Research Methodology: Quantitative & Qualitative

Asad W. Malik
Asad.malik@um.edu.my
Department of Information Systems
Faculty of Computer Science & Information Technology
University of Malaya
Office Location: B-2-15

INQUIRY METHODS IN RESEARCH

- Main inquiry methods guide a researcher to solve problems and find answers to questions in research:
  - Positivist method (used in quantitative research)
  - Interpretative method (used in qualitative research)
  - Critical method (used in qualitative research)

Positivist Method

- Through numerical analysis, positivist method emphasizes the accuracy of research evidence.
- Generally regarded as quantitative research.
- Experimental research and survey are among the many methods used by positivist researchers.
- Studies are conducted to
  - make predictions using methods to identify, measure and state accurately relationships among the variables being studied in a phenomenon.
- The positivist research:
  - forms hypotheses about relationships between variables in the study;
  - tests the relationships on subjects randomly selected from a target population;
  - Obtains results after undergoing rigorous statistical analysis will be generalised to all subjects in that population.

Positivist Method

- E.g. to identify factors of unemployment among male graduates of a tertiary institution:
  - will study one sample which is randomly chosen from that population of male graduates there;
  - then factors identified for study can then be generalized to all male graduates of that population;
  - Report quantitative values representing the factors which are responsible for the unemployment, such as:
    - Frequency, percentage, mean and standard deviation of male graduates who are unemployed

Interpretative Method

- Explains a phenomenon by using verbal descriptive data.
  - Analysis of verbal descriptive data is emphasized.
- Generally regarded as qualitative research.
- Field research is one of the most frequent types of studies.
  - Collects data through observation and interviews.
- This type of research usually examines in depth the characteristics of a small group of subjects.
- E.g. a study to identify the work style of a group of company managers who have been identified as excellent leaders.
  - Qualitative data from interviews with managers is more important to the researcher.

Critical Method

- Used to improve the social conditions of mankind.
- Generally regarded as qualitative research.
- Attempts to understand the relationships among social groups, and how social differentiation is created.
- Use existing historical sources and secondary data as the bases of their comparative studies.
- Research findings will be considered valid if they can be applied to improve the social situation.

Quantitative and Qualitative Research

- Different in terms of the methods and techniques used.
- Have different objectives, concepts, research designs, methods of sampling, collecting data and data analysis, and instrumentation.

Quantitative Research

- Discrete number – associate with numerical data and accuracy.
- Based on positivist research method where experimental research is conducted to collect numerical data, which are then analysed using statistical tests.
- A research problem is stated in the form of hypothesis:
    - variables are defined – to be measured (studied).
- Measurements priorities validity and reliability in order to test theories, build facts and state the relationship among the variables under investigation

Quantitative Research

- Can also conducted using descriptive or inferential studies.
  - In descriptive studies: data is collected from an entire population and basic statistics such as frequency, percentage, mean, standard deviation and distribution score are reported.
  - In inferential studies: one sample is randomly chosen from the population being studied, numerical data is collected from the sample and hypothesis is tested using statistical tests.
- The results obtained from the sample will be generalized to its population.

Quantitative Research

Descriptive study	Inferential study
❖ Doesn't use research samples. ❖ Respondents comprise all subjects in a population. ❖ Significance test is not needed. ❖ Uses descriptive statistics such as frequency, mean, percentage, variance, etc. ❖ Results of the study only apply to subjects which are being studied. ❖ Results of the study will not be generalised to other groups.	❖ Respondents are subjects chosen from a population. ❖ Sample should be randomly selected to be representative of the population. ❖ Inference tests are used to analyse data collected from the subjects, such as t-test, and ANOVA among others, are used. ❖ Type I and II errors (i.e. *false positive* – incorrect rejection of a true null hypothesis; and *false negative* – failure to reject a false null hypothesis) should be controlled to ensure validity of the study. ❖ Test results derived from the subjects in the sample are generalised to all subjects in the population.

