RESEARCH METHODOLOGY

By

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What is Research Methodology?

o **Research is the systematic approach to obtaining and confirming new and reliable knowledge"**

o **Systematic and orderly (following a series of steps)**

o **Purpose is new knowledge, which must be reliable**

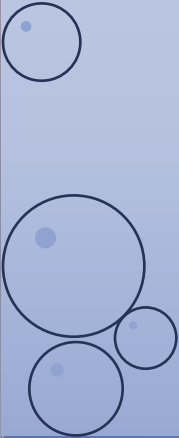o **This is a general definition which applies to all disciplines**
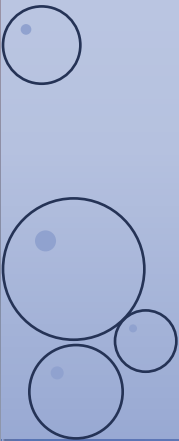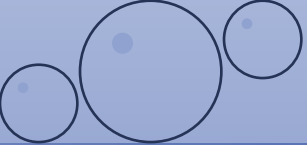
Research is not.....

Data Collection

- an intermediate step to gain reliable knowledge
- collecting reliable data is part of the research process
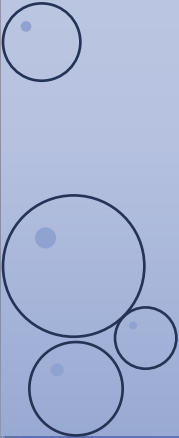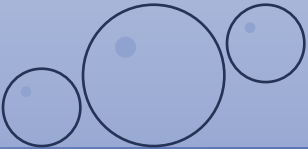
Searching out published research results in libraries (or the internet)

- This is an important early step of research
- The research process always includes synthesis and analysis
- But, just reviewing of literature is not research

Research is…

1. **Searching for explanation of events, phenomena, relationships and causes**

   – **What, how and why things occur**

   – **Are there interactions?**

2. **A process**

   – **Planned and managed – to make the information generated credible**

   – **The process is creative**

   – **It is circular – always leads to more questions**

- **<u>All</u> well designed and conducted research has potential application.**

- **Failure to see applications can be due to:**
  - **Users not trained or experienced in the specialized methods of economic research and reasoning**
  - **Researchers often do not provide adequate interpretations and guidance on applications of the research**

- **Researchers are responsible to help users understand research implications**

  (How?)

