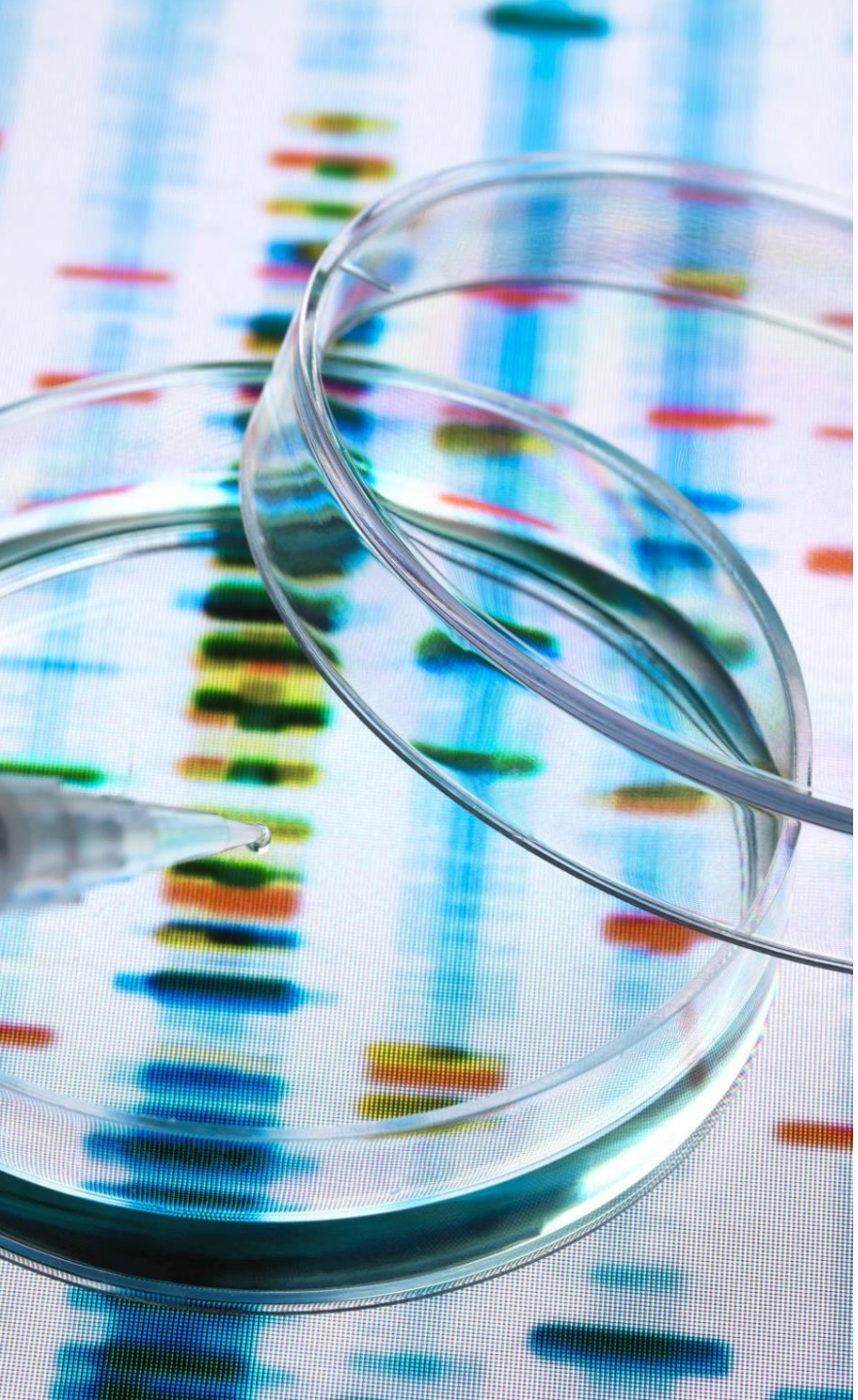

QUANTITATIVE RESEARCH DESIGN AND APPROACH

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LEARNING OUTCOMES

- Explain research design especially in the context of quantitative research project.
- Explain the differences between descriptive and explanatory research to understand the nature of your own research.
- Explain survey as one of the main research strategy in quantitative research.
- Identify the data collection methods in survey and choose from amongst these to achieve coherence throughout your research design.
- Identify and choose the appropriate sampling method to use in your own research.

INTRODUCTION

- Quantitative research approach - to study natural phenomena with mathematical rigor using statistical analysis.
- A limited number of variables is always assumed, and these variables are measurable, and holding mathematical relationships between each other.
- Quantitative research generally emphasizes planning, hypotheses, large random samples, and objective measures.
- It assumes the existence of a distinction between researcher and subjects, and aims at ‘generalizing’, i.e. at producing laws applicable to much broader realities.

