



Research Plan And Design

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Research - Defined

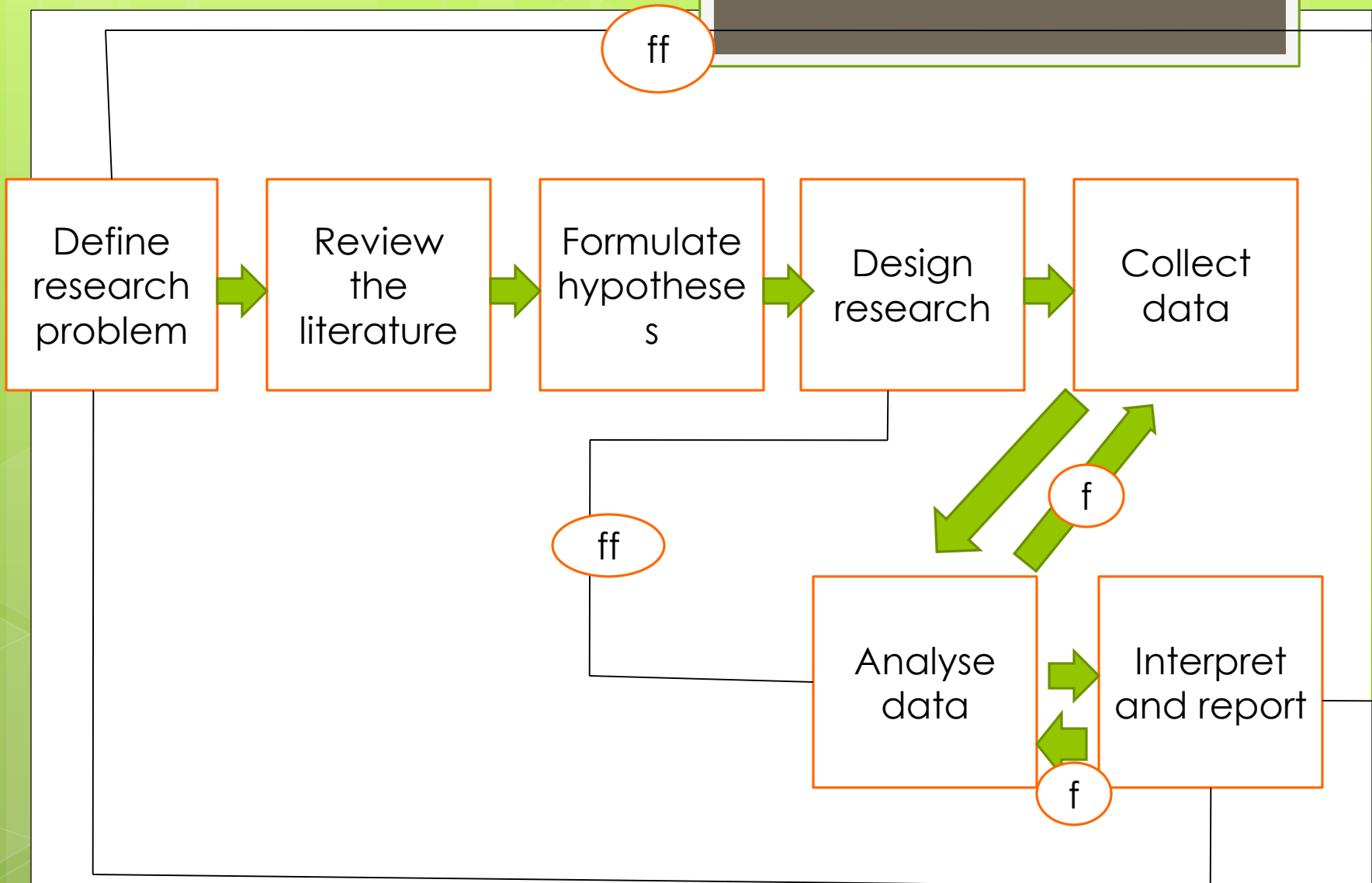
The process of gathering information for the purpose of initiating, modifying or terminating a particular **investment** or group of **investments**.



Research Process

7 STEPS OF RESEARCH PROCESS

- Step One: Define research problem
- Step Two: Review of literature
- Step Three: Formulate hypotheses
- Step Four: Preparing the research design
- Step Five: Data collection
- Step Six: Data analysis
- Step Seven: Interpretation and report writing



Where
 f = feed back (helps in controlling the sub system)
 ff = feed forward (serves the vital function of providing criteria for evaluation)

Step One: Define Research Problem

There are two types of research problem, viz., those

- relate to states of nature
- relationship between variables.