Structure of Research

The "hourglass" notion of research

begin with broad questions

narrow down, focus in

operationalize

OBSERVE

analyze data

reach conclusions

generalize back to questions
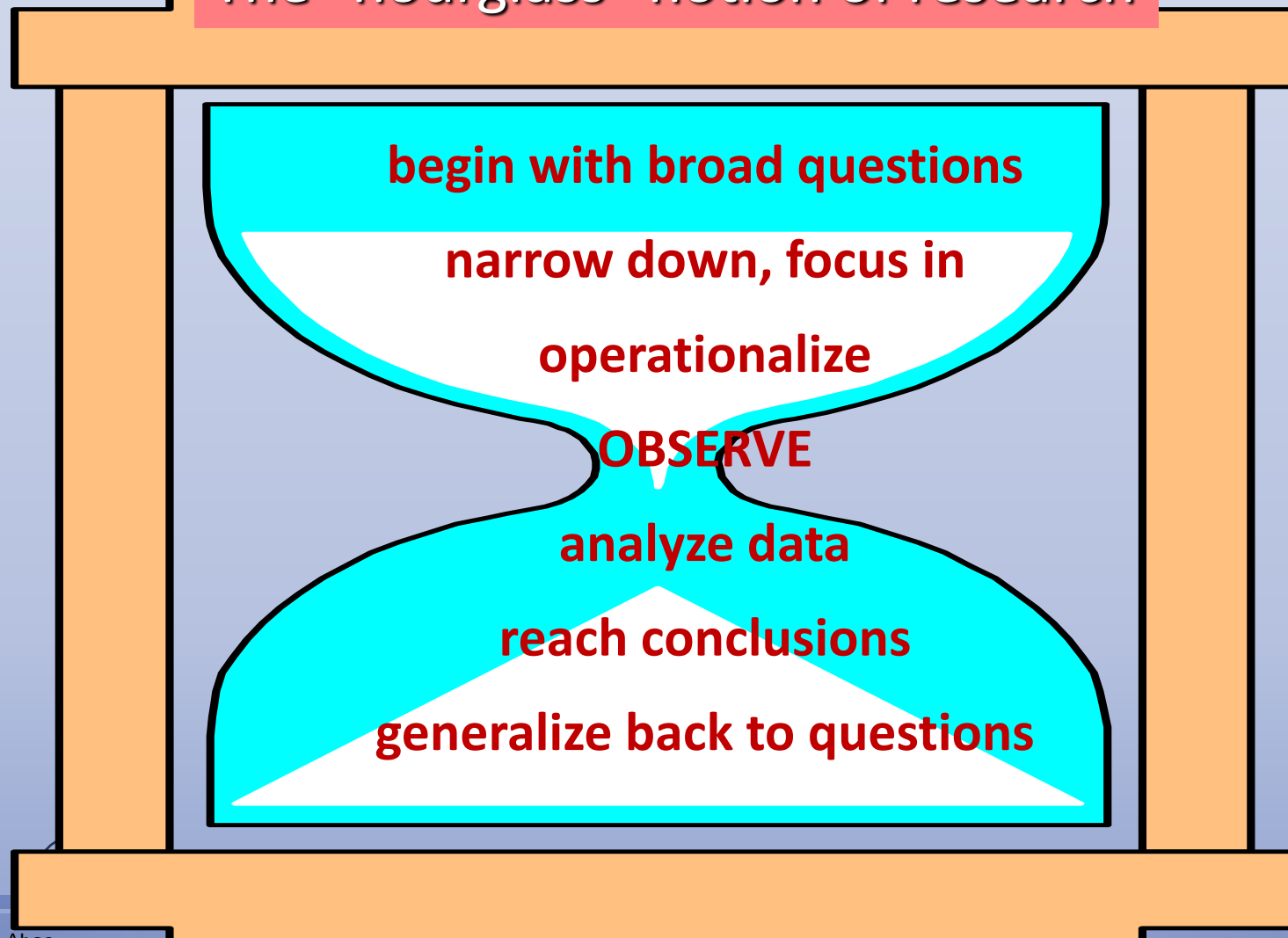
Methodology Defined & Described

Methodology and Method are often (incorrectly) used interchangeable

- **Methodology** – the study of the general approach to inquiry in a given field

- **Method** – the specific techniques, tools or procedures applied to achieve a given objective

    – Research methods in economics include regression analysis, mathematical analysis, operations research, surveys, data gathering, etc.

o **Methodology is the core of your dissertation as it is a proof that you use the scientific method.**

➤ **Through this chapter, your study's validity is judged.**
o **So, it is very important, that your our methodology answers two main questions:**
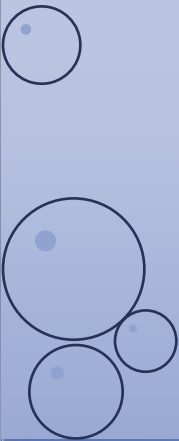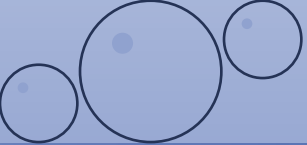
o **How did you collect or generate the data?**
o **How did you analyze the data?**

o **others could repeat the experiment and evaluate whether the results are reproducible.**

o **the audience can judge whether the results and conclusions are valid.**

○ **The explanation of the collection and the analysis of your data is very important because;**

○ **readers need to know the reasons why you chose a particular method or procedure instead of others.**

○ **readers need to know that the collection or the generation of the data is valid in the field of study.**

o "Methodology" implies more than simply the methods you intend to use to collect data. It is often necessary to include a consideration of the concepts and theories which underlie the methods.

o When you describe your methods it is necessary to state how you have addressed the research questions and/or hypotheses. The methods should be described in enough detail for the study to be replicated, or at least repeated in a similar way in another situation. Every stage should be explained and justified with clear reasons for the choice of your particular methods and materials.

o There are many different ways to approach the research that fulfils the requirements of a dissertation. These may vary both within and between disciplines. It is important to consider the expectations and possibilities concerning research in your own field.

➢ Discuss the anticipated problems in the process of the data collection and the steps you took to prevent them.

Present the rationale for why you chose specific experimental procedures.

Provide sufficient information of the whole process so that others could replicate your study. You can do this by:

➢ giving a completely accurate description of the data collection equipments and the techniques.

