Course Title: Business Research

Course Code: 01ABBAB24412

Unit III - Research Design

3.1 - Problem Statement, Research Gap, Need of the Study, Scope of the Study, Rationale of the Study.

3.2 - Research Questions, Research Objectives and Research Hypothesis.

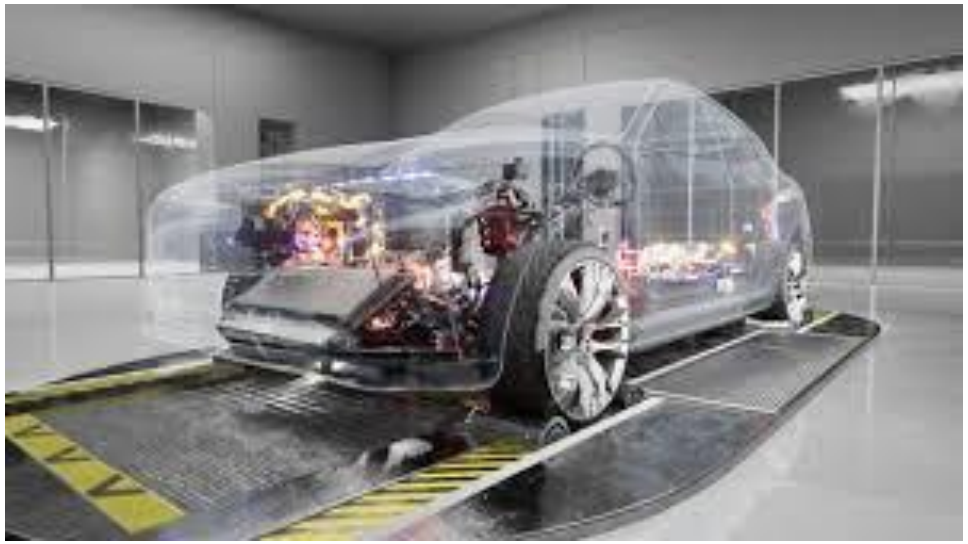
3.3 - Defining Population, Sampling Method and Research Tools.

3.4 - Types of Data & Source of Data.

3.5 - Data Collection Method.

3.6 - Data Analysis Tools.

Research Design



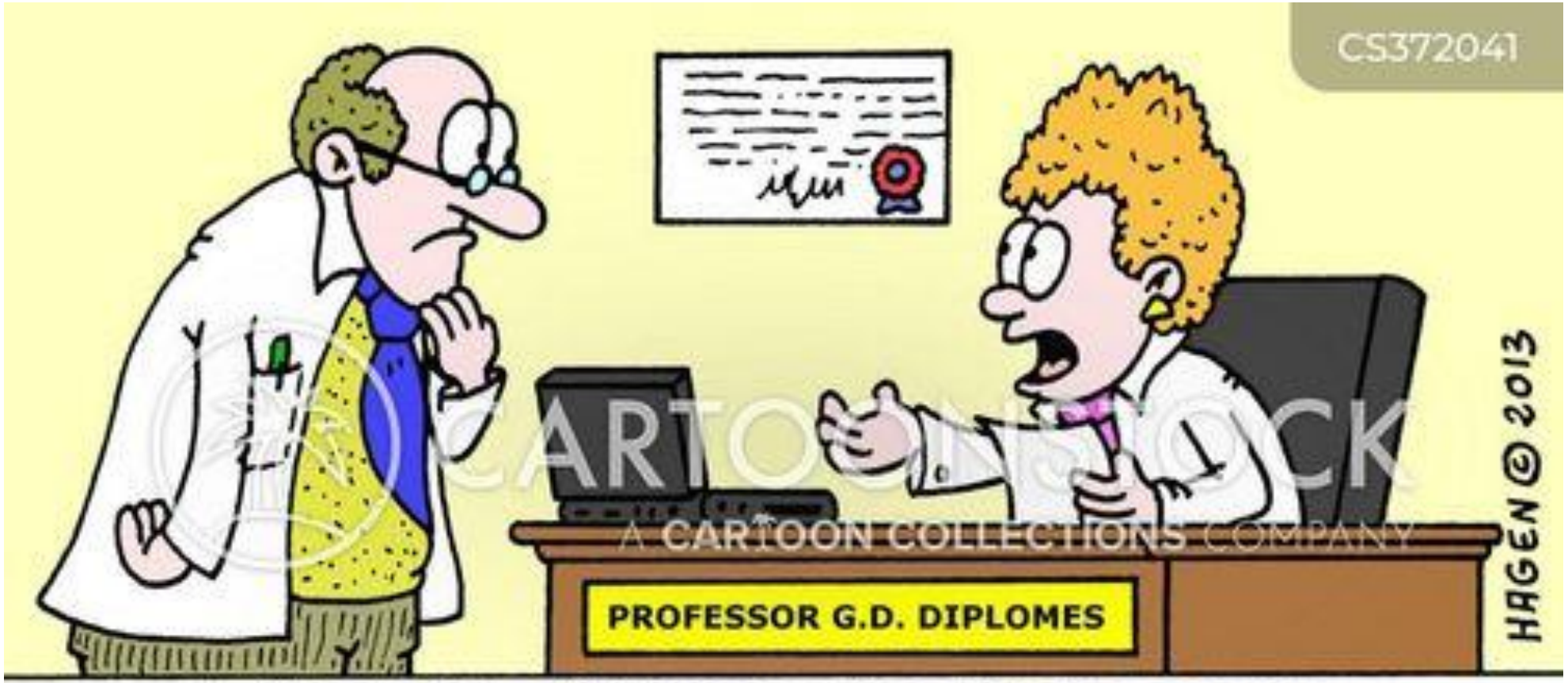
- For construction of a house/ Car, we need to have a proper blueprint prepared by an expert architect. Similarly, we need a proper research design or plan prior to data collection and analysis of our research project.

Research Design

- Research design is the overall plan or structure that guides a study.

- It defines how data will be collected, analyzed, and interpreted to fill the gaps and achieve the research objectives.

A not so good research design



Types of Research Design

1. ***Exploratory Research Design***

To explore a new topic where little or no prior research exists.

Methods Used: Literature review, interviews, focus groups.

Example: Studying how artificial intelligence is affecting HR decision-making in startups.

2. ***Descriptive Research Design***

To describe characteristics of a population or situation.
Methods Used: Surveys, observations, case studies.
Example: A study on employee job satisfaction levels in the IT industry.

Types of Research Design

3. ***Experimental Research Design***

To establish cause-and-effect relationships by controlling variables.

Methods Used: Laboratory experiments, randomized controlled trials.

Example: Testing whether a new training program improves employee productivity.

4. ***Correlational Research Design***

To examine the relationship between two or more variables without manipulation.