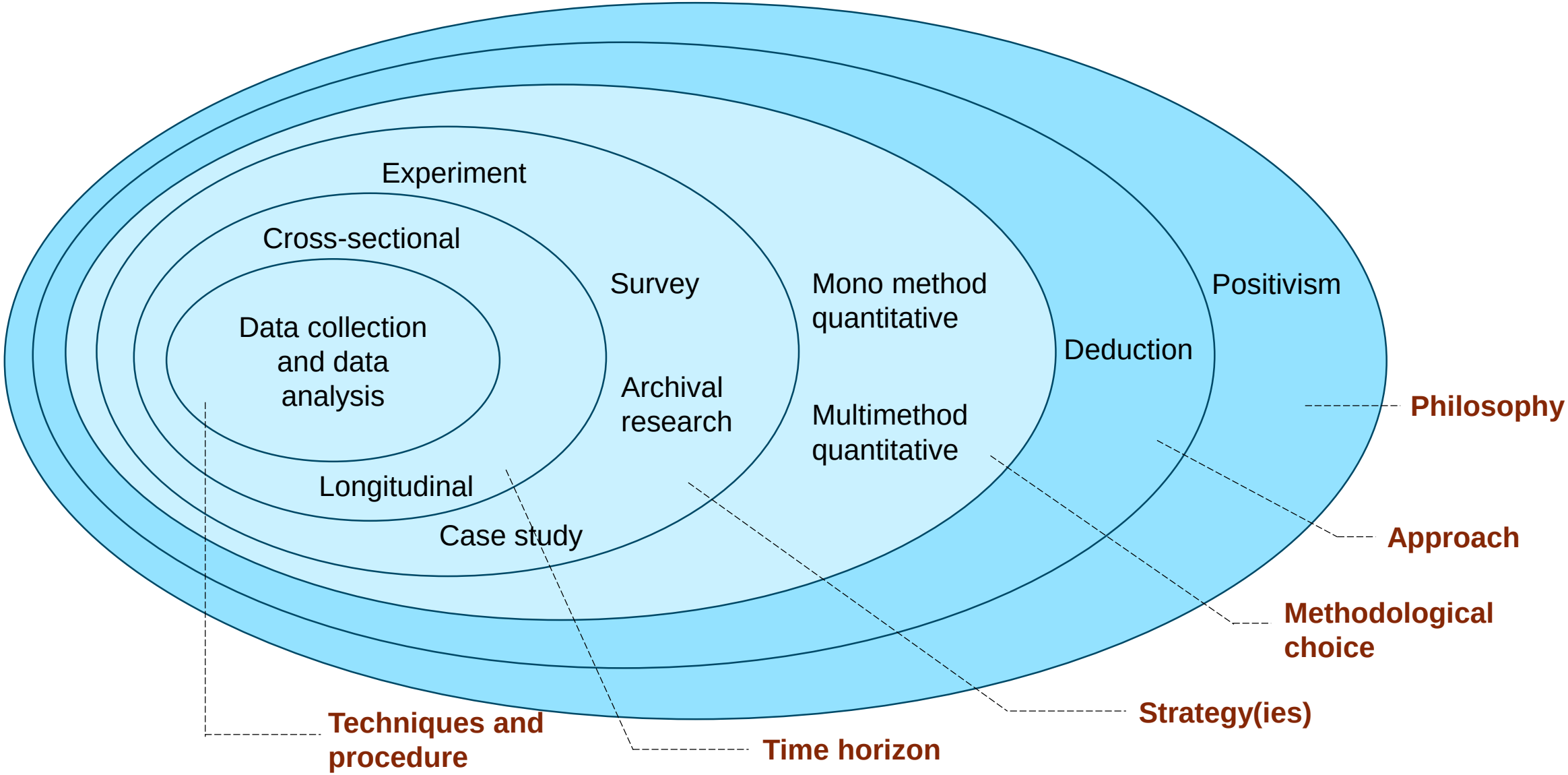


Figure 1: The Quantitative 'Research Onion' *(Adapted from Saunders et al. 2011)*

The Research Process

Stage 1 - Clarifying the Research question

Stage 2 - Proposing Research

Stage 3 - Designing the Research

Stage 4 - Data Collection & Preparation

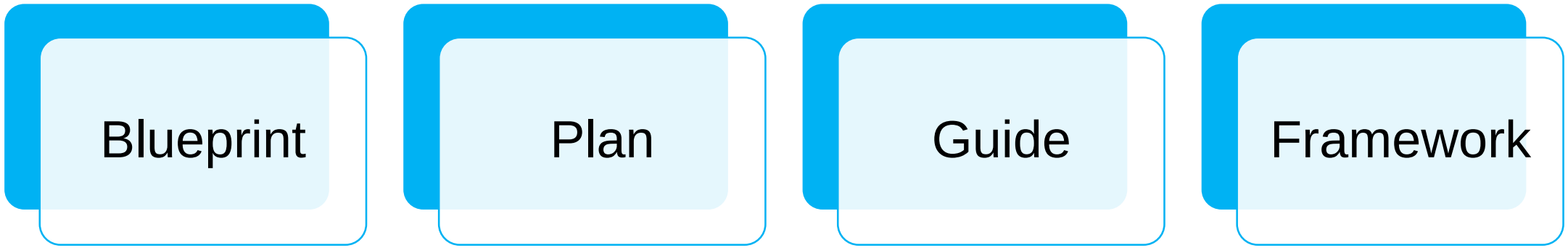
Stage 5 - Data Analysis & Interpretation

Stage 6 - Reporting the Results

RESEARCH DESIGN

- Research design is the general plan of how researcher will go about answering his/her research question(s).
- It will contain clear objectives derived from the research question(s), specify the sources from which researcher intend to collect data, how researcher propose to collect and analyze data, discuss ethical issues and the constraints that will inevitably encounter.