Qualitative Research

- Explain phenomena in the real world that can't be explained by numerical data (quantitative data) produced by quantitative research, e.g.
  - Intentions of a student who frequently plays truant;
  - Motives of an engineer who furthers his studies in the field of psychology;
- Qualitative data collected through interviews and in-depth observation methods.
  - These methods are more appropriate for investigating individual or group phenomena that involve emotions, motivation, empathy, which can't be fully captured by the numbers from a quantitative study.

Qualitative Research

- Non-structured interviews, observations and questionnaires in the form of essays are the most common ways of collecting data in a qualitative research.
- When the sample size in a qualitative research is small (sometime involves only one respondent), data triangulation is used to improve the reliability of the research.

Research Methodology: Collecting Quantitative Data

Key Idea

- ✓ Who will you study (unit, sampling, sample size)?
- ✓ What permissions will you need? (levels)
- ✓ What information will you collect? (types of data, links to questions/variables)
- ✓ What instrument(s) will you use? (selecting an instrument, scales of measurement, validity, reliability)
- ✓ How will you administer the data collection? (standardization, ethical issues)

Who Will You Study? Identifying The Unit of Analysis

- ✓ Unit of analysis is the level at which the data will be gathered
  - ❖ Institutional or organizational (e.g. school district)
  - ❖ Site-specific (e.g. secondary school)
  - ❖ Individual participants or parents
  - ❖ Campus approval (e.g. university or college)
- ✓ What Permissions Will You Need? Obtain permission

Define Scope of Your Work

- ✓ Identify dependent and independent variable - Map research questions on your variable
- ✓ Identify Population and sample
- ✓ Identify sample selection procedure
- ✓ Technology used to gather data
- ✓ Analyze data using statistical models
- ✓ Data presentation

A Checklist of Questions for Designing a Survey Method

Table 8.1 A Checklist of Questions for Designing a Survey Method

_____	Is the purpose of a survey design stated?
_____	Are the reasons for choosing the design mentioned?
_____	Is the nature of the survey (cross-sectional vs. longitudinal) identified?
_____	Is the population and its size mentioned?
_____	Will the population be stratified? If so, how?
_____	How many people will be in the sample? On what basis was this size chosen?
_____	What will be the procedure for sampling these individuals (e.g., random, nonrandom)?
_____	What instrument will be used in the survey? Who developed the instrument?
_____	What are the content areas addressed in the survey? The scales?

Complete list available at: Chapter-8: Quantitative methods, Creswell “Research and Design” page 202

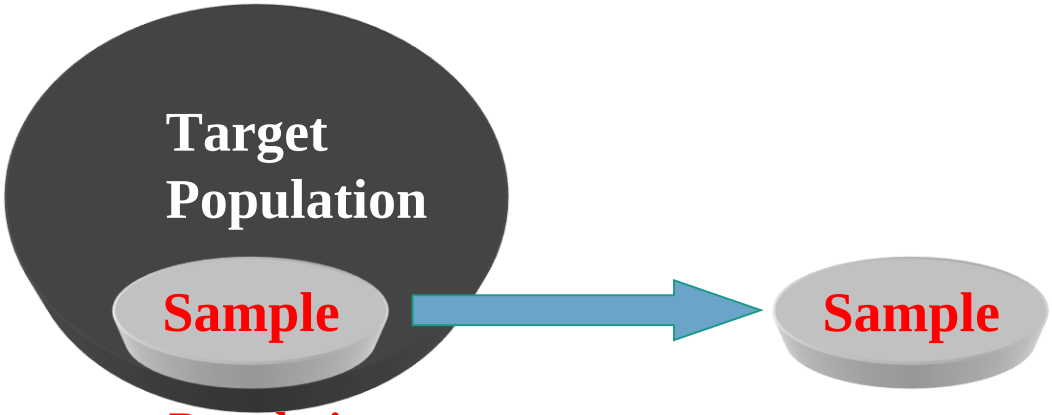
The SURVEY Design

- ✓ The reason of selecting survey based study, purpose or rational
- ✓ Provide reference to the use of survey for similar purpose
- ✓ cross-sectional—with the data collected at one point in time
- ✓ longitudinal—with data collected over time
- ✓ Specify the form of data collection – Email, Google Forms, Interviews, discussion or etc.

