 - I believe in religion, and I go to the temple (Scale value 2)
 - I believe in religion, but I seldom go to the temple (Scale value 5.3)
 - I think the temple is a hindrance to religion for it still depends upon superstition and myth (Scale value 9.4).
- This implies 'the lower the scale value, the more positive the attitude towards the temple'.

Variables

- Continuous Variable
- A continuous variable is one for which, within the limits the variable ranges, any value is possible. For example, a person's height is a continuous variable ("height" exists anywhere along the range of values possible).
- Discrete Variable
- A discrete variable is one that cannot take on all values within the limits of the variable. For example, responses to a five-point rating scale can only take on the values 1, 2, 3, 4, and 5. The variable cannot have the value 1.7.
- Quantitative Variable
- Quantitative variables are measured on an **ordinal, interval, or ratio scale**. If subjects were asked to name their favorite actress, then the variable would be qualitative. If the time it took them to respond were measured, then the variable would be quantitative.
- Qualitative Variable
- Qualitative variables are generally measured on a **nominal scale**. If subjects were asked to name their favorite actress, then the variable would be qualitative.

Co-relational research Key Characteristics - 3

- Use of statistics to clarify the pattern of relationships
 - Descriptive statistics
 - Simply presents or describes important relationship among various measures of a variable
 - Basic statistics eg no of plaza users in good weather, size of plaza
 - Co-relational statistics
 - **Strength and direction** of relationships between two or more variables
 - Strong and positive co-relation between community attachment, pedestrianism, social interaction and community identity and physical features considered.

Co-relational research

- Relationship
 - Nature and predictive power of relationship between variables
 - Higher level of plaza utilization and combined presence of the bunch of variables including sittable space, proximity to street life, sun, water/fountains, trees and availability of food from vendors etc.
 - Strength of co-relations, use of inferential statistics
 - Test of statistical significance, a co-relation significant at the 0.01 level meaning that there is only a 1 in 100 chance that the overall assessment of community is unrelated to the component measures

Co-relational research

- Causal-comparative
 - Position in-between relationship and causality
 - Identify variables that could reveal cause for significant differences in the levels of measured variables but it does so only provisional way as the variables are measured as naturally set.
 - The inference is only provisional or hypothetical and 'independent' and 'dependent' variables are proposed, no 'treatment' as in experiments
 - Comparability has to be judged intelligently – the expertise of the researchers assumes significance - other possible influences should be addressed
 - Causation is established with greater rigor in experimental design

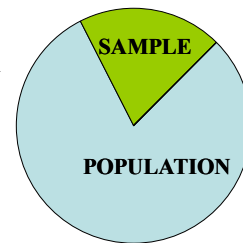
Co-relational research

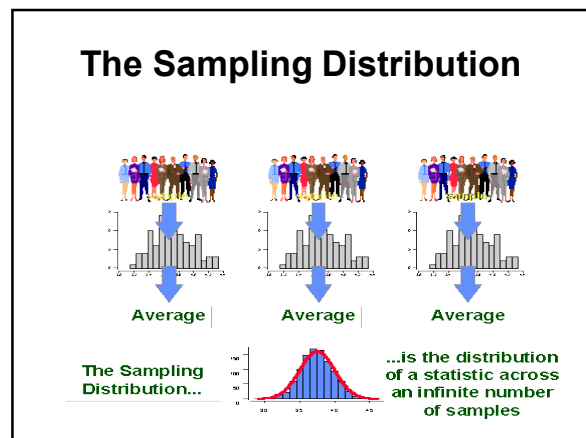
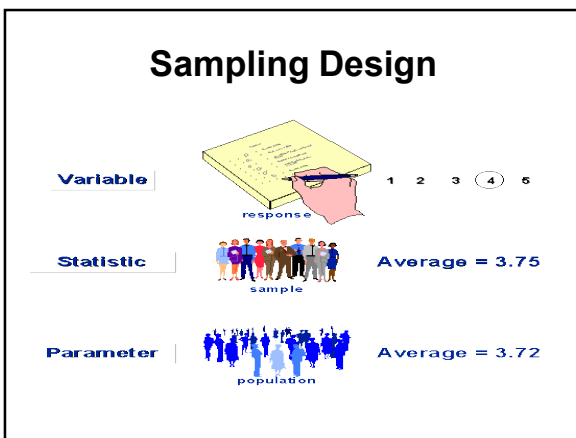
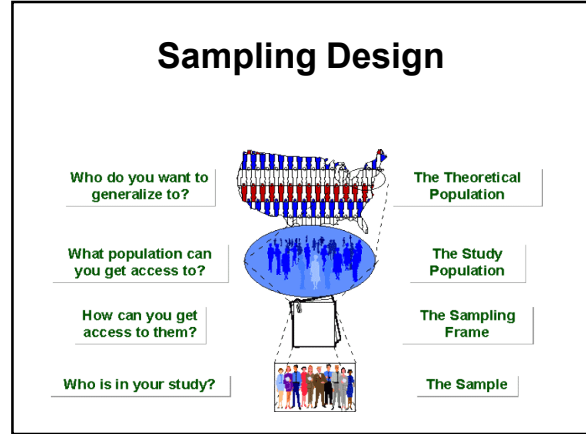
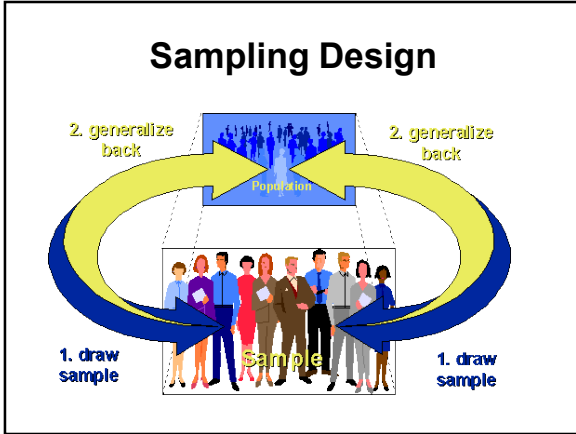
Data collection Techniques: Sampling