RESEARCH DESIGN



QUANTITATIVE RESEARCH DESIGN

- Quantitative research examines relationships between variables, which are measured numerically and analyzed using a range of statistical techniques.
- Because data are collected in a standard manner, it is important to ensure that questions are expressed clearly so they are understood in the same way.
- Quantitative research often uses probability sampling techniques to ensure generalizability.

QUANTITATIVE RESEARCH DESIGN

- The researcher is seen as independent from those being researched (respondents).
- Quantitative research is principally associated with experimental and survey research strategies.
- In quantitative research, a survey research strategy is normally conducted using questionnaires, structured interviews, or structured observation.

NATURE / PURPOSE OF STUDY

- Descriptive studies
  - to gain an accurate profile of events, persons or situations
  - discover the answers to the questions who, what, when, where, or how much
  - e.g.:
    - What is the level of sustainable performance among manufacturing firms in Malaysia?
    - What is the extent of implementation of sustainable manufacturing practices among manufacturing firms in Malaysia?
    - Demographic profile of the respondents

NATURE / PURPOSE OF STUDY

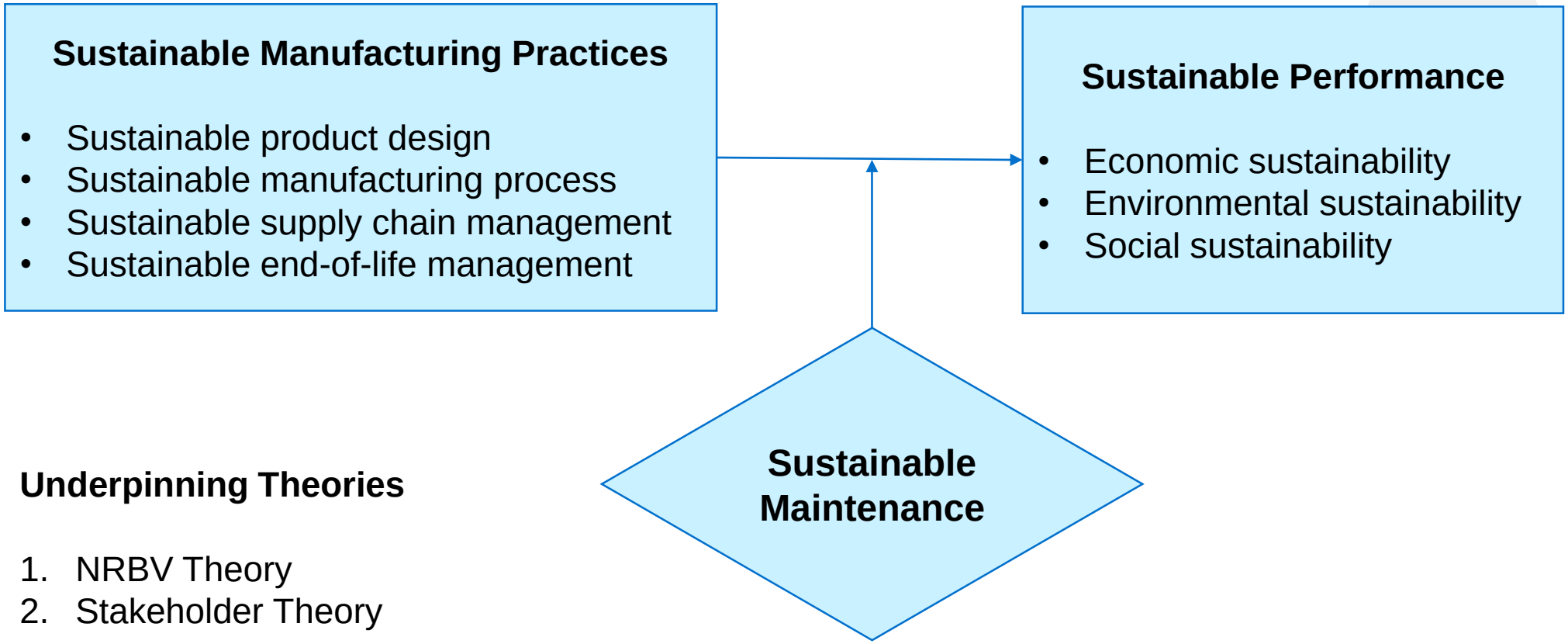
- Explanatory studies
  - establish causal relationships between variables
  - studying a situation or a problem to explain the relationships between variables
  - e.g.:
    - Is there any significant positive relationship between the implementation of sustainable manufacturing practices and sustainable performance among manufacturing firms in Malaysia?
    - Does sustainable maintenance moderate the relationship between sustainable manufacturing practices and sustainable performance among manufacturing firms in Malaysia?

NATURE / PURPOSE OF STUDY

- Correlational research → to determine the associational relationships between variables in a research project
- Causal research → to obtain evidence regarding cause-and-effect relationship between variables in the research project.
- Causal research is appropriate for the following purpose:
    1. To understand which variable are the cause (independent variables) and which variable are the effect (dependent) of a phenomenon.
    2. To determine the nature of the relationship between the causal variables and effect to be predicted.