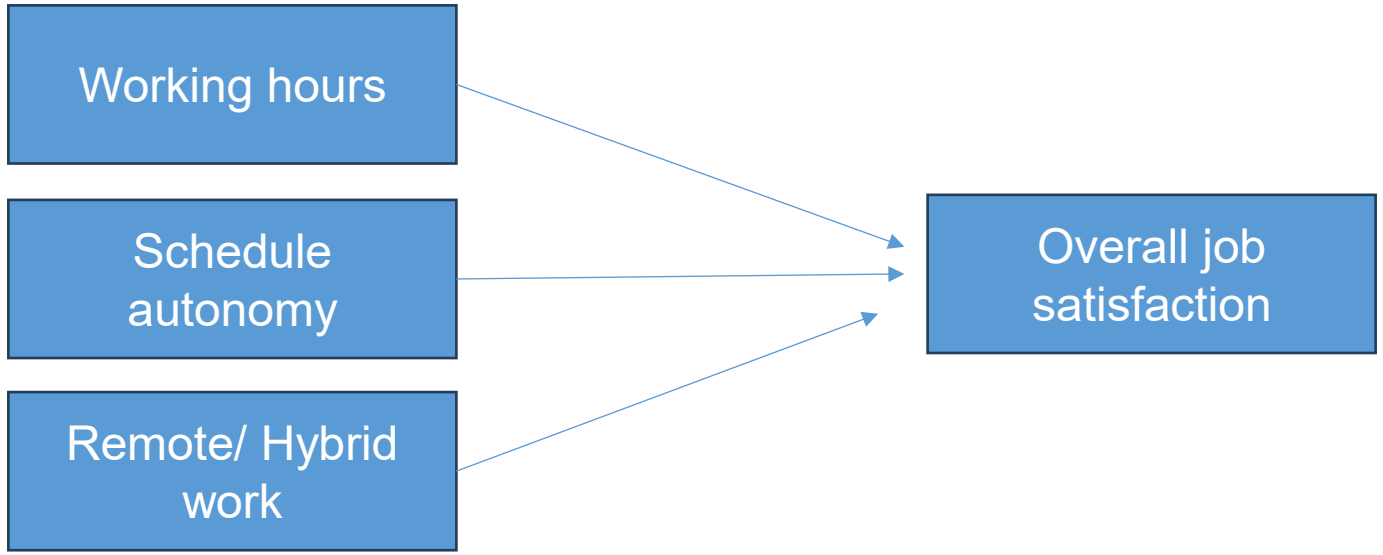
Methods Used: Statistical analysis of survey or secondary data.

Example: Studying the relationship between workplace flexibility and job satisfaction.

Types of Research Design

4. ***Correlational Research Design***

To examine the relationship between two or more variables without manipulation.



Types of Research Design

5. ***Longitudinal Research Design***

To study changes over time by collecting data from the same subjects repeatedly.

Methods Used: Surveys, panel studies, repeated observations.

Example: Tracking leadership development in employees over a 5-year period.

6. ***Cross-Sectional Research Design***

To analyze data at a single point in time rather than over a period.

Methods Used: Surveys, interviews, observational studies.

Example: A study on social media usage among teenagers in 2024.

Problem Statement

- A research problem statement is a clear, concise, and specific statement that describes the issue or problem that the research project addresses.

- It should be written in a way that is easily understandable to both experts and non-experts in the field.

Writing a Problem Statement

- **Identify the general area of interest:** Start by identifying the general area of research that interests you.

- **Define the specific problem:** Narrow down the general area of interest to a specific problem or issue.

- **Explain the significance of the problem:** Provide context for the problem by explaining why it is important to study and what gap in current knowledge or understanding it fills.

Writing a Problem Statement

- **Provide a clear and concise statement:** State the problem in a clear and concise manner, making sure to use language that is easily understood by your intended audience.

- **Use a scientific and objective tone:** The problem statement should be written in a neutral and objective tone, avoiding any subjective language and personal bias.

Writing a Problem Statement

Example 1 — *Problem Statement Related to Technology Acceptance and Consumer Behaviour*

From a peer-reviewed research context, this **problem statement** (paraphrased to preserve clarity) describes the gap the study is addressing in applying TAM to consumer behaviour:

> **Problem Statement:**
> Despite widespread adoption of online shopping platforms, **consumer acceptance and continuous usage behaviours are not well understood** because most existing models focus only on initial purchase intentions. There is limited research that integrates *trust* and *quality perceptions* with traditional TAM constructs (perceived usefulness and perceived ease of use) to explain how these factors influence *consumer satisfaction*, *repeat purchase*, and *recommendation behaviours* in e-business environments. Only by addressing these gaps can marketers and platform designers improve strategies to retain consumers

Research Gap

- A research gap is, simply, a topic or area for which missing or insufficient information limits the ability to reach a conclusion for a question.

- It should not be confused with a research question, however.

https://researcheracademy.elsevier.com/research-preparation/research-design/identify-research-gaps

Research Gap

These tourism departments can be found on social media platforms such as Facebook, Twitter, YouTube, and others for destination promotion. Of these, Facebook has become the most relevant destination marketing tool for Indian DMOs to reach their domestic and global audiences. India also ranks first in the number of Facebook users and the highest number of users between 18 and 34 years (Statista, 2019a, 2019b), who engage more on social media while travelling (Amaro et al., 2016). However, there is scant research to comment on Indian DMOs' usage of Facebook even though there are a large number of DMOs and the country boasts the highest number of users on the platform. Hence, the authors have tried to address this research gap.

The present study has been carried out to fill this research gap with the following objectives: a) to explore how Indian DMOs employ Facebook for destination promotion; b) to enlist their performance by quantifying Facebook features and qualitative inputs from managers; c) to find the flaws in their usage of Facebook; and d) to identify best practices for Indian DMOs when using Facebook.

https://researcheracademy.elsevier.com/research-preparation/research-design/identify-research-gaps

Research Gap-Types

- **Knowledge gaps-** These are gaps in knowledge or understanding of a subject, where more research is needed to fill the gaps.
- For example, there may be a lack of understanding of the mechanisms behind a particular disease or how a specific technology works.

- **Conceptual gaps-** These are gaps in the conceptual framework or theoretical understanding of a subject.
- For example, there may be a need for more research to understand the relationship between two concepts or to refine a theoretical framework.

https://researcheracademy.elsevier.com/research-preparation/research-design/identify-research-gaps

Research Gap-Types

- **Methodological gaps-** These are gaps in the methods used to study a particular subject.
- For example, there may be a need for more research to develop new research methods or to refine existing methods to address specific research questions.

- **Data gaps-** These are gaps in the data available on a particular subject.
- For example, there may be a need for more research to collect data on a specific population or to develop new measures to collect data on a particular construct.

https://researcheracademy.elsevier.com/research-preparation/research-design/identify-research-gaps

Need of the Study

- The ‘need of the study’ in a research thesis is all about answering the big ‘Why?’—
- It’s where we show the value, impact, and potential of your work.
- Here’s why it matters, and here’s how my research is going to help fill that gap or move things forward.’

- For example, if we are studying the impact of social media on adolescent self-esteem.
- By exploring this, your study could offer insights that help parents and educators better support young people.

Need of the Study

- The need of the study or project significance refers to the rationale behind undertaking a specific research project.

- It explains why the research is important, its relevance to the field, and how it contributes to addressing real-world problems or filling knowledge gaps.

Need of the Study- Example

- ***In recent years**, organizations have increasingly adopted workplace flexibility practices to improve employee well-being and organizational performance. **While previous studies** have explored the relationship between workplace flexibility and job satisfaction, the findings remain inconclusive, particularly in the context of emerging economies such as India. **Moreover, limited empirical evidence** is available on how different forms of workplace flexibility influence overall job satisfaction among employees across sectors. Hence, the **present research is needed** to examine this relationship in a contemporary organizational setting and to provide evidence that can support effective human resource policies and managerial decisions.*

Scope of the Study

- The scope of research is a crucial element in any academic study, defining the boundaries and focus of your investigation, which is crucial for the scope of the study.

- The scope of a study explains the extent to which the research area will be explored in the work and specifies the parameters within which the study will be operating.

- It’s essential to define the scope of research early in the process, as it helps to guide the research design.

Scope of the Study

- The scope in research refers to the boundaries and extent of a study, defining its **specific objectives**, target population, variables, methods, and limitations, which helps researchers focus and provide a clear understanding of what will be investigated.

- *Scope: The scope of the study will focus on the impact of social media on the mental health of young adults aged 18-24 in the United States.*

Rationale of the Study

- The rationale of the study explains the underlying reason and justification for choosing a particular research topic, clearly stating why the study is important, what motivated the researcher, and how the study contributes to theory, practice, or policy.