➢ explaining how you collected the data and analysed them.

○ **Specifically;**

a- Present the basic demographic profile of the sample population.

○

b- Explain how you gathered the samples/ subjects by answering these questions:

I- Did you use any randomization techniques?
II- How did you prepare the samples?

c- Explain how you made the measurements by answering this question.

I -What calculations did you make?

d- Describe the materials and equipments that you used in the research.

e- Describe the statistical techniques that you used upon the data.

o **The order of the methods section should flow like this:**

1. Describing the samples/ participants.
2. Describing the materials you used in the study
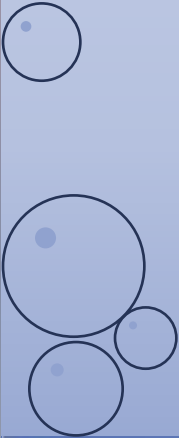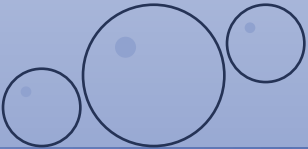**3. Explaining how you prepared the materials**
4. Describing the research design
5. Explaining how you made measurements and what calculations you performed
6. Stating which statistical tests you did to analyze the data.

o

o **In other words, the methodology chapter should cover the following,**

o **1. Define the population and the methods of sampling**

o **2. Describe the instrumentation**

o **3. Describe the procedures and if relevant, the time frame**

o **4. Describe the analysis plan**

o **5. Describe any approaches to ensure validity and reliability**

o **6. State any assumptions**

o **7. Describe the scope and limitations of the methodology**

Data analysis plan

- Outline data analysis for each specific aim

- Make clear which procedures are being used toward which aim

- Usually some simple tables and plots should be sufficient

- Keep it simple

Two important questions

➡ **What do you want to do/show?**

➡ **What kind of data …**

…will answer your question best?

… can you get?

… do you have?

Research Methods

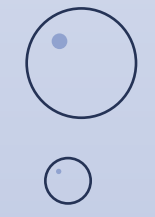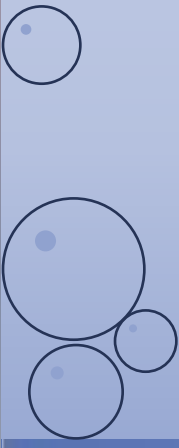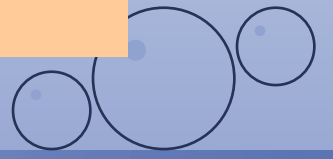> **Quantitative research   OR   Qualitative research????**

- **Quantitative research - numbers, numbers, numbers**
- **Qualitative research - words, words, words**

Types of Quantitative Studies

o Descriptive

o True experimental

o Quasi-experimental

o Correlational

o Predictive

Types of Qualitative Studies

- Qualitative research gathers information that is not in numerical form:

- diary accounts,

- open-ended questionnaires,

- unstructured interviews

- unstructured observations.

- **Qualitative data** is typically descriptive data and as such is harder to analyze than quantitative data.

- **Qualitative research** is useful for studies at the individual level, and to find out, in depth, the ways in which people think or feel (e.g. case studies).

Sample vs. Population

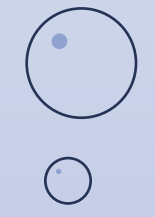Population = collection of ALL possible observations

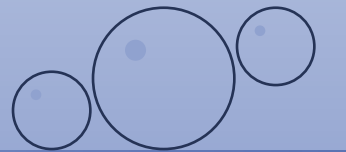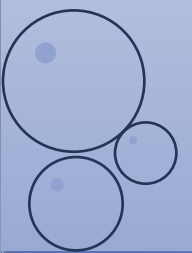Sample = subset of a population

Random Sample
- ✓ representative of a population
- ✓ all observations have equal chance of being selected

Why Do We Use Samples?