- Sampling
 - Since 'data field' options may be extensive, wide and varied, it is not only not possible to study the entire 'population', all of it may also not be particularly appropriate for the particular research objective
 - One needs to make a choice of a sample to investigate in terms of objectivity, appropriateness and manageability.
 - Although sampling is needed to be done in other research strategies also, for co-relational research this is of particular significance
 - A sample is a REPRESENTATIVE group based on which a generalization to the 'POPULATION' or even an 'UNIVERSE' may be attempted statistically.

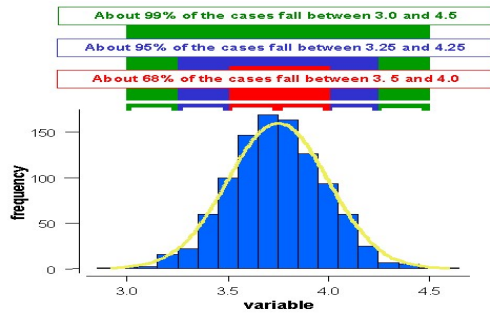
SAMPLE: subset of a larger population

- Sampling Problems:
Definition of the population, size of the sample and representation of the sample.
- Sample Design = Sample Frame + Sample items + Sample size

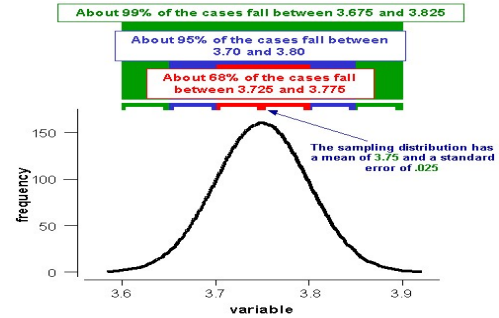




The Sampling Distribution



The Sampling Distribution



Co-relational research Data collection Techniques: Sampling

- Probabilistic and non-probabilistic sampling
 - Probabilistic sample very representative of the population/ randomization – can use inferential statistics. Significance level of 0.05 is usual
 - Non-probabilistic sample or purposive sample – should not be generalized to larger population
- How to select a random sample?
 - While we do not know who would be selected, we do know the probability that any individual will be selected
 - It is not necessary that every individual has the same probability of getting selected
 - One needs a complete numbered list of population of interest to select sample
 - Excel or SPSS may be used to make a random sample.