NATURE / PURPOSE OF STUDY

- Correlational and causal research are characterized by:
  - A well-structured research framework
  - Prior formulation and specification of hypotheses
  - A well pre-planned and structure research methodology
    - Structured questionnaires/interviews/observations
    - Representative sample



Underpinning Theories

1. NRBV Theory
2. Stakeholder Theory

Figure 2: An Example of Research Framework

Table 1: Examples of Research Questions, Research Objectives and Research Hypotheses

Research Questions (RQs)	Research Objectives (ROs)	Research Hypotheses (H)
RQ1: Is there any significant positive relationship between the implementation of sustainable manufacturing practices and sustainable performance among manufacturing firms in Malaysia?	**RO1:** To examine the relationship between the implementation of sustainable manufacturing practices and sustainable performance among manufacturing firms in Malaysia.	**H1:** There is a significant positive relationship between the implementation of sustainable manufacturing practices and sustainable performance.
RQ2: Does sustainable maintenance moderate the relationship between sustainable manufacturing practices and sustainable performance among manufacturing firms in Malaysia?	**RO2:** To examine the moderating effects of sustainable maintenance on the relationship between sustainable manufacturing practices and sustainable performance among manufacturing firms in Malaysia.	**H2:** Sustainable maintenance positively moderates the relationship between sustainable manufacturing practices and sustainable performance.

Below is important information related to the questionna

1. The questionnaire consists of three sections:
   Section 1: General information
   Section 2: Sustainable manufacturing practice
   Section 3: Sustainable performance

2. All information is only for research purposes and w
   hence it will not be revealed under any circumstance

3. Please read the questions carefully before answering

SECTION 3: SUSTAINABLE PERFORMANCE

This section attempts to determine the performance of manufacturing firms leading by implementation of sustainable manufacturing practices. Please indicate the extent to which you agree with the following statements as they relate to the changes in your organization performance **in the last three years** caused by the current practices (as you indicate in section 2), **CIRCLE** the appropriate number against each item, using the given scale.

Economic sustainability (company's achievements for both operational and business performance resulting from the undertaken efforts as stated in section 2)	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Reduced overall costs	1	2	3	4	5
Improved product quality	1	2	3	4	5
Reduced lead times	1	2	3	4	5
Improved customer service	1	2	3	4	5
Increased productivity	1	2	3	4	5
Increased revenues	1	2	3	4	5
Increased market share	1	2	3	4	5
Improved reputation	1	2	3	4	5
Better new market opportunities	1	2	3	4	5

RESEARCH STRATEGY - SURVEY

- Surveys ask respondents for information using verbal or written questioning.
- Respondents are a representative sample of people.
- Gathering information via surveys:
  - quick
  - inexpensive
  - efficient
  - accurate
  - flexible

SURVEY

- Three main data collection methods in survey research:
  - Interviewing
  - Administering questionnaires
  - Observing people and phenomena

SURVEY – Structured Interview

- Interview respondents to obtain information on the issues of interest.
- Structured interviews:
  - Conducted when it is known at the outset what information is needed. The interviewer has a list of predetermined questions to be asked of the respondents.
  - The same questions will be asked of everybody in the same manner.
  - Could be conducted either face to face or through the medium of telephone, depending on:
    - the level of complexity of the issues involved
    - the likely duration of the interview
    - the convenience of both parties
    - the geographical area covered by the survey

SURVEY – Questionnaire

- A questionnaire is a pre-formulated written set of questions to which respondents record their answers, usually within rather closely defined alternatives.
- Questionnaires are an efficient data collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest.
- Questionnaires can be administered personally, mailed to the respondents, or electronically distributed.

Table 2: Personally administered questionnaire vs. mail questionnaires vs. electronic questionnaires

Mode of Data Collection	Advantages	Disadvantages
Personally administered questionnaire	• Can established rapport and motivate respondents. • Doubt can be clarified. • Less expensive when administered to groups of respondents. • Almost 100% response rate ensured. • Anonymity of respondent is high.	• Organizations may be reluctant to give up company time for the survey with groups of employees assembled for the purpose.
Mail questionnaires	• Anonymity is high. • Wide geographic regions can be reached. • Token gifts can be enclosed to seek compliance. • Respondent can take more time to respond at convenience. • Can be administered electronically, if desired.	• Response rate is almost always low. A 30% rate is quite acceptable. • Cannot clarify questions. • Follow-up procedures for non-responses are necessary.
Electronic questionnaires	• Easy to administer. • Can reach globally. • Very inexpensive. • Fast delivery. • Respondents can answer at their convenience like the mail questionnaire.	• Computer literacy is a must. • Respondents must have access to the facility. • Respondent must be willing to complete the survey.

SURVEY – Questionnaire

- Sound questionnaire design principles should focus on three areas:
  - Wording of the questions
  - Planning of issues of how the variables will be categorized, scaled, and coded after receipt of the responses
  - General appearance of the questionnaire
- Pretesting of structured questions - to ensure that the questions are understood by the respondents and that there are no problems with the wording or measurement
  - Pretesting involves the use of a small number of respondents to test the appropriateness of the questions and their comprehension.