- ✓ Cost
- ✓ Time
- ✓ Inaccessibility of the population
- ✓ Accuracy
- ✓ Destruction of the observations

Steps in Developing a Sample Plan

Types of statistics

Descriptive

o Data are compiled, organized, summarized and presented in suitable visual forms

o so that the data are easier to understand

o tables, charts, diagrams are used to exhibit the information obtained from the data

Inferential

o Make generalization about a population by analyzing the sample

o If the sample is a good representation of the population, then accurate conclusions about the population could be inferred

Common descriptive statistics

➡ **Count (frequencies)**

➡ **Percentage**

➡ **Mean**

➡ **Mode**

➡ **Median**

➡ **Range**

➡ **Standard deviation**

➡ **Variance**

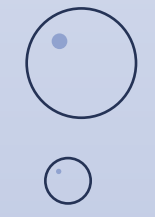➡ **Ranking**

Inferential Statistics

- ➤ **Data collection procedures that allow researchers to estimate how reliably they can make predictions and generalize findings.**

- ➤ **Allows us to compare groups and test hypothesis.**

- ➤ **Answer research question in a study.**

Selecting the appropriate statistical test requires several steps.

➤ **The level of variable is a major component in deciding what test to use.**

Test selection should be based on:

1) **What is your goal: Description? Comparison? Prediction? Quantify association? Prove effectiveness? Prove causality?**

➤ **2) What kind of data have you collected**

➤ **3) Is your data normally distributed? Can you use a**

➤ **parametric or non-parametric test?**

➤ **4) What are the assumptions of the statistical test you would like to use? Does the data meet these assumptions?**

Most Commonly Used Inferential Statistics

- ➤ **Parametric**
- ➤ **t statistic-commonly used in research, tests whether 2 group means are different.**
- ➤ **ANOVA**
- ➤ **Pearson's Correlation**
- ➤ **Linear regression**

- ➤ **Nonparametric**
- ➤ **Chi-square- used when data is at the nominal level, determine difference between groups. Robust and used with small samples.**
- ➤ **Mann-Whitney U test**
- ➤ **Kruskal-Waliis test**
- ➤ **Wilcoxon test**
- ➤ **Fisher's exact probability.**

Tests of Relationships

➤ **Interested in exploring the relationship between 2 or more variables.**

➤ **Studies would use statistics to determine the correlation or degree of association between 2 or more variables.**

➤ **Pearson r, the sign test, the Wilcoxon matched pairs, signed rank test and multiple regression.**

Types of t-Test

➡ **One sample t test: test if a sample mean for a variable differs significantly from the given population with a <u>known</u> mean**

➡ **Unpaired or independent t test: test if the population means estimated by <u>independent</u> 2 samples differ significantly (group of male and group of female)**

➡ **Paired t test: test if the population means estimated by <u>dependent</u> samples differ significantly (mean of pre and post treatment for same set of patients**
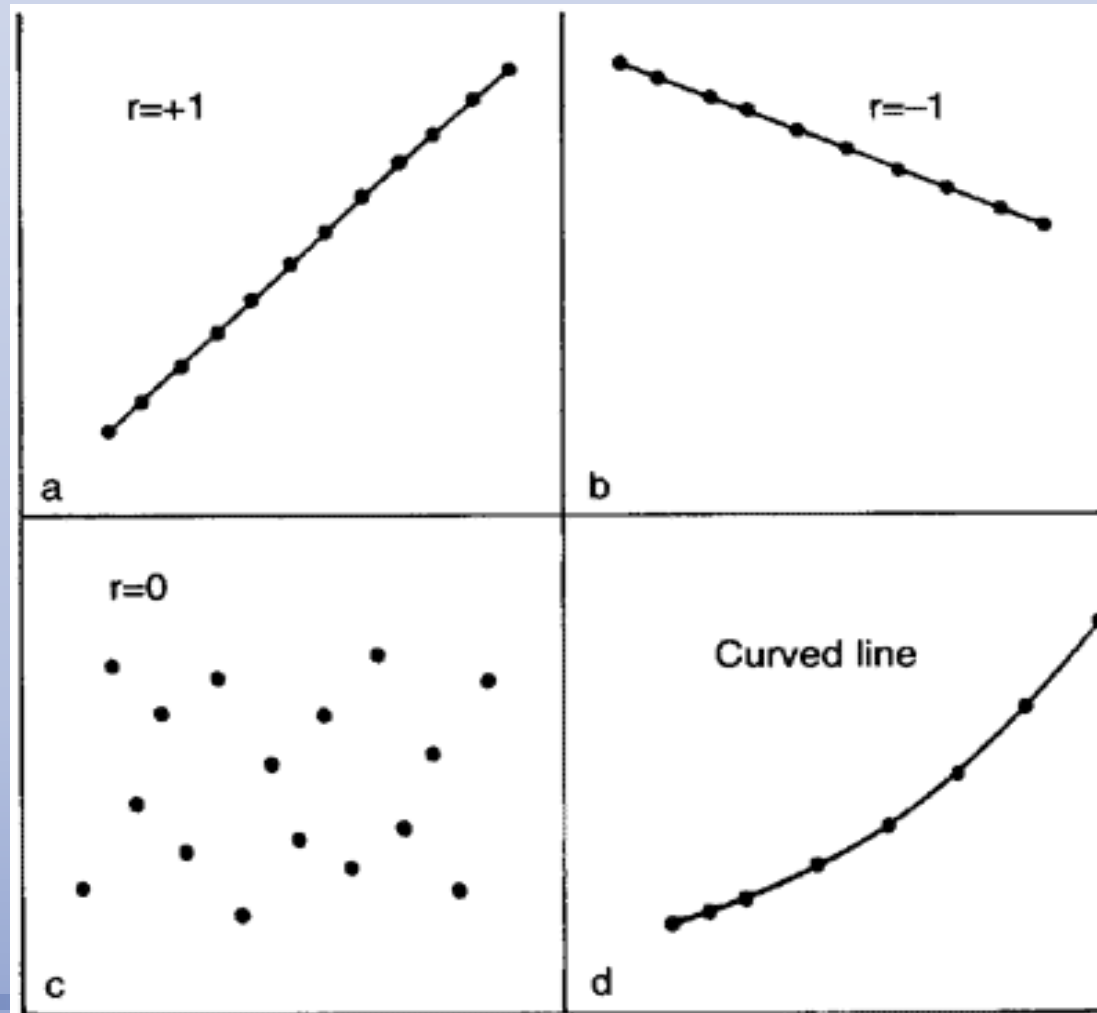
chi² test