Research Questions

- A research question is a clear and focused question that guides a research project. It helps researchers identify a problem to solve and produce significant results.
- A research question is an inquiry that the research attempts to answer. It is the heart of the systematic investigation.

Research Questions

- Research Gap = What is missing in existing knowledge?
- Research Question = What will this study find out to fill that missing part?
- Research questions are clear, focused, and specific questions that a study seeks to answer through systematic investigation. They translate the research problem or gap into empirically testable inquiries and guide the research design, data collection, and analysis.

Research Questions - Example

- How do consumers perceive the usefulness of the selected technology?
- How do consumers perceive the ease of use of the technology?

How do the E-Business platforms influence online users' behavior and repeat purchases?
How can TAM, DMP, trust and quality be used to assess consumer behavior and repeat purchases?

Research Objectives

- A research objective is defined as a clear and concise statement of the specific goals and aims of a research study.

- Use action verbs to make objectives engaging and actionable.
- Write each objective in a single sentence to make them easier to read and understand.
- Use language that lay-readers can easily understand.

Research Objectives

tourists had visited the town (Nair, 2019). We set our goal to understand the usages of social media and reviews by international tourists about the destination Puducherry with the help of the following objectives:

- To discover the profile of international tourists visiting Puducherry.
- To understand the level of social media usage by international tourists visiting Puducherry.
- To explore the perception of international tourists about the destination Puducherry by analysing their reviews on preferred social media.

Research Objectives

Problem → Gap → Need of the study → Research Questions → Objectives →

Hypothesis

Literature review- Type

Conceptual Model- Structure

Research Hypothesis

- A hypothesis is an ***assumption*** that is made based on some evidence.
- This is the initial point of any investigation that translates the research ***questions into predictions***.
- It includes components like variables, population and the relation between the variables.
- A research hypothesis is a hypothesis that is used to ***test the relationship between two or more variables.***

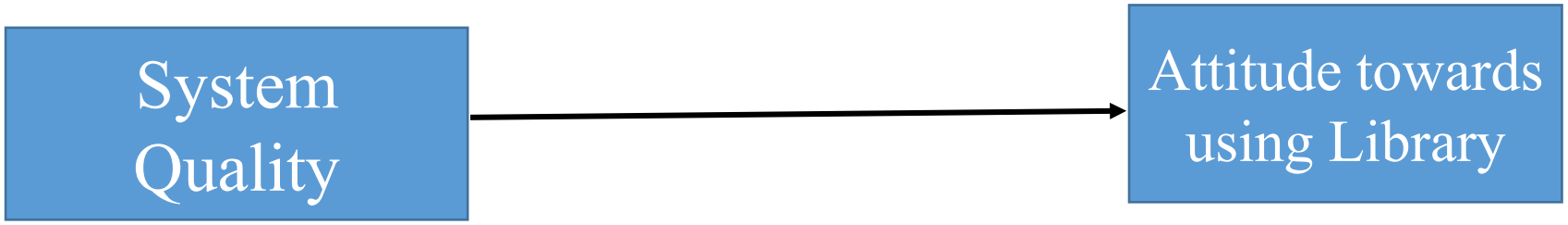
Research Hypothesis-Types

- 1. Simple Hypothesis.
- 2. Complex Hypothesis.
- 3. Null Hypothesis (Denoted by "HO")
- 4. Alternative Hypothesis (Denoted by "H1")

Research Hypothesis-Types

1) ***Simple Hypothesis-*** It shows a relationship between one dependent variable and a single independent variable.

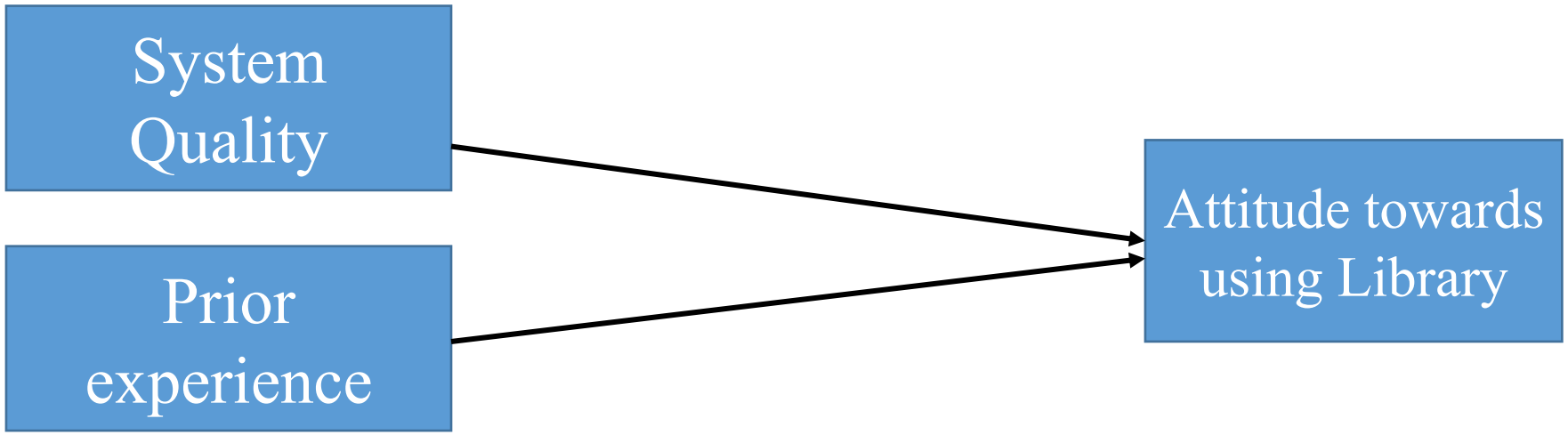
For example – If the system quality is good, Students' attitude will be positive for using the library.

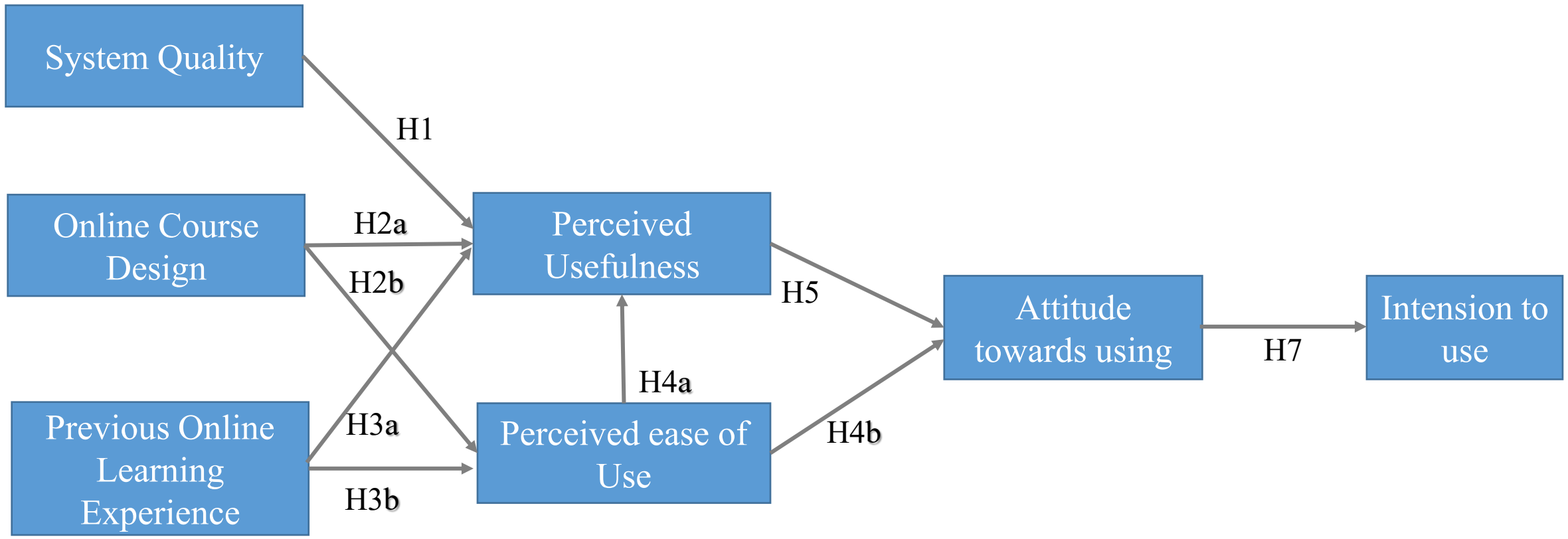


Research Hypothesis-Types

2) Complex Hypothesis- It shows the relationship between two or more dependent variables and two or more independent variables.