Essentially two steps are involved in define research problem, viz.,

- understanding the problem thoroughly and
- rephrasing the same into meaningful terms from an point of view.

Step Two: Review of Literature

- Once the problem is define, **a brief summary** of it should be written down. It is compulsory for a research worker **writing a thesis** for a Ph.D. degree to write a synopsis of topic and submit it to necessary committee or the research board for approval.

Step Three: Formulate Hypothesis

- Formulate hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested.

The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track.

Step Four: Preparing the Research Design

- The function of research design is to provide for the **collection of relevant evidence** with minimal expenditure of effort, time and money.
- Research purpose may be grouped into four categories, viz., (1) Exploration, (2) Description, (3) Diagnosis, and (4) Experimentation.

Step Five: Data Collection

- Primary data can be collected through:

- By Observation

- Through personal interview

- Through telephone interview

- By mailing of questionnaires

- Through Schedules

Step Six: Data Analysis

The analysis of data requires a number of closely related operations such as establishment of categories.

This stage mainly include :

1. Coding
2. Editing
3. Tabulation

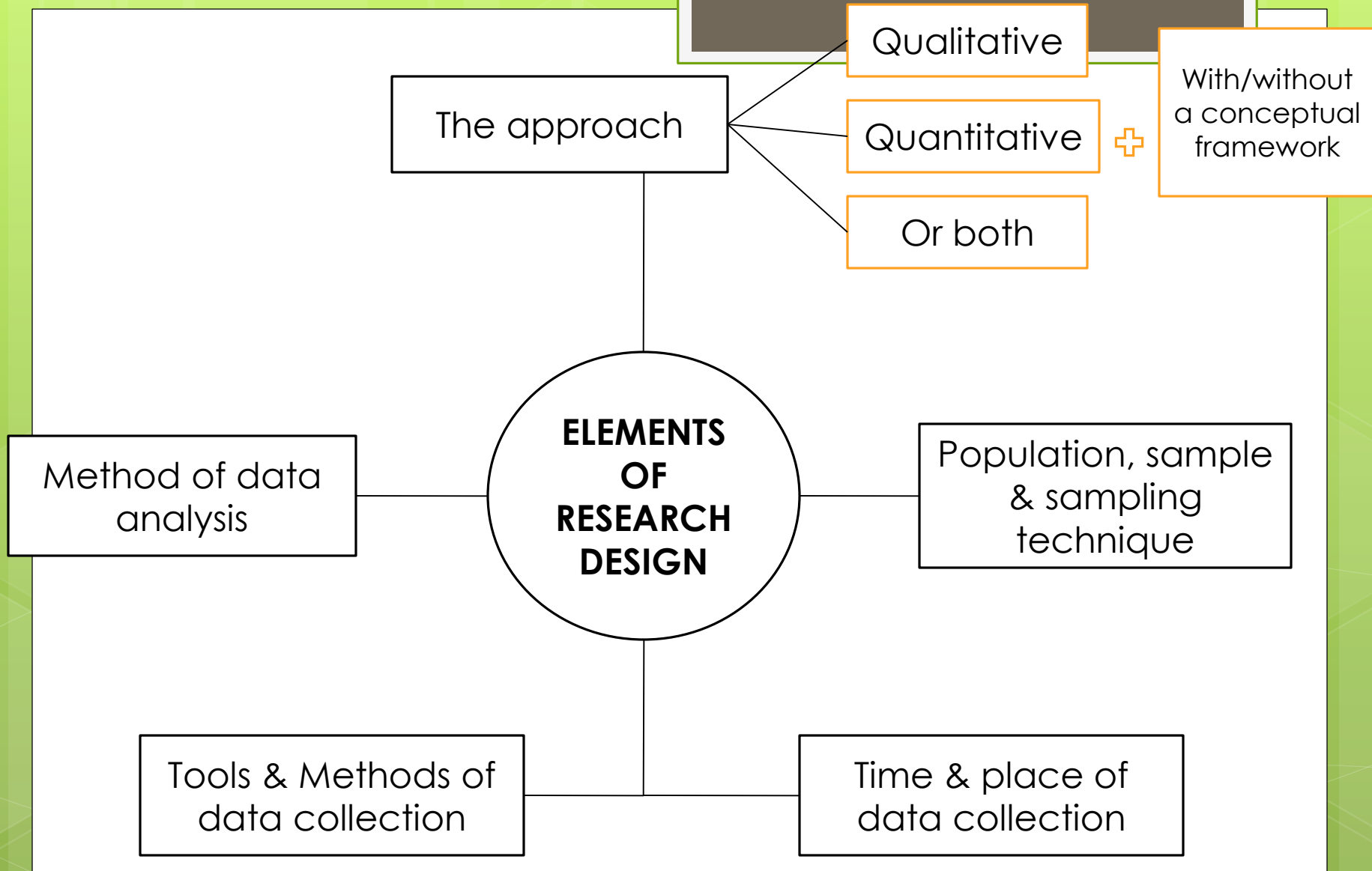
Step Seven: Interpretation and Report Writing