SURVEY – Structured Observation

- People can be observed in their natural work environment or in the lab setting, and their activities and behaviors or other items of interest can be noted and recorded.
- Structured observational studies → the observer has a predetermined set of categories of activities or phenomena planned to be studied
- Data collection through mechanical observation

SURVEY – Structured Observation

- Advantages of observational studies:
  - The data obtained through observation of events as they normally occur are generally more reliable and freer from respondent bias.
  - It is easier to note the effects of environmental influences on specific outcomes.
  - It is easier to observe certain groups of individuals (e.g. very young children and extremely busy executives) from whom it may be otherwise difficult to obtain information.

MEASUREMENT OF VARIABLES

- Measurement may be defined as the assignment of numbers to characteristics of objects, persons, states, or events, according to rules.
- Type of variables
  - “Clear” and thus lends itself to some objective and precise measurement. e.g., marital status, gender, height, etc. Objective physical measuring devices can be used.
  - “Nebulous” and thus does not lend itself to precise measurement because of its subjective nature. e.g., attitude, motivation, satisfaction, etc. Reducing abstract concepts so that they can be measured is called: operationalization process.

Operational Definition

- Operationalizing, or operationally defining a concept to that is becomes measurable, is achieved by looking at the behavioral dimensions, facets, or properties denoted by the concept, and categorizing these into observable and measurable elements.

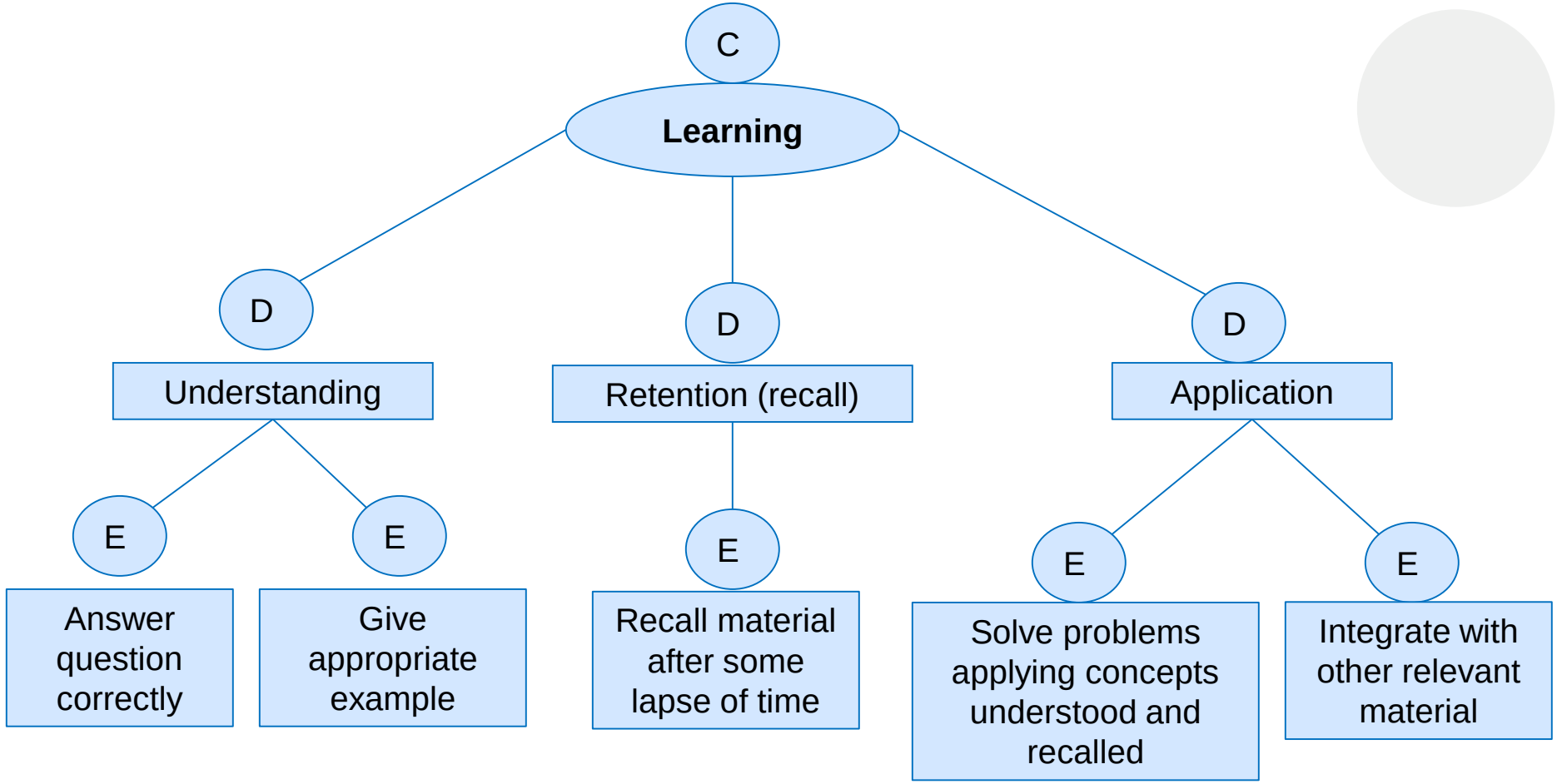
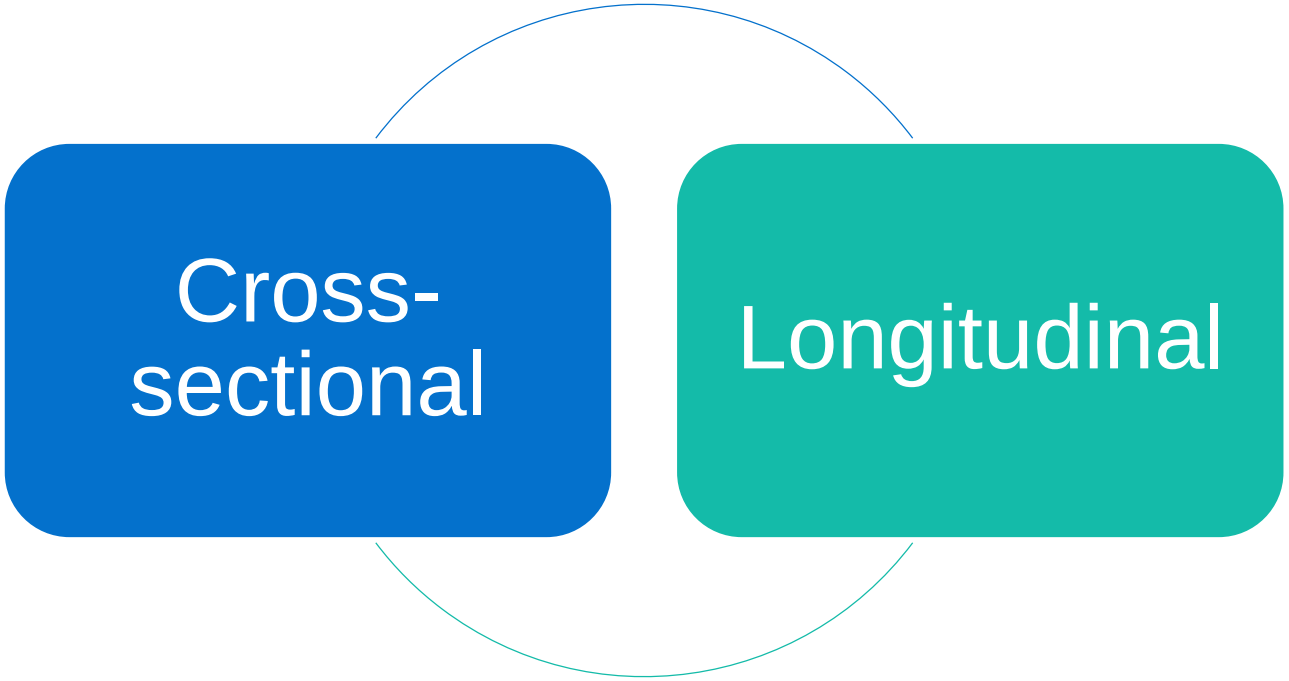