- If the system quality and prior experience is good, Students' attitude will be positive for using the library




System Quality
Online Course Design
Previous Online Learning Experience
Perceived Usefulness
Perceived ease of Use
Attitude towards using
Intension to use
H1
H2a
H2b
H3a
H3b
H4a
H4b
H5
H7

Hypothesis

3. Non-directional Hypothesis- *A*lso known as a two-tailed hypothesis, is a type of hypothesis that does not specify the direction of the relationship between variables.

Research Question: Does social media have an impact on self-esteem?

Objective: To find out the impact of social media on self-esteem.

Non-Directional Hypothesis: There is a significant relationship between social media usage and self-esteem.

Hypothesis

4. Directional Hypothesis- A directional hypothesis is a one-tailed hypothesis that states the direction of the difference or relationship.

Research Question: Does exercise have a positive impact on mood?

Objective: To find out the impact of exercise on the mood.

Directional Hypothesis: Engaging in regular exercise will result in an **increase** in **positive** mood compared to a sedentary lifestyle.

Hypothesis writing style

1. Null Hypothesis

- When there is no significant relationship or association between independent and dependent variables, the statistical hypothesis is called the null hypothesis.
- A null hypothesis is represented by (H_0). (Called H-not)

- H_0: There is no relationship between social media usage and self-esteem.

- In hypothesis testing, it is the default position, and researchers try to invalidate it using statistical analysis.

Hypothesis writing style

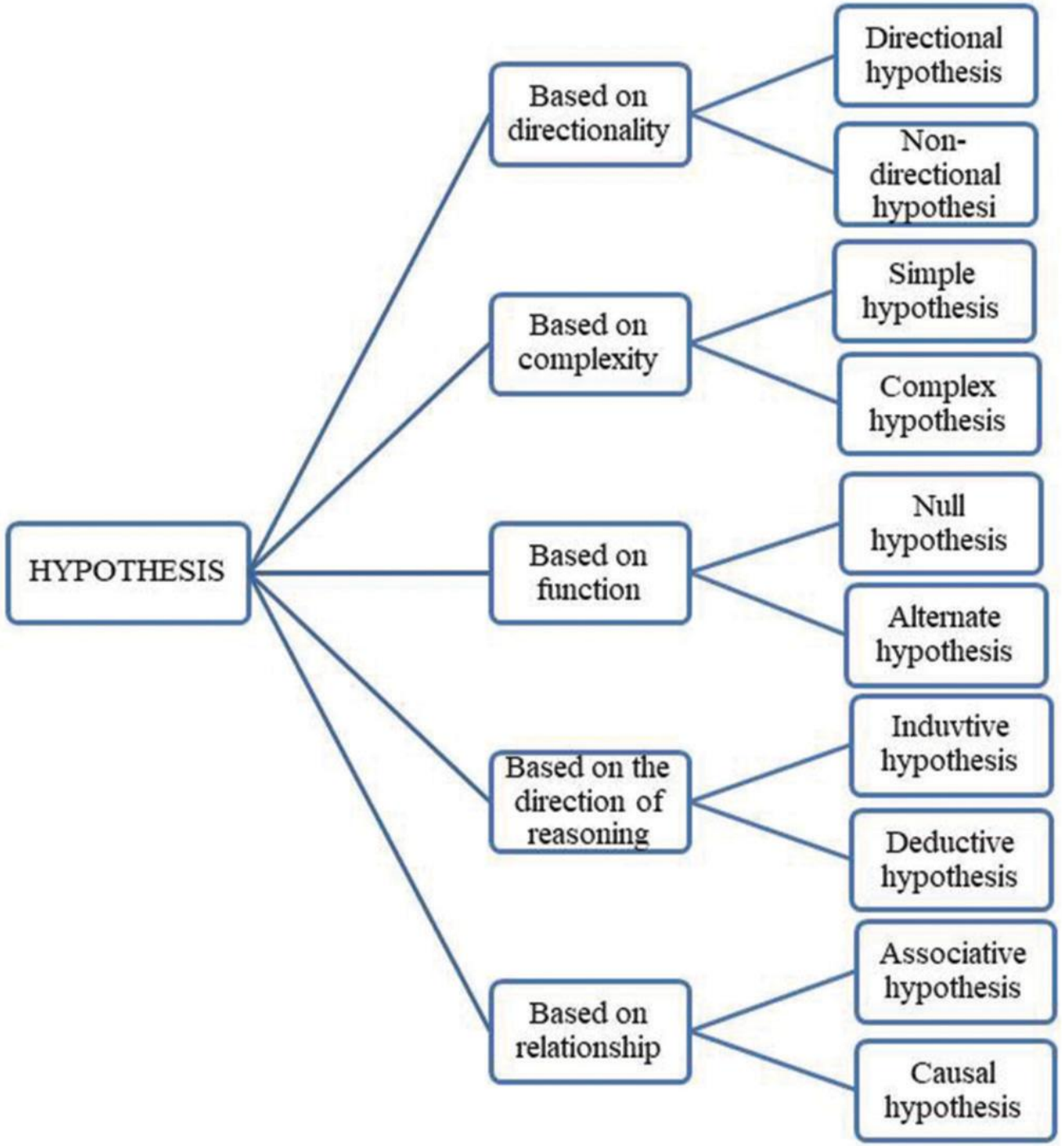
2. Alternate Hypothesis

- Alternative hypothesis suggests that there is a significant association or difference between the variables.
- It is represented as H_1 or H_a.

- H1: There is a relationship between social media usage and self-esteem.

- In hypothesis testing, it is the default position, and researchers try to validate it using statistical analysis.

Hypothesis


HYPOTHESIS
Based on directionality
Directional hypothesis
Non-directional hypothesi
Based on complexity
Simple hypothesis
Complex hypothesis
Based on function
Null hypothesis
Alternate hypothesis
Based on the direction of reasoning
Induvtive hypothesis
Deductive hypothesis
Based on relationship
Associative hypothesis
Causal hypothesis

Population

- The entire group or set of individuals, objects, or events that possess specific characteristics and are of interest to the researcher.
- It represents the larger population from which a sample is drawn.
- Examples of populations in research:

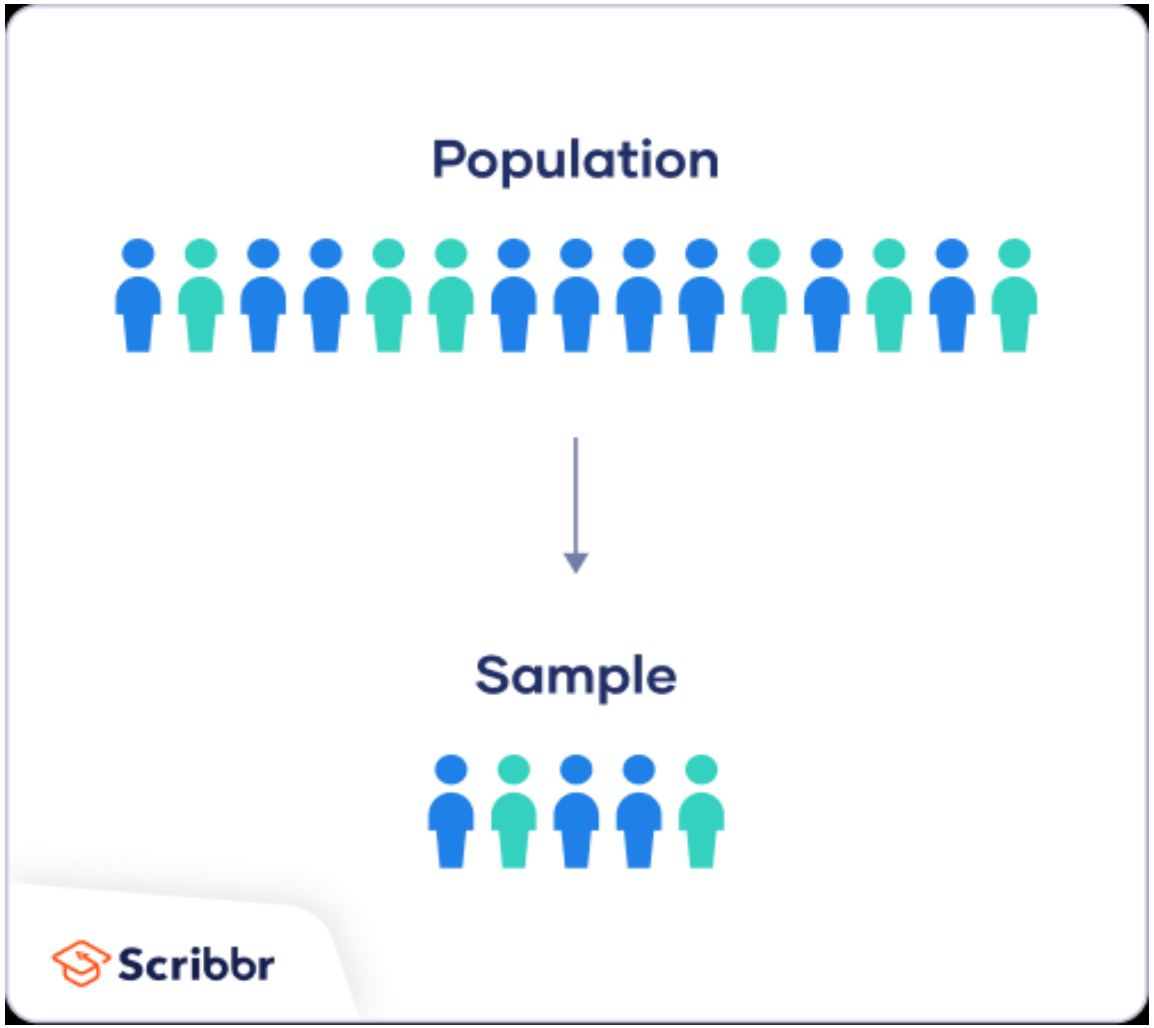
✓ All people who might be affected by a new drug

✓ All undergraduate students in the India

✓ All elementary school students in a school district

Sample

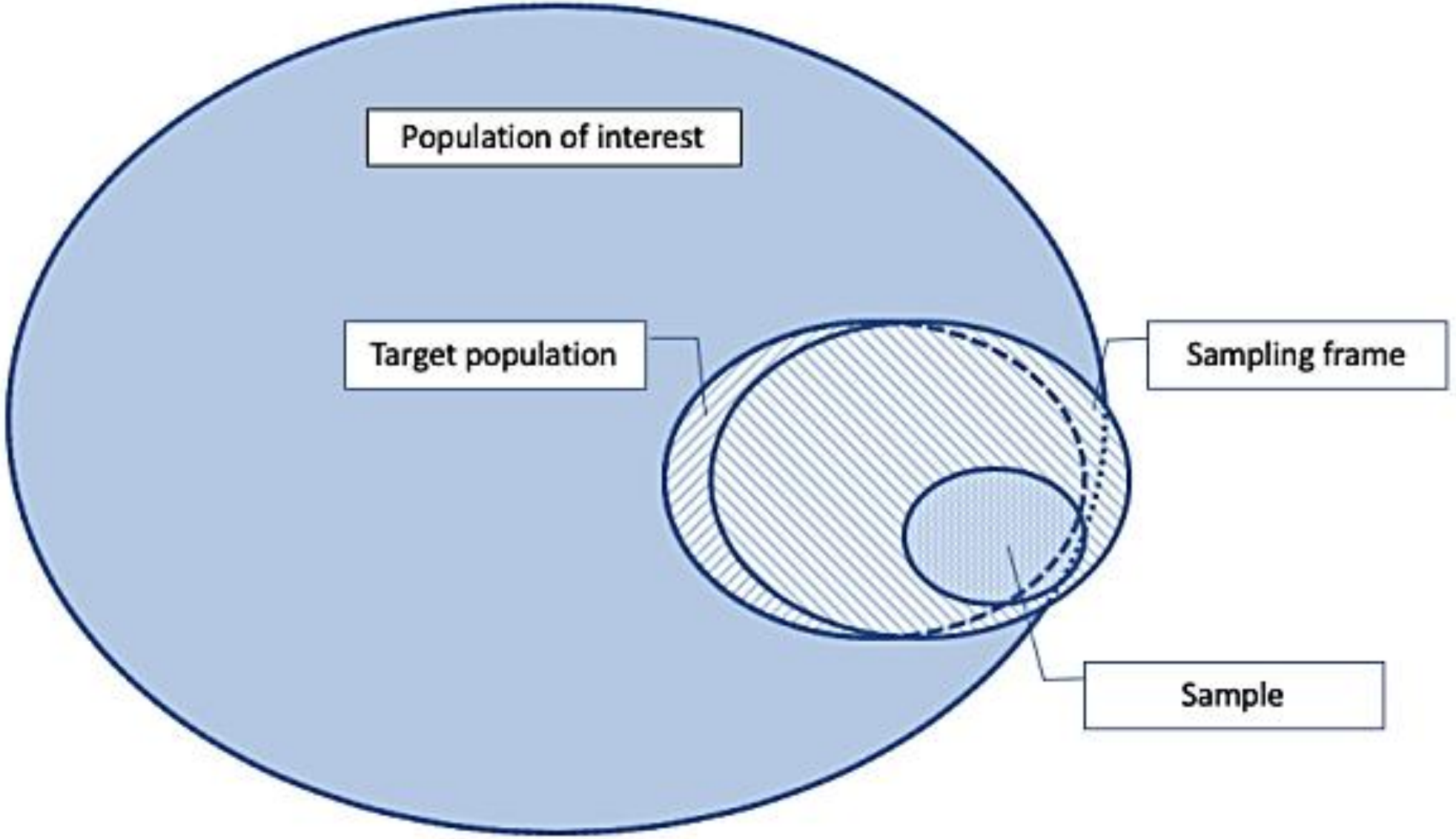
- A sample is a subset of the research population that is carefully selected to represent its characteristics.



Why Sampling?

