

Pure v/s Applied Research

- Theoretical
 - Hypo Based
- Practical Problem Solving
- Decision Making
- Action Research

What is Research Design?

- A plan for selecting the sources and types of information used to answer research questions
- A framework for specifying the relationships among the study variables
- A blueprint that outlines each procedure from the hypothesis to the analysis

Research Design

Classification Basis:

- The Degree of Problem Crystallization
- Method of Data Collection
- Researcher's Control of Variable
- Purpose of Study
- Time Dimension
- Topical Scope
- Research Environment
- Subject's Perception of Research

Classifications of Designs

- *Exploratory study* is usually to develop hypotheses or questions for further research
- *Formal study* is to test the hypotheses or answer the research questions posed

Methods of Data Collection

- Monitoring, which includes observational studies
- Interrogation/communication studies

Power to Produce Effects

- In an *experiment*, the researcher attempts to control and/or manipulate the variables in the study
- In an *ex post facto design*, the researcher has no control over the variables; they can only report what has happened

Purpose of the Study

- *Descriptive study* tries to describe the phenomenon
- *Causal study* is how one variable produces changes in another

The Time Dimension

- *Cross-sectional studies* are carried out once and represent a snapshot of one point in time
- *Longitudinal studies* are repeated over an extended period

The Topical Scope

- *Statistical studies* attempt to capture a population's characteristics by making inferences from a sample's characteristics
- *Case studies* place more emphasis on a full contextual analysis of fewer events or conditions and their interrelations

The Research Environment

- *Field conditions*
- *Laboratory conditions*
- *Simulations*

A Participant's Perceptions

- Usefulness of a design may be reduced when people in the study perceive that research is being conducted
- Participants' perceptions influence the outcomes of the research

Data Collection Techniques

- *Qualitative techniques*
- *Secondary data*
- *Focus groups*
- *Two-stage design*

Measurement Scale

- To Ascertain the Extent, Dimension/Quality/Capacity/ Against Standards.
- The Assignment of numbers to objects to represent Amounts or Degree of a Property of Objects.

Measurement Scale

• Type

- Nominal
- Ordinal
- Interval
- Ratio

• Characteristics

- No Order Distance or Origin
- No Distance or Unique Origin
- No Unique Origin
- Has Order, Distance & Origin

Instrument Design Process

- Phase 1: Developing the instrument design strategy
- Phase 2: Constructing and refining the measurement questions
- Phase 3: Drafting and refining the instrument

Sampling Design

■ Accuracy :-

Absence of Bias.

No Systematic Variance.

■ Precision :-

Of Estimate

Representative ness

Standard Error of Estimate

Less SE means Higher Precision

Steps in Sampling Design

What????

- Relevant Population
- Parameters of Interest
- Sampling Frame
- Type of Sample
- Sample Size
- Cost of Sampling

Sampling

Representation Bias

Element Selection

	Probabilistic	Non Probabilistic
Unrestricted	Simple Random	Convenience
Restricted	Systematic Cluster Stratified	Purpose Judgment, Quota Snow Ball

Sample Size :-

- Interval Range
- Confidence level

Use Correction Factor When
Sample Size $> 5\%$ of the
Population

e.g. 95% Confidence Level ± 0.1 Units Interval Estimate Very
High Precision

Sampling Analysis

- Prelim. Sample Profile
- Representative Sample : Prob. True About People and How Much Error.

Ex. A/c Receivables

Assumed Population Mean = 50 days

SD = 10

1st Option = Take all the Corresponding A/c

A/c P.M = 51 days

2nd Option = Sampling

n=25

Avg. Days Outstanding = 54

HYPOTHESIS TESTING

Two Tailed

NULL $H_0 = 50$ Days

ALT $H_A \neq 50$ Days

One Tailed

$H_A > 50$ Days Concern

$H_A < 50$ Days

“Accept H_0 ” = “Fail to Reject”

Rej- H_0 = H_A Accept

Type 1 & 2 Errors

State of Nature

S. Decision

	Innocent	Guilty
Let Go	No Error (1-a)	Type 2 b
Convict	Type 1 a	No Error (1-b)

Statistical testing procedure

- Establishing H_0 as well as H_A

- Choose the statistical test – Minimize Errors
- Select the required level of significance/conf.
- Compute the actual test value
- Make the decision

Calculated > Critical

Reject H_0 . Otherwise not.

Dependency Techniques

- Multiple regression
- Discriminant analysis
- Multivariate analysis of variance
- (MANOVA)
- Linear structural relationships (LISREL)
- Conjoint analysis
 - Simalto+Plus

Uses for Multiple Regression

- Predict values for a criterion variable by developing a self-weighting estimating equation
- Control for confounding variables to better evaluate the contribution of other variables
- Test and explain causal theories
 - Path analysis

Uses for Discriminant Analysis

- Classify persons or objects into various groups
- Analyze known groups to determine the relative influence of specific factors

Use for MANOVA

- Assess relationship between two or more dependent variables and classificatory variables or factors samples
- E.g. . . . measure differences between
 - employees
 - customers
 - manufactured items
 - production parts

Uses of LISREL

- Explains causality among constructs not directly measured
- Two parts
 - Measurement model
 - Structural Equation model

Two Models of LISREL

■ Measurement

- used to relate the observed, recorded, or measured variables to the latent variables (constructs)

■ Structural equation

- shows the causal relationships among the latent variables

Use for Conjoint Analysis

- Market research
- Product development

Interdependency Techniques

- Factor analysis
- Cluster analysis
- Multidimensional Scaling (MDS)

Interdependency Techniques

Factor Analysis

- Computational techniques that reduce variables to a manageable number
 - construction of new set of variables based on relationships in the correlation matrix
 - Principal components analysis
 - Communalities
 - Rotation
- Measurement statistics

Interdependency Techniques

- Factor analysis
- Cluster analysis

Steps in Cluster Analysis

- Select sample to be clustered
- Define measurement variables
- Compute similarities among the entities through correlation, Euclidean distances, and other techniques
- Select mutually exclusive clusters
- Compare and validate the clusters

Interdependency Techniques

- Factor analysis
- Cluster analysis
- Multidimensional Scaling (MDS)

Selecting a Multivariate Technique

- Dependency
 - dependent (criterion) variables and independent (predictor) variables are present
- Interdependency
 - variables are interrelated without designating some dependent and others independent

Multidimensional Scaling

- Creates a special description of a participant's perception about a product, service, or other object of interest

**Wishing All of You
a Bright Research Career...**