➤ **Used to test strength of association between <u>qualitative</u> variables**

➤ **Used for categorical data**

Correlation and Regression

➡ **Methods to study magnitude of the association and the functional relationship between two or more variables**
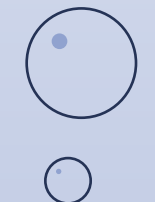
Correlation

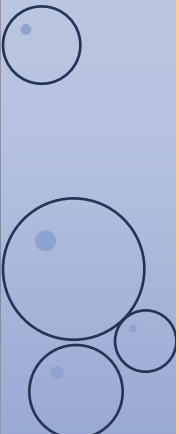➥ **Denote strength of relationship between variables**

Linear Regression

➡ **Focuses on prediction. Involves discovering the equation for a line that is the best fit for the given data.**

➡ **Method that's indicate a mathematical relationship between a dependent and one or more independent variables**

➡ **Simple linear regression and multiple regression are appropriate for continuous variables like(BP, Weight)**

➡ **That linear equation is then used to predict values for the data.**

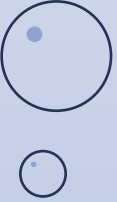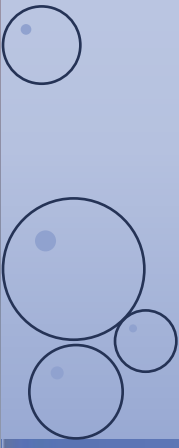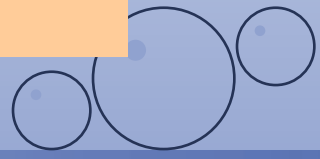➡ **Do variables a and b predict event c?**

Key questions to answer in your methodology

o What kind of research methods are you going to use? Are they mostly:

o Quantitative, or qualitative, or a mixture of both?

o What do you think your methods will enable you to discover?

o What might they prevent you from discovering?

o What kinds of research methods would be best suited to the kind of research you are undertaking and the research questions you are pursuing?

o What sort of problems do you envisage in setting up these methods?

o What are their benefits?

o What will you need to do to ensure they gather useful data?

Summary

o "Methodology" implies more than simply the methods you intend to use to collect data.

o It is necessary to include a consideration of the concepts and theories which underlie the methods.

o you have to show that you understand the underlying concepts of the methodology.

o When you describe your methods it is necessary to state how you have addressed the research questions and/or hypotheses.

o The methods should be described in enough detail for the study to be replicated, or at least repeated in a similar way in another situation.

o Every stage should be explained and justified with clear reasons for the choice of your particular methods and materials.

Thank you