- Cost & Resource
- Time constraint
- Management
- Statistical inference
- Ethical considerations

Population / Sample



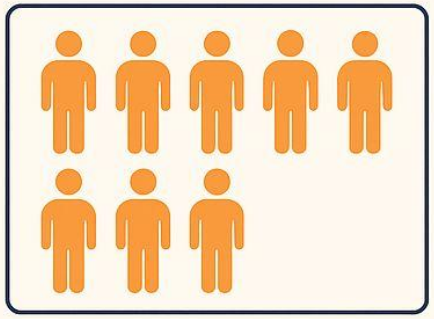
Population/Sampling

POPULATION vs SAMPLE

in Statistics

Population

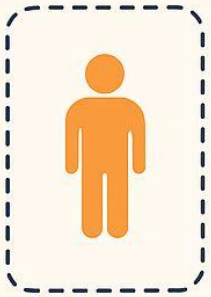
The entire group you want to study



Example: All farmers in a country

Sample

A smaller part of the population



Example: 1,000 randomly selected farmers

Key Differences

Size	Whole group	Small portion
Data Name	Parameter	Statistic
Cost & Time	High	Low
Goal	Complete info	Estimate population Common in research
Use Case	Rare (e.g. census)	

QA-3 – 02-02-2026

Problem → Gap → Need of the study → Research Questions → Objectives →

Hypothesis → Population → Sample

Research Design-?

Literature review- Type

Conceptual Model- Structure

Sampling methods

A. Probability sampling / Random sampling

- Every member of the population has a chance of being selected.
- It is a stringent method.
- It is mainly used in quantitative research.
- If we want to produce results that are representative of the whole population, probability sampling techniques are the most valid choice.

https://www.youtube.com/watch?v=6SICMRC8n94

Sampling methods

B. Non-Probability sampling / Non-random sampling

- Samples are chosen deliberately and not randomly.
- Researcher selects samples based on the subjective judgment.
- It is a less stringent method.
- It is widely for qualitative research.

A. Probability sampling / Random sampling

1. Simple Random sampling

- Every element in the population has an equal chance of being selected as part of the sample.

- All the members of the population are included in the list and then randomly select the desired number of subjects.

- It’s something like picking a name out of a hat.

A. Probability sampling / Random sampling

1. Simple Random sampling

- Define the population size you're working with. This could be based on the population of a city. For this exercise, we will assume a population size of 1000.
- Assign a random sequential number to each participant in the population, which acts as an ID number – e.g. 1, 2, 3, 4, 5, and so on to 1000.
- Decide the sample size number needed. For this exercise, let's use 100 as the sample size.
- Select your sample by running a random number generator to provide 100 randomly generated numbers from between 1 and 1000.

A. Probability sampling / Random sampling

2. Systematic Random Sampling

- Every member of the population is listed with a number, but instead of randomly generating numbers, individuals are chosen at regular intervals.

- Likened to an arithmetic progression wherein the difference between any two consecutive numbers is the same.

A. Probability sampling / Random sampling

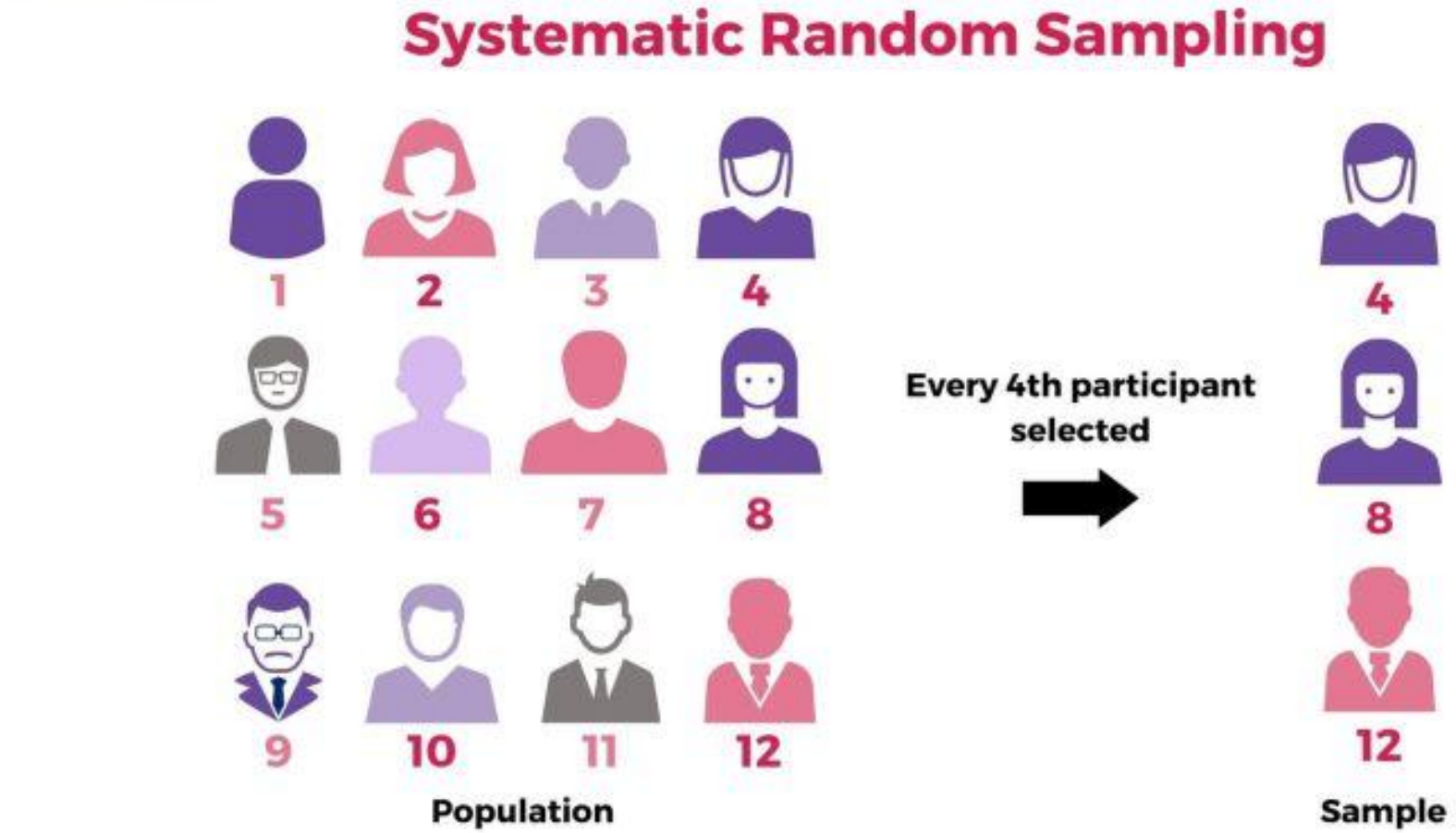
2. Systematic Sampling

- **Example**: All employees of the company are listed in alphabetical order. From the first 10 numbers, you randomly select a starting point: number 6. From number 6 onwards, every 10th person on the list is selected (6, 16, 26, 36, and so on), and you end up with a sample of 100 people.

- **If my population is 5000 and sample to be collected is 500 then-**

  Systematic Sampling Formula for interval (i) = N/n = 5000/500 = 10

A. Probability sampling / Random sampling



Linear systematic sampling

A. Probability sampling / Random sampling

3. Stratified Sampling

- Also known as proportional random sampling.

- This is a probability sampling technique wherein the subjects are initially **grouped** into different classifications such as age, socioeconomic status or gender.

- It is creating different strata or group or layers in population then taking random sampling from each group.

A. Probability sampling / Random sampling

3. Stratified Random Sampling

Example:

- The company has 800 female employees and 200 male employees.

- You want to ensure that the sample reflects the gender balance of the company, so you sort the population into two strata based on gender.

- Then you use random sampling on each group, selecting 80 women and 20 men, which gives you a representative sample of 100 people.

A. Probability sampling / Random sampling

4. Cluster Random Sampling

- Cluster sampling also involves dividing the population into subgroups, but each subgroup should have similar characteristics to the whole sample.
- Instead of sampling individuals from each subgroup, we randomly select entire subgroups.