Researcher has to prepare the report of what has been done by him.

Writing of report includes:

1. the preliminary pages;
2. the main text, and
3. the end matter.

Research Design



The Approach...

- It involves the description of the plan to investigate the phenomenon under study in a structured (quantitative), unstructured (qualitative) or a combination of the two methods (quantitative-qualitative integrated approach).
- Therefore, the approach helps to decide about the presence or absence as well as *manipulation & control* over variables.
- It also helps to identify the presence or absence of & *comparison* between groups.
- The approach of research study depends on several factors, but primarily on the nature of phenomenon under study.
- At this stage of the research study, conceptual framework may or may not be incorporated.

Population, Sample, and Sampling Technique...

- Research design also provides the researcher with directions about population, sample & sampling technique, which will be used for the research study.
- *For example*, in an ethnographic qualitative research design, a researcher gets the directive that the population will be a specific cultural group & the study will include a small sample selected through a nonprobability sampling technique.

The Time, Place and Sources of Data collection...

- Time (specifying days, months, & years of study), location (study setting) & the sources of the requisite data are the other important constituents essential to ensure effective planning to conduct a research study.

Tools and Methods of Data Collection...

- This element of research design involves the description of different tools & methods of data collection, for example, questionnaires, interview, direct observation or any other methods that suit the particular approach of the research as well as nature of the phenomenon under study.

Methods of the Data Analysis...

- A research design must also include the description of the methods of data analysis - either quantitative or qualitative data analysis techniques – that helps the researcher to collect the relevant data, which later can be analysed as per the research design plan.
- Without a formal plan of data analysis a researcher may collect irrelevant data, which can later become difficult to analyse.

Example 1: Research Planning

Key task: Break down your problem into sub-problems

1. Choose your topic of interest: Cloud computing
2. Define research question(s)
 - How to select the best cloud deployment model based on benefits, costs, opportunities, risks (BCOR) framework?
3. Study the literatures (**Study 1, Paper 1**)
 - Goal: find the list of BCOR of cloud computing implementation
 - Approach: meta-analysis
 - Method: systematic review using PRISMA framework
 - Database: scopus, sciencedirect, IEEE, etc
 - Inclusion criteria: 2000-2016
 - Data analysis: content analysis using Atlas.ti

Example 1: Research Planning

4. Design your research (cont')

- Exploratory to the cloud users (getting insight) (Study 2, Paper 2)
 - Goal: validate the findings from the literatures to the experts, find the new BCOR
 - Approach: qualitative
 - Data collection: FGD/semi-structured Interview
 - Respondents: Experts of IT infrastructure (managers, CIOs, lecturers, etc.)
 - Instruments: ...
 - Data analysis: follow the qualitative data analysis protocol
 - Time: 2 months

Example 1: Research Planning

4. Design your research (cont')

- Survey to the IT infrastructure staffs (to generalize findings in Indonesia context) (**Study 3, Paper 3**)
 - Goal: Prioritizing the BCOR of cloud computing implementation in Indonesia context
 - Approach: quantitative
 - Data collection: online + offline survey
 - Respondents: Employees who manage IT infrastructure (IT infrastructure managers, CIOs, etc.)
 - Instruments: close-ended questionnaire
 - Data analysis: Entropy