Population and Sample

- ✓ A population is a group of individuals that comprise the same characteristics
- ✓ A sample is a sub-group of the target population that the researcher plans to study for the purpose of making generalizations about the target population
- ✓ Identify the population in the study
- ✓ Also state the size of this population, if size can be determined, and the means of identifying individuals in the population
- ✓ In survey research, investigators often choose a sample size based on selecting a fraction of the population (say, 10%), select the size that is unusual or typical based on past studies

Populations and Samples



Population

-All teachers in high schools in one city
-College students in all community colleges
-Adult educators in all schools of education

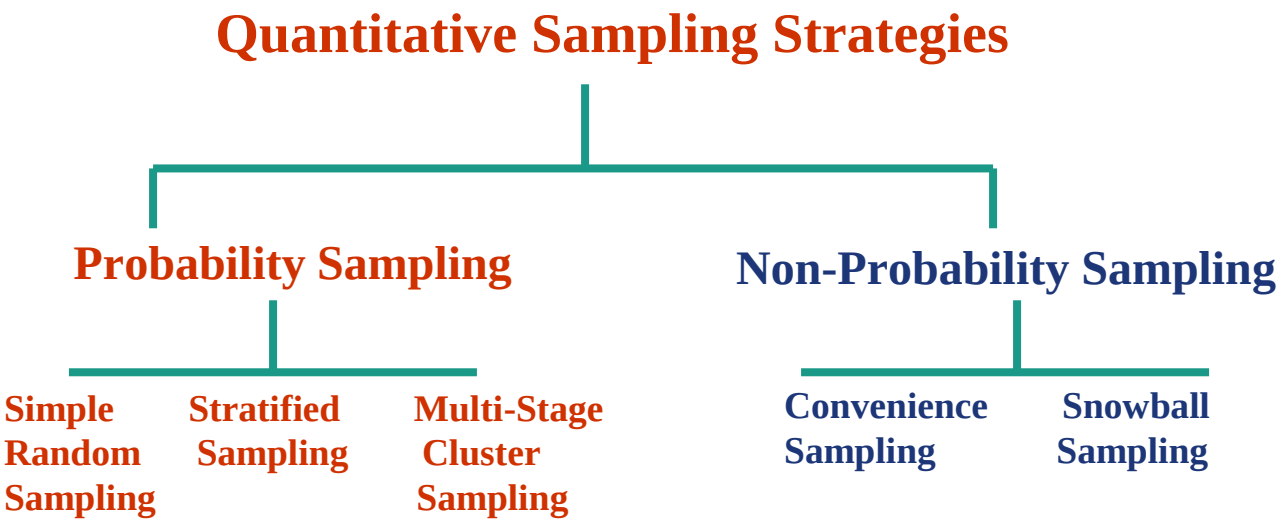
-All high school biology teachers
-Students in one community college
-Adult educators in 5 schools of education in the Midwest

Probability and Non-Probability Sampling

- ✓ **Probability sampling** is the selection of individuals from the population so that they are representative of the population

- ✓ **Non-probability** sampling is the selection of participants because they are available, convenient, or represent some characteristic the investigator wants to study.