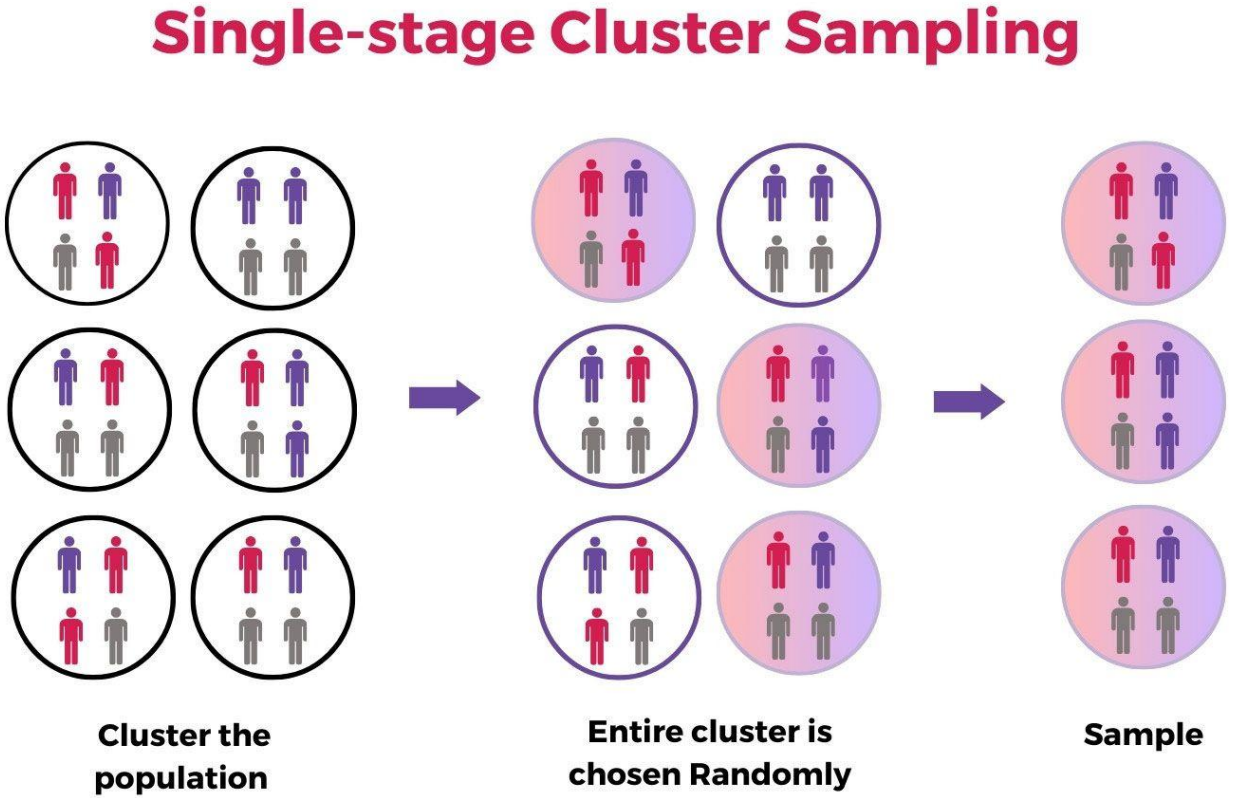
- Evaluating Public health programs in Rural areas

https://www.youtube.com/watch?v=xoEqxu-F0TQ&t=5s

A. Probability sampling / Random sampling

4. Cluster Random Sampling

TGM Research



A. Probability sampling / Random sampling

Sampling Method	Selection Procedure	When It Is Suitable
Simple Random Sampling (SRS)	Every unit in the population has an equal and known chance of selection. Lottery method or random function.	population is homogeneous and a complete sampling frame is available.
Systematic Sampling	Select every kth unit after a random starting point (k = N/n).	When population list is ordered and evenly distributed.
Stratified Random Sampling	Population divided into homogeneous strata; random samples drawn from each stratum.	When population has identifiable subgroups (e.g., gender, department).
Cluster Sampling	Population divided into natural clusters; randomly select clusters, then study all or sample within them.	When population is geographically dispersed or large.

B. Non-Probability sampling

- In a ***non-probability*** sample, individuals are selected based on non-random criteria, and not every individual has a chance of being included.

- Criteria such as convenience, expert judgment, or accessibility, rather than chance

- That means the inferences you can make about the population are weaker than with probability samples, and your conclusions may be more limited.

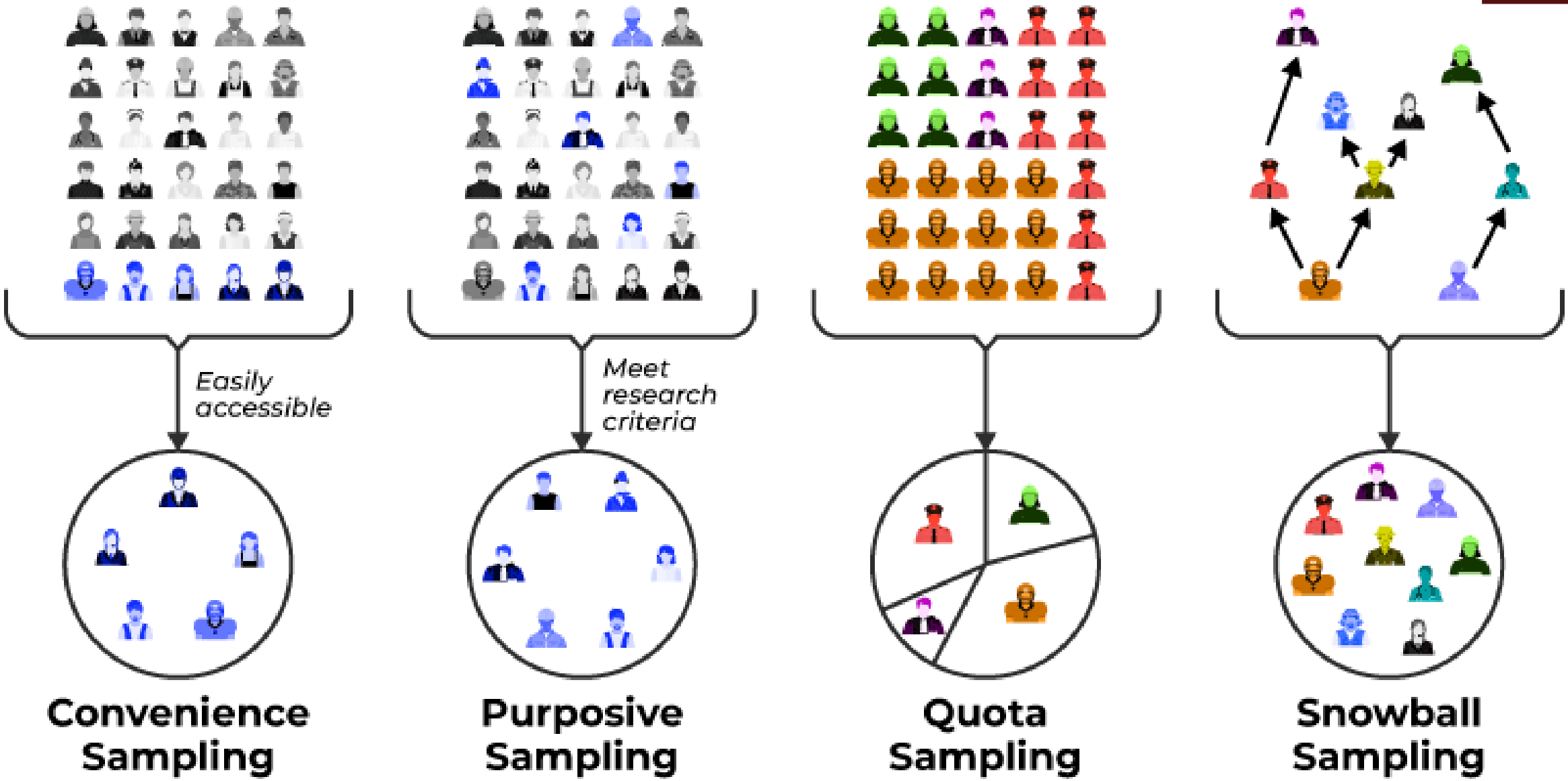
B. Non-Probability sampling

- This sampling method depends heavily on the expertise of the researchers.