Example 1: Planning Research

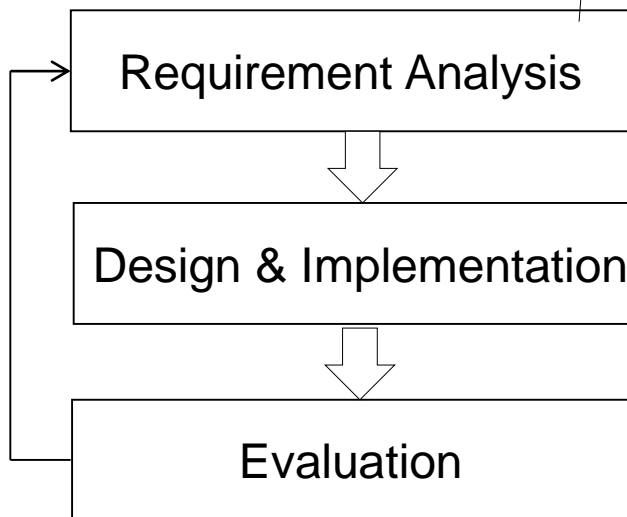
4. Design your research (cont')

- Design the framework for selecting the best cloud computing deployment model (Study 4, Paper 4)
 - Sub Goal 1: design the framework
 - Approach: qualitative method
 - Data collection: study literature, interview with experts
 - Instrument: proposed AHP conceptual model in form of hierarchy of decision (criteria and alternatives)
 - Method of analysis: follow the qualitative analysis protocol
 - Time: 1 month
 - Sub Goal 2: demonstrate the use of the framework
 - Approach: quantitative method, case study in ABC
 - Data collection: survey
 - Instrument: questionnaire in form of pairwise comparison matrix
 - Method of analysis: AHP

The same way applies when you are preparing research proposal for your PhD Program

Contoh: KSS untuk petani

- Choose a topic of interest
Model for Farmer
- Define research questions
 - How to implement KSS
- Determine methodology
question.



Study 1: Literature Review on KSS for farmer: technology vs behavioral perspectives

Study 2: Theoretical framing

- Qualitative Study: antecedents of KS behavior among farmers, for example using TOEI (Technology, Organization, Environment, Individual) perspectives
- Qualitative study: challenges in KS among farmers
- Quantitative Study: Ranking KSS factors (entropy, AHP, Fuzzy, etc), grouping according age, education, etc.
- Quantitative Study: Antecedents of KSS behavior (Structural Equation Modeling).
- Etc.

Study 3: Requirement Elicitation (based on study 1 & 2)

Study 1: Usability evaluation (usability)

Study 2: Feature evaluation

- Experimental Study: impact of reward feature to KS behavior.
- Quantitative Study: KSS continuance intention
- etc

Study 3: Requirement of software modification



Validity of Research Design

- There are two important criteria for evaluating the credibility & dependability of the research results:
 - ✓ Internal validity
 - ✓ External validity

INTERNAL VALIDITY

- It validates whether the independent variables actually made a difference.
- Campbell & Stanley (1963) used the term *internal validity* to refer to the extent to which it is possible to make an inference that the independent variable is truly influencing the dependent variable.
- In the internal validity, the independent variable is responsible for variation in dependent variable.
- Internal validity demands a tighter control over study to maximize the effectiveness of the results.

Internal Validity

- Internal validity is helpful in making the inference that the independent variable influences the dependant variable.
- According to Campell & Stanley (1966), six major extraneous variables have been identified which can jeopardize the internal validity. They are known as *threats to the internal validity* are as follows:
 - ✓ History
 - ✓ Maturation of subjects
 - ✓ Testing
 - ✓ Instrumentation changes
 - ✓ Mortality
 - ✓ Selection bias

Threat: History

- The threat of history occurs when some event beside the experimental treatment occurs during the course of study, & this events even influences dependent variables.
- For example, you are conducting a health teaching programme on the importance of breast self examination (BSE), while recently a famous film actress is diagnosed to be suffering from breast cancer.
- It catches media attention. Medical experts are interviewed , & the importance of BSE is supported.
- All major television channels & newspapers starts reporting on the importance of BSE.
- While you find that the BSE activity has improved, you as a researchers may not be able to conclude if the change in behavior is the result of your teaching programme or it is a result of the diagnosis of the affliction of the movie actress & the subsequent media coverage.

Threat: Maturation of Subjects

- When experimental research is carried on for a long period of time over a group of subjects, there may be changes in the subjects in different ways, like in children there is increase in height, weight, etc.
- So maturation is a threat to internal validity.
- For example, a researcher is interested in assessing the effect of particular nutritional protocol on the weight & height of the malnourished children.
- If this experiment is conducted for vary long period, it is difficult to make out whether the effect on weight & height is due to maturation or nutritional protocol.

