WHAT IS AN EXPERIMENTAL RESEARCH DESIGN?

♦ The purpose of experimental research design is to enable the researcher to credibly establish a cause-effect relationship.

♦ Many studies illustrate how experimental method is used to separate alternative explanations and test them.

♦ The special nature of the experiment is that they are always conducted under controlled conditions in a systematic way in which an artificial situation is created and events which generally go together are pulled apart.
There are three general categories of experiments –

- Laboratory Experiments
- Field Experiments
- Natural Experiments
TYPES OF EXPERIMENTS

- **Laboratory Experiments** –
  - most common carried out in a specially created setting
  - experimenter able to control wide variety of extraneous variables

- **Field Experiments** –
  - researcher manipulates the independent variables but does so in a field i.e. outside environment where only the setting differs

- **Natural Experiments** – termed as *Quasi - Experiments*
  - are studies which take advantage of experiment like situations that arise as a result of social policy or events in nature.
  - independent variable not directly under the control of the investigator
  - subjects are neither randomly assigned nor matched in groups
COMPONENTS OF AN EXPERIMENTAL METHOD PLAN

♦ Participants
♦ Elements and factors
♦ Setting
♦ Instruments and materials
♦ Procedures and measures
♦ Statistical analysis
♦ Experimenter
PARTICIPANTS- SELECTION

♦ Random selection or random sampling
  - With this each individual has an equal probability of being selected from the population, ensuring that the sample will be representative of the population. (Keppel, 1990)

♦ Non-random selection or convenient sampling
  - Use of naturally formed groups for practical or ethical reasons.
PARTICIPANTS- ASSIGNMENT

- If random assignment is made, indicate how it is made.

- Identify other controls in the experimental design that will systematically control the variables that might influence the outcome.
  - Use of covariates and statistical control
  - Use of subgroups
PARTICIPANTS - NUMBER

- Number of participants in each group.
- Systematic procedures for determining the size of each group.
- Power analysis (Lispey, 1990) to identify the appropriate sample size for groups.
  - Level of statistical significance
  - Amount of power desired
  - The effect size
PARTICIPANTS – SUBJECT CHARACTERISTICS

Validity threats -

- Qualities of the subject are likely to influence the experimental outcome e.g. age, education
- Participants’ expectations and beliefs about the experiment also influence the results

Solutions –

- Eliminate / reduce extraneous variables
- Make the extraneous variables as similar as possible for all treatment conditions in matched groups as well as in random assignment
VARIABLES

Variables - Elements and factors under consideration

- Any characteristic or quality which differs in degree or kind and can be measured
- Have values or levels of measure. For eg. Height, running speed, age etc.
VARIABLES – VARIOUS TYPES

- Continuous variables
- Categorical variables
- Combination of both
- Dependent variables
- Independent variables
- Extraneous variables

All are associated with the subjects, the experimenter, the settings and the experimental procedure itself.
SETTING CHARACTERISTICS

Validity threats –

- Qualities of the setting in which the experiment takes place - functioning of the equipment, time of the day and all other situational variables are potential sources of errors

Solutions –

- Run all subjects about the same time of the day
- Keep the Lab conditions as similar as possible for all subjects
- Check equipment frequently to make sure that it is functioning properly
INSTRUMENTS AND MATERIALS

♦ Choice
♦ Development
♦ Items
♦ Scales
♦ Reports of reliability
♦ Validity of scores on past uses
♦ Any permissions needed to use them
♦ Pilot test of materials
IMPORTANT TERMINOLOGY

♦ Experimental group
  - A subject group exposed to the independent variable.
  - Also called the treatment group

♦ Control group
  - A subject group which resembles the experimental group in every way except that it is not exposed to the independent variable.
PROCEDURES AND MEASURES

♦ Indication of overall experiment type
♦ Citing reasons for the design
♦ Advancing a visual model for understanding of procedures
TYPES OF EXPERIMENTAL DESIGN

- **Pre-experimental design**
  - X----------O

- **True experiments**
  - Group A: R-----O------X-------O
  - Group B: R------O---------------O

- **Quasi experiments**
  - Group A: O------X-------O
  - Group B: O---------------O

X: exposure of a group to an experimental variable  
O: observation or measurement recorded on an instrument  
R: random assignment
STATISTICAL ANALYSIS

- Descriptive statistics calculated for observations and measures at the stages of the experiment
- Means, standard deviations and ranges
- Inferential statistical tests used to examine the hypotheses in the study
EXPERIMENTER CHARACTERISTICS

Validity threats –

♦ Like subjects, possess qualities that might influence the outcome of the experiment. For eg. Nervousness or pre-occupation with other matters

♦ Must be eliminated or kept the same for all subjects

Solutions –

♦ Train experimenters in order to reduce extraneous influences

♦ Use the same experimenter for all subjects

♦ If more than one experimenter is involved, have each run an equal number of subjects

♦ Randomly assign experimenters to subjects
LIMITATIONS

♦ Although this methodology allows the researcher an impressive amount of control over variables, it is chiefly limited by its artificiality.

♦ Conditions in the laboratory may be different from those in the real world and people may react and respond differently.

♦ Some behavioral issues are not suitable for experimentation for ethical reasons or for cost.