- This type of sample is easier and cheaper to access, but it has a higher risk of sampling bias.

- Non-probability sampling is a method in which **not all population members have an equal chance of participating in the study**, unlike probability sampling.

B. Non-Probability sampling



B. Non-Probability sampling

1. Convenience Sampling

- A convenience sample simply includes the individuals who happen to be most accessible to the researcher.

- This is an easy and inexpensive way to gather initial data, but there is no way to tell if the sample is representative of the population, so it can't produce generalizable results.

B. Non-Probability sampling

1. Convenience Sampling

- *Example-* You are researching opinions about student support services in your university, so after each of your classes, you ask your fellow students to complete a survey on the topic.
- This is a convenient way to gather data, but as you only surveyed students taking the same classes as you at the same level, the sample is not representative of all the students at your university.

- ***The most common non-probability sampling method, because of its speed, cost-effectiveness, and ease of availability of the sample.***

B. Non-Probability sampling

1. Convenience Sampling

- Convenience in terms of:
  - its speed,
  - cost-effectiveness,
  - ease of availability of the sample
  - accessibility of the sample

B. Non-Probability sampling

2. Purposive Sampling

- This type of sampling, also known as **judgement sampling**, involves the researcher using their expertise to select a sample that is most useful to the purposes of the research.

- It is often used in qualitative research, where the researcher wants to gain detailed knowledge about a specific phenomenon.

- Always make sure to describe your inclusion and exclusion criteria and beware of observer bias affecting your arguments.

B. Non-Probability sampling

2. Purposive Sampling

- Example- We want to know more about the opinions and experiences of disabled students at your university, so we purposefully select a number of students with *different support needs* in order to gather a varied range of data on their experiences with student services.

- Suppose a researcher is conducting a study on the performance of top-performing employee in a big company. Instead of choosing employee randomly, the researcher chooses to interview employee who have *acquired a couple of awards* and *recognitions* for their terrific work.

B. Non-Probability sampling

2. Purposive Sampling

- In the judgmental sampling method, researchers select the samples based purely on the researcher's knowledge and credibility.

- In other words, researchers choose only those people who they deem fit to participate in the research study. Judgmental or purposive sampling is not a scientific method of sampling.

B. Non-Probability sampling

3. Snowball Sampling

- If the population is **hard to access**, **hidden, sensitive** snowball sampling can be used to recruit participants via other participants.

- Snowball sampling is getting “referrals from referrals”.

- The number of people you have access to “snowballs” as you get in contact with more people.

- This can lead to sampling bias.

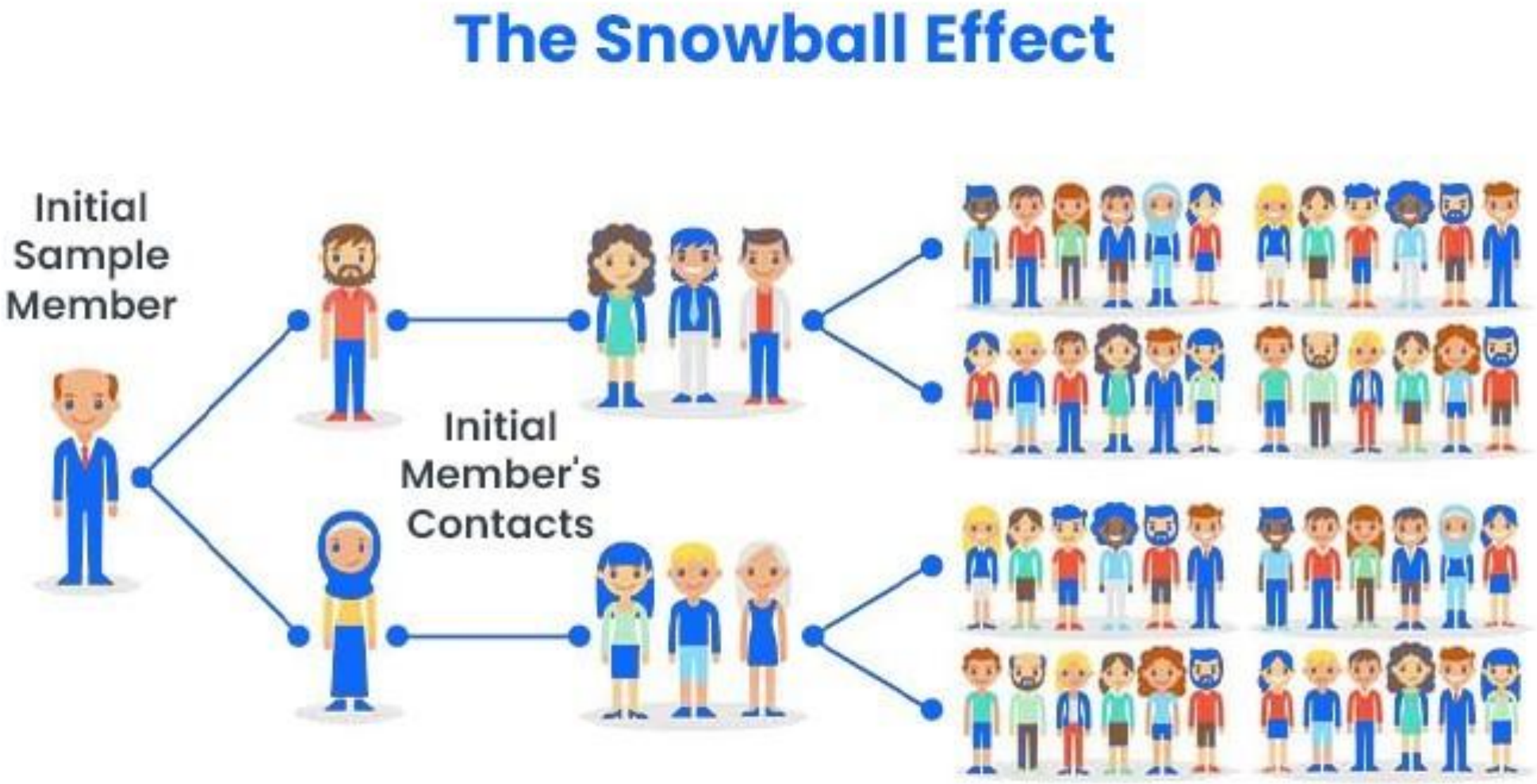
B. Non-Probability sampling

3. Snowball Sampling

- *Example-* A researcher studying homelessness starts by interviewing one person living on the streets. That person refers the researcher to two friends who are also homeless. Those two friends each refer two more people. The sample "snowballs" from 1 person → 3 people → 7 people, growing through participant referrals.

- Research on child labor, sex workers, drug users, technology users – early adaptors.

B. Non-Probability sampling



B. Non-Probability sampling

4. Quota Sampling

- Quota sampling relies on the non-random selection of a predetermined number or proportion of units. This is called a quota.

- You first divide the population into mutually **exclusive** subgroups (called strata) and then recruit sample units until you reach your quota.

- These units share specific characteristics, determined by you prior to forming your strata. The aim of quota sampling is to control what or who makes up your sample.

B. Non-Probability sampling

4. Quota Sampling

- Researchers establish quotas, typically demographic factors.

- like age (diff. groups) or gender (male/ female) , income (L/M/H), locality (U/R), Family (N/J), Class etc.