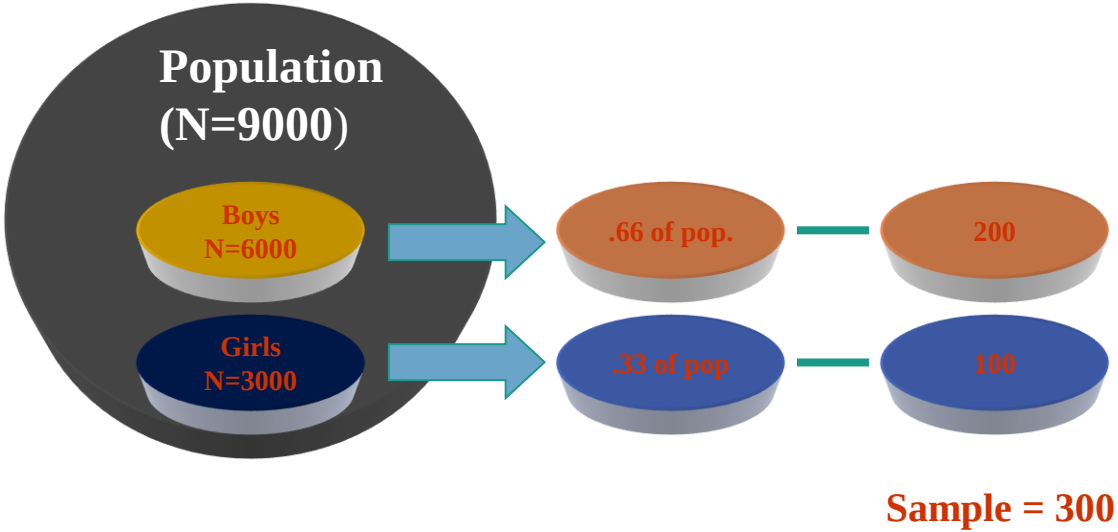
Types of Quantitative Sampling



Types of Probability Samples

- Simple Random Sampling: selecting a sample from the population so all in the population have an equal chance of being selected (Mostly used)
- Systematic Sampling: Start at random and choose every “nth” individual or site in the population until the desired sample size is achieved (Very common after random sampling)
- Multi-Stage Cluster Sampling: a sample chosen in one or two stages because the population is not easily identified or is large
- Stratified sampling: stratifying the population on a characteristic (e.g. gender) then sampling from each stratum

Proportional Stratification Sampling Approach



Types of Non-Probability Samples

- ✓ Convenience Sampling: participants are selected because they are willing and available to be studied
- ✓ Snowball Sampling: the researcher asks participants to identify other participants to become members of the sample.

Instrumentation

- ✓ Name the survey instrument used to collect data
- ✓ Discuss whether it is an instrument designed for this research, a modified instrument, or an intact instrument developed by someone else
- ✓ Also state the permission to used that instrument
- ✓ Add the list of tools used for the study

Variables in the Study – Link variables with Q's

- ✓ Research variables are already mentioned in the proposal but it is good to link with the entire study

Table 8.2 Variables, Research Questions, and Items on a Survey

Variable Name	Research Question	Item on Survey
Independent Variable 1: Prior publications	Descriptive research Question 1: How many publications did the faculty member produce prior to receipt of the doctorate?	See Questions 11, 12, 13, 14, and 15: publication counts for journal articles, books, conference papers, book chapters published before receiving the doctorate
Dependent Variable 1: Grants funded	Descriptive research Question 2: How many grants has the faculty member received in the past 3 years?	See Questions 16, 17, and 18: grants from foundations, federal grants, state grants
Control Variable 1: Tenure status	Descriptive research Question 3: Is the faculty member tenured?	See Question 19: tenured (yes/no)
Relating the Independent Variable 1: Prior publications to the Dependent Variable: Grants funded	Inferential Question 4: Does prior productivity influence the number of grants received?	See Questions 11,12,13,14,15 to Questions 16, 17, 18