Figure 5: Dimensions (D) and Elements (E) of the Concept (C) of Learning (L)

Measurement Scales

- Nominal - usually used for obtaining personal data such a gender, department in which one is working, etc., where grouping of individuals or objects is useful.
- Ordinal - usually used to rate preferences or usage of various brand of the product by individuals and to rank order individuals, objects, or events
- Interval - used when responses to various items that measure a variable can be tapped on five points (or seven points or any others number of points) scale, which can thereafter be summated across the items
- Ratio - usually get used in organizational research when exact figures on objective (as opposed to subjective) factors are called for

CHOOSING A TIME HORIZON



SAMPLING DESIGN

- The purpose of carrying out survey is to collect related information about the target group - the population.
  - the group which forms the subject of study in a particular survey
  - the group to which a researcher would like the results of the study to be generalized
- Census - occurs when a population is examined in its entirety
- Sampling - the process of selecting a number of items or individuals (sample) represent the large group from which they were selected

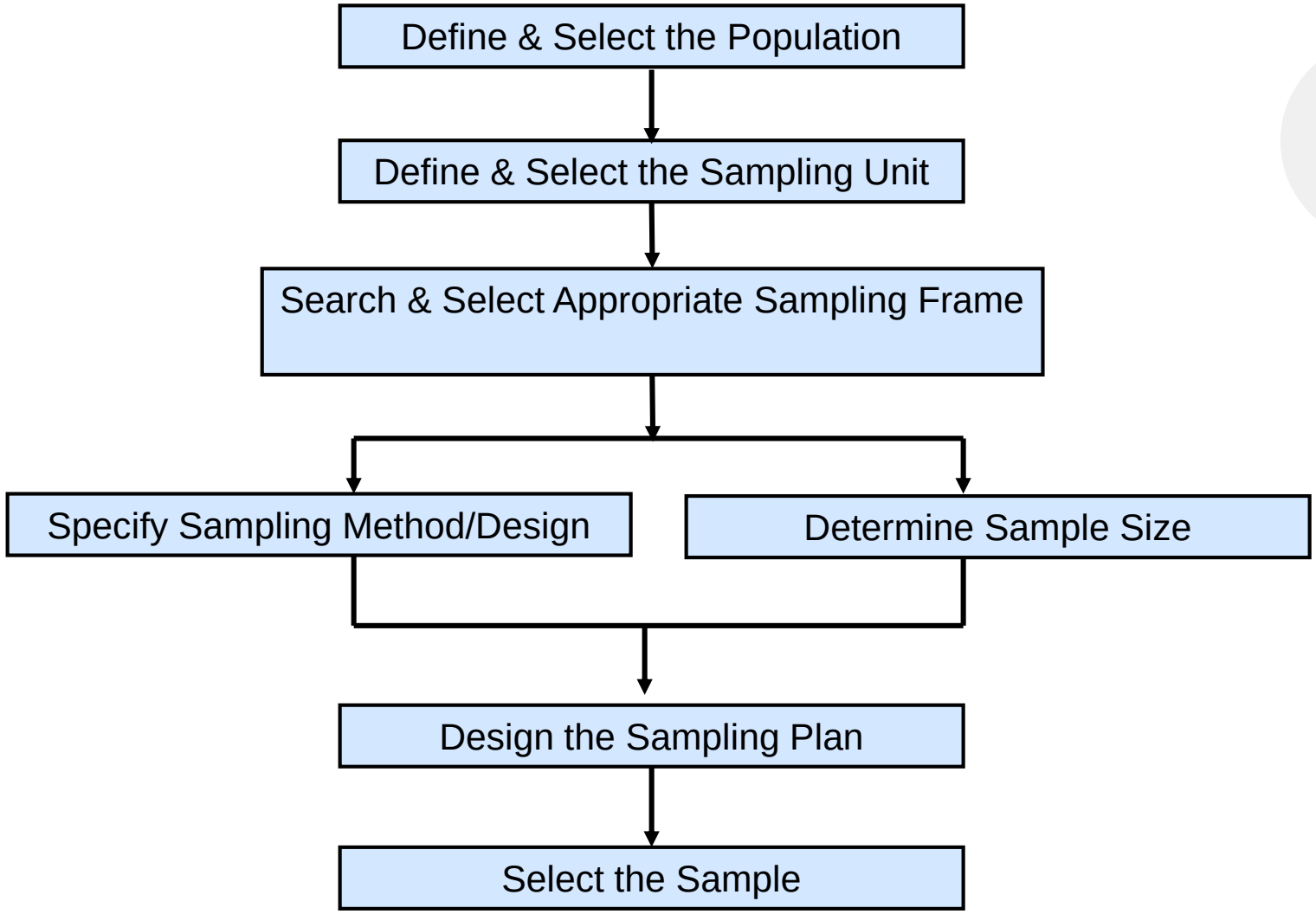
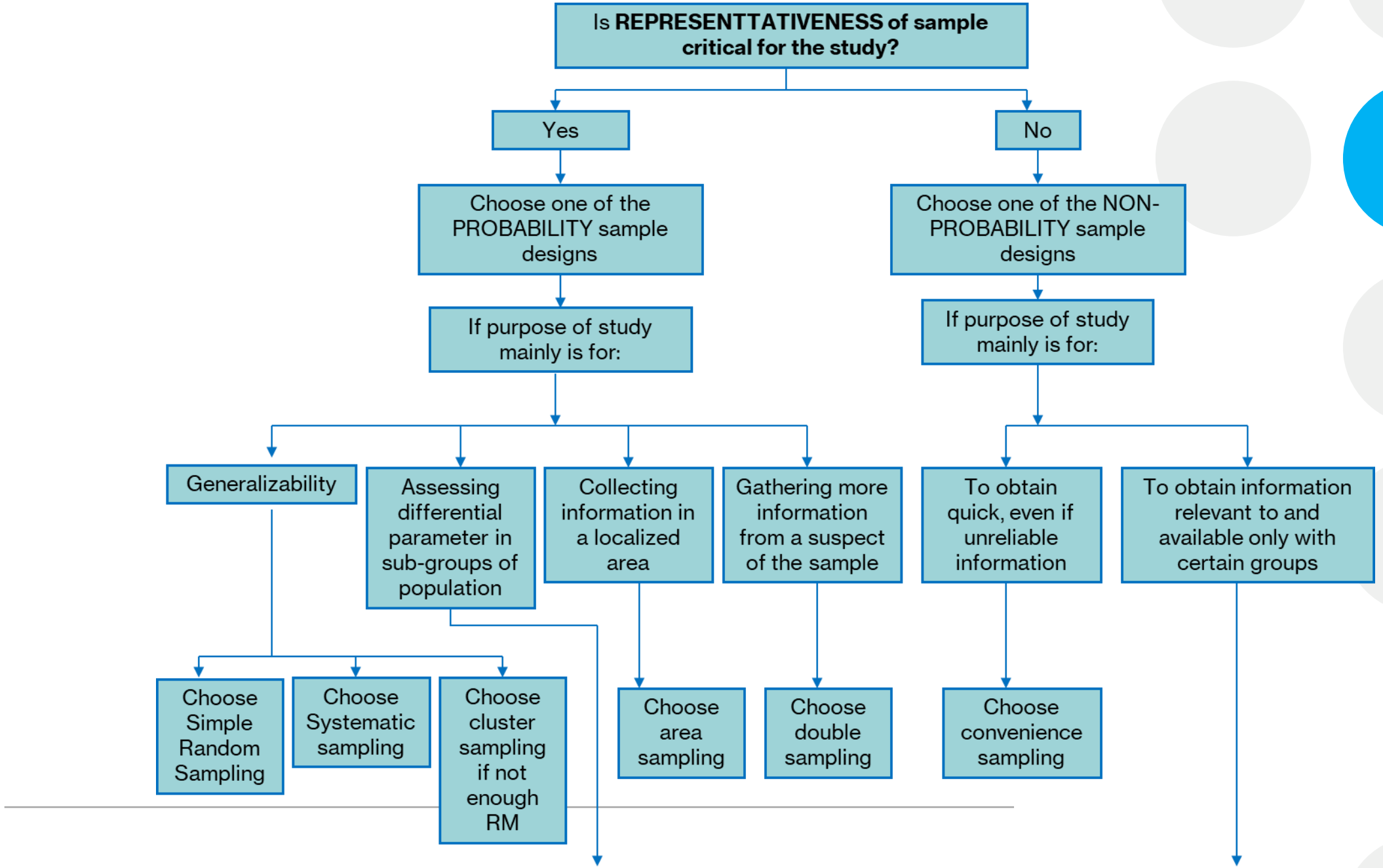