Threat: Testing

- It refers to the effect of taking a pretest of subjects' performance post-test.
- The effect of taking a pretest may sensitize an individual & improve the score of the post-test.
- Individuals generally score higher when they take test a second time regardless of the treatment.

Threat: Instrumentation Change

- Another threat related to measurement is that of instrumentation.
- This bias reflects changes in measuring instruments or methods of measurements between two points of data collection.
- Instruments like thermometer, sphygmomanometer, weighing scale, tape measure, etc. should be checked for their accuracy at regular intervals, & same instruments should be used throughout the study to minimize the instrument-related error of the internal validity.

Threat: Morality

- Mortality is the loss or dropout of study subjects during the course of study.
- If the subjects who remain in the study or join later are not similar to those who dropped out, the results could be affected.
- For example, a researcher conducting a longitudinal study wherein a subject who participated in first round of the data collection may not be available for the second or other rounds of data collection.

Threat: Selection Bias

- If the subjects are not selected randomly for participation in groups, then there is a possibility that the groups which will be compared may not be equivalent.
- The effect on the dependant variable may be due to some other factors.
- For example, if two different classes are used to test the effects of two types of lecture methods or if subjects are selected in a nonrandom way, the effect on the dependant variables could be because of other heterogeneous factors rather than the types of lecture methods.

External Validity

- It refers to the extent to which the results can be generalized to a large population.
- External validity researches under what conditions & in which type of subjects the same results can be expected to be replicated, or whether the same intervention will work in another setting & with different subjects.
- External validity explores the generalization beyond specific experiment, to check if the results & findings come out to be same with other settings, or with other subjects population, but related variables.

External Validity

- The factors that may affect external validity are:
 - ✓ Hawthorne effect
 - ✓ Experimental effect
 - ✓ Reactive effect of pretest
 - ✓ Novelty effect
 - ✓ People
 - ✓ Place
 - ✓ Time

Threat: Hawthorne Effect

- Subjects may behave in a particular manner because they are aware that they are being observed & this is called the *Hawthorne Effect*.
- Subjects have the knowledge that they are involved in research study, thus affecting the result.

Threat: Experimental Effect

- Experimental effect is a threat to study results when researcher's characteristics, mannerisms, or behavior may influence subject behavior.
- Examples of researcher's characteristics or behavior are facial expressions, clothes, age, gender, body built, etc.
- Thus, the way researcher dresses up or his or her gender can influence the way in which respondents answer research questions.

Threat: Reactive Effect of Pretest

- The reactive effect of the pretest occurs when subjects have been sensitized to the treatment because of taking a pretest.
- People might not respond to the treatment in the manner they finally do if they had not received the pretest.
- For example, a researcher wants to conduct a study to assess the effect of a health education programme on the awareness of HIV/AIDS among people.
- In this instance, researcher conducts a pretest to collect baseline data before health education.
- This pretest may sensitize the subjects to learn about the HIV/AIDS irrespective of health education is provided or not to the subject.

Threat: Novelty Effect

- When a treatment is new, subjects & researcher might behave in different ways.
- They may be enthusiastic about new methods of doing things. Once treatment is more familiar & as the novelty wears off, results might differ.

Threat: People

- For example people of a specific race such as whites have high prevalence of coronary artery disease compared to the blacks.
- Therefore, a generalization made for whites will not be applicable for blacks. Hence, this is threat to external validity.

Threat: Place

- For example the people living in high altitudes have high hemoglobin (Hb) levels because at higher altitudes the requirement of oxygen is more, due to which there is more production of red blood cells (RBCs).
- However, the Hb level of the people living on the plains is lower in comparison, so a generalization for people of hilly areas is not applicable for people living on plains.

Threat: Time

- If a research was carried out on a community in 1990 & then again in 2000, the results of these two researches would be different.
- Therefore, older results cannot be generalized over periods of time as societies & circumstances constantly change.

Group Assignment (60 minutes)

- Form a group of 4 people (same as your previous group)
- Do the following:
 - Choose your topic of interest (might be the same as your previous topic)
 - Create a research plan for answering your research question
 - Define the goal(s) for each step
 - Give a detailed design for each step

Thank You!