Two Major Category of Sampling

Probability Sampling

(Random Sampling)
 Selecting samples according to
 Some laws of Chance
 # sampling error/allowance

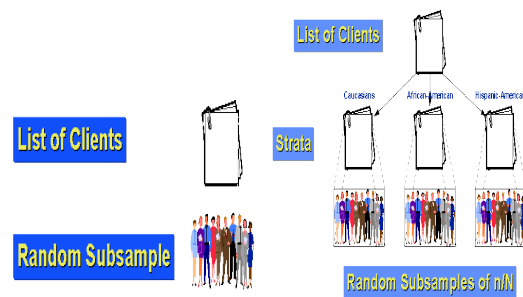
Non-Probability Sampling

Sample selection on the discretion
 of the researcher.
 # Mainly used in opinion surveys
 # bias and prejudice introduced.
 # purposive

Using EXCEL for Random sampling

- Get listing of everyone (sample frame): arrange list in columns/ one variable in one column
- Assign a random number to each individual in the list
 - In a new column, use rand() function to generate random numbers
 - Copy all the random number and paste in a new column (Edit>Paste Special > Paste Values) giving each individual a random identity number
 - Sort using this id number column (in ascending or descending order)
 - Select the first so many as required in the sample
 - [Using SPSS, open datafile, do Data> Select Cases> Random sample of cases > specify delete unselected> click Sample and specify number of cases]

Stratified Random Sampling



Systematic Random Sampling

N = 100

want n = 20

N/n = 5

select a random number from 1-5; chose 4

start with #4 and take every 5th unit

1	26	31	76
2	27	52	77
3	28	53	78
4	29	54	79
5	30	55	80
6	31	56	81
7	32	57	82
8	33	58	83
9	34	59	84
10	35	60	85
11	36	61	86
12	37	62	87
13	38	63	88
14	39	64	89
15	40	65	90
16	41	66	91
17	42	67	92
18	43	68	93
19	44	69	94
20	45	70	95
21	46	71	96
22	47	72	97
23	48	73	98
24	49	74	99
25	50	75	100

Co-relational research Data collection Techniques

- Surveys – broad rather than in-depth information – many variables and wide population can be covered. Questionnaire needs to be properly designed **NEXT LECTURE**
- Observation – camera, check-list, counting, etc.
- Mapping
- Sorting/ordering – preference ranking

Co-relational research Data Analysis Techniques

- Use of descriptive and inferential statistical analysis
 - Numbers are used to describe information, data or techniques used to calculate
 - Characteristics of groups of numbers representing information or data

Data Outputs Measures

- **Summary measures: Descriptive statistics**
 - Univariate analysis – single variable for distribution (categories, number & % or frequency distribution graphs), central tendency – mean, median and mode (simple & weighted, spatial ones), dispersion (range or variance and standard deviation
 - Importance and interpretation of descriptive measures in research/inference

Descriptive Statistics

- **Statistic:** a measure obtained from a **sample**, such as the sample mean or standard deviation. (contrast with **parameter** which is a measure of the **population**)
- **Frequency graph:** a picture depicting the number of times an event occurred.
- **Bar graph** or **Histogram:** a frequency graph with number of blocks or length of bar representing the frequency of occurrence.

Descriptive Statistics

- **Mean/Arithmetic mean:** a number having an intermediate value between several other numbers in a group from which it was derived and of which it expressed the average value
- **Median:** the mid point in a set of ranked numbers
- **Mode:** the number which occurs most often in a group of numbers.

Co-relational research Data Analysis Techniques: Inferential Statistics

- **Range:** The difference in the highest score and the lowest score in a set of scores
- **Variance:** mean of squared deviations of individual numbers from the mean of the group of numbers ; the square of the standard deviation
- **Standard Deviation:** is a measure of the deviation of individual numbers from the mean of the group of numbers, it is the mean or average deviation of those numbers from the mean of the set of numbers
- Inferential statistical tools allow us to make computation and applications of correlations, significance, linear regression, etc. and draw meanings and inferences on the population.

15, 20, 21, 20, 36, 15, 25, and
15.

$$\sqrt{\frac{\sum(X - \bar{X})^2}{(n - 1)}}$$

where:
 X = each score
 \bar{X} = the mean or average
 n = the number of values
 Σ means we sum across the values

- **Mean** **20.8750**
- **Mode** **15**
- **Std. Deviation** 7.0799
- **Variance** 50.1250
- **Range** 21.00

• Dem/Excel use!

Co-relational research Data Analysis Techniques

- Use of descriptive and inferential statistical analysis
- Multivariate statistical procedures
 - Multiple regression
 - Relations between multiple variables and predictions
 - Strength and directions of relationship between variables, several independent variables and single outcome variable
 - Provides a mathematical equation that indicates the amount of variation that is contributed by each of the independent variables
 - Uses interval and ratio scale

Co-relational research Data Analysis Techniques

- Multivariate statistical procedures
 - Multiple regression
 - Factor analysis
 - Cluster of Variables showing similar patterns of responses or observations are factors instead of use of key variables in the multiple regression procedure
 - Multi-dimensional scaling
 - More flexible than both multiple regression and factor analysis
 - Scatter/Graphic plot of multiple variables gives a pattern of distribution that tells of relations/relative salience.