Figure 3: The Sampling Process


Is REPRESENTTATIVENESS of sample critical for the study?
Yes
No
Choose one of the PROBABILITY sample designs
Choose one of the NON-PROBABILITY sample designs
If purpose of study mainly is for:
If purpose of study mainly is for:
Generalizability
Assessing differential parameter in sub-groups of population
Collecting information in a localized area
Gathering more information from a suspect of the sample
To obtain quick, even if unreliable information
To obtain information relevant to and available only with certain groups
Choose Simple Random Sampling
Choose Systematic sampling
Choose cluster sampling if not enough RM
Choose area sampling
Choose double sampling
Choose convenience sampling

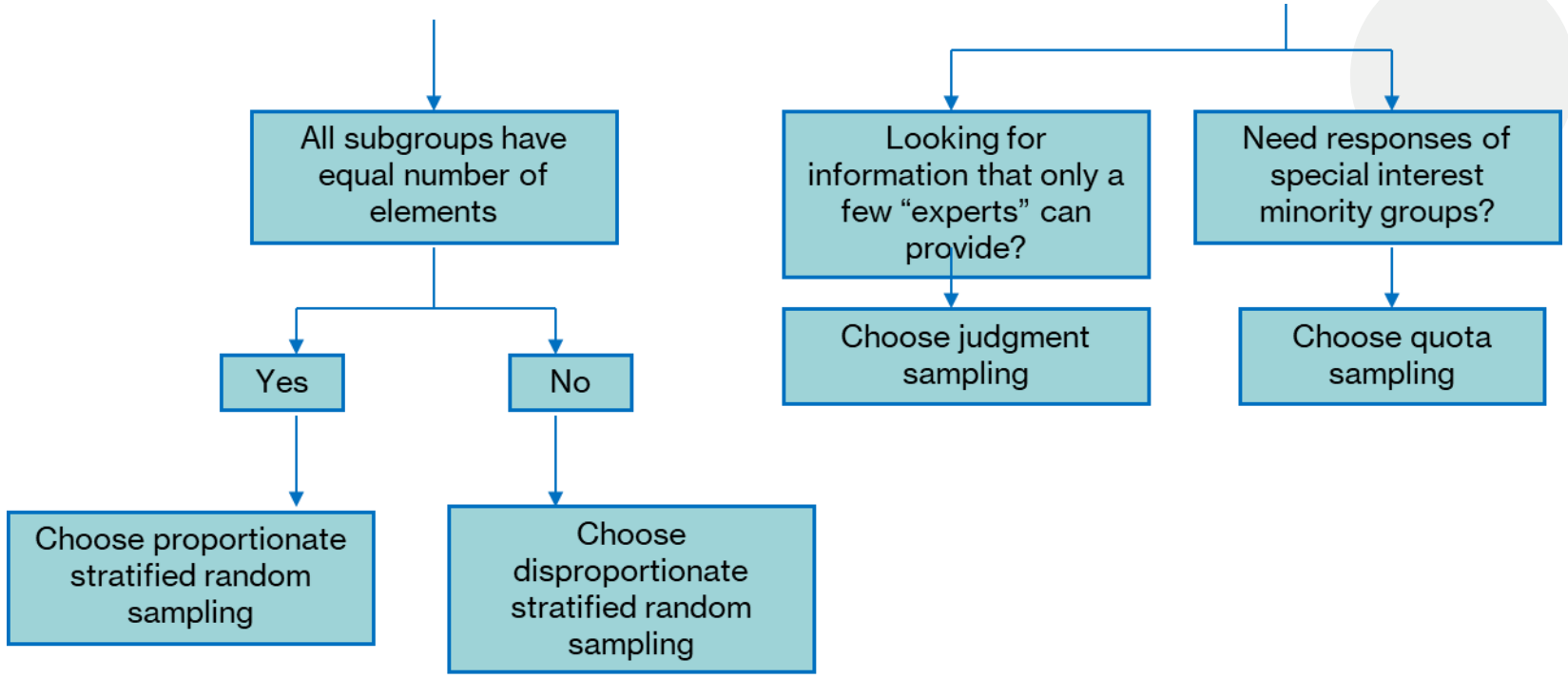


Figure 4: Choice Points in Sampling Design


THANK YOU
Any Questions?