- ❑ Chapter-8: Quantitative methods, Creswell "Research and Design" page 208

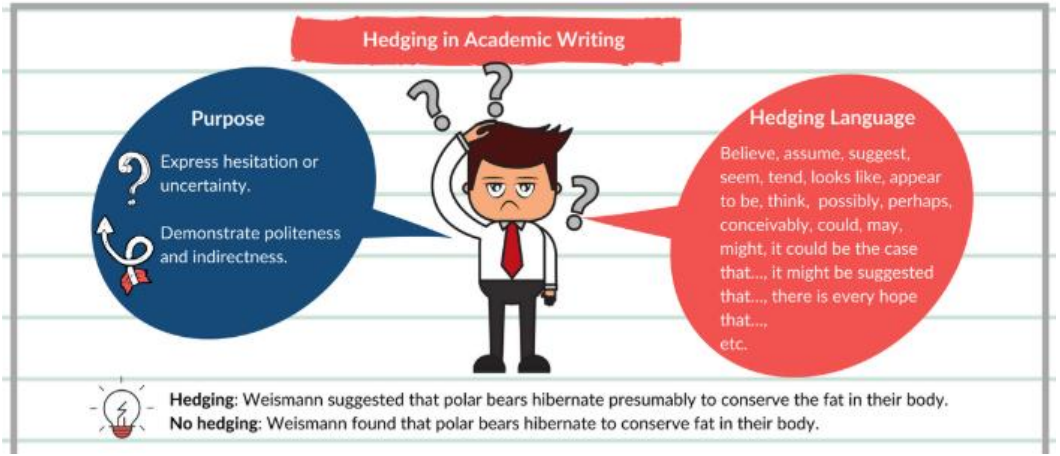
Data Analysis and Interpretation

In the proposal, present information about the steps involved in analyzing the data

- ✓ Step-I: Track respondent and non-respondent – A table with number and percentage
- ✓ Step-II: Identify response bias
- ✓ Step-III: Plan to provide a analysis of data for all independent and dependent
- ✓ Variables
- ✓ Step-IV: Identify the statistics and the statistical computer program for testing the major inferential research questions or hypotheses in the proposed study
- ✓ Step-V: Present the results in tables or figures

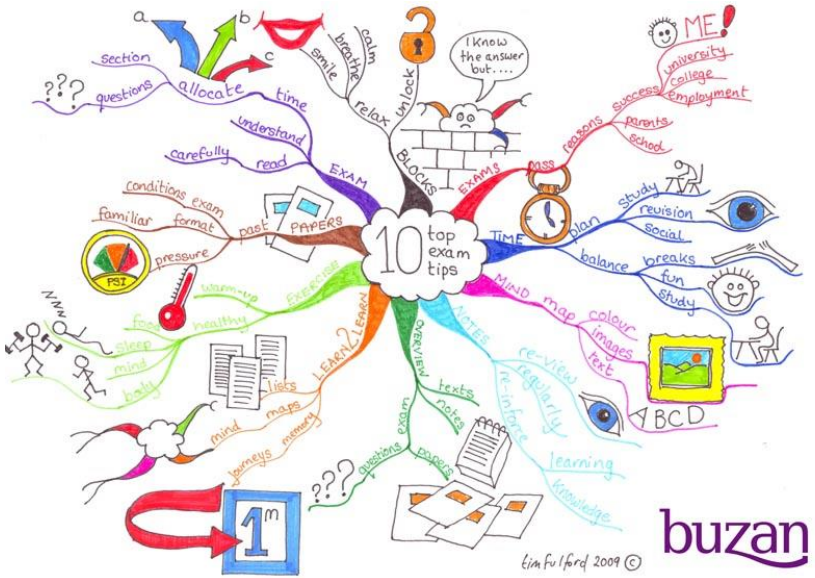
Hedging in Academic Writing

- In academic writing, hedging is used to distinguish between facts and claims
- Uses of hedged language
- to minimize the possibility of another academic opposing the claims that are being made
- to enable the author to devise a politeness strategy where they are able to acknowledge that there may be flaws in their claims



Mind Map

- Is a way to organize your writing
- It's like a loud thinking
- Like you have a problem, which is at the center
- Every branch indicate one type of solution
- Inside every solution, there are many techniques
- Example of argument map is given in a separate pdf.



http://www.mindmapping.com/

Reading Assignment

- Read chapter-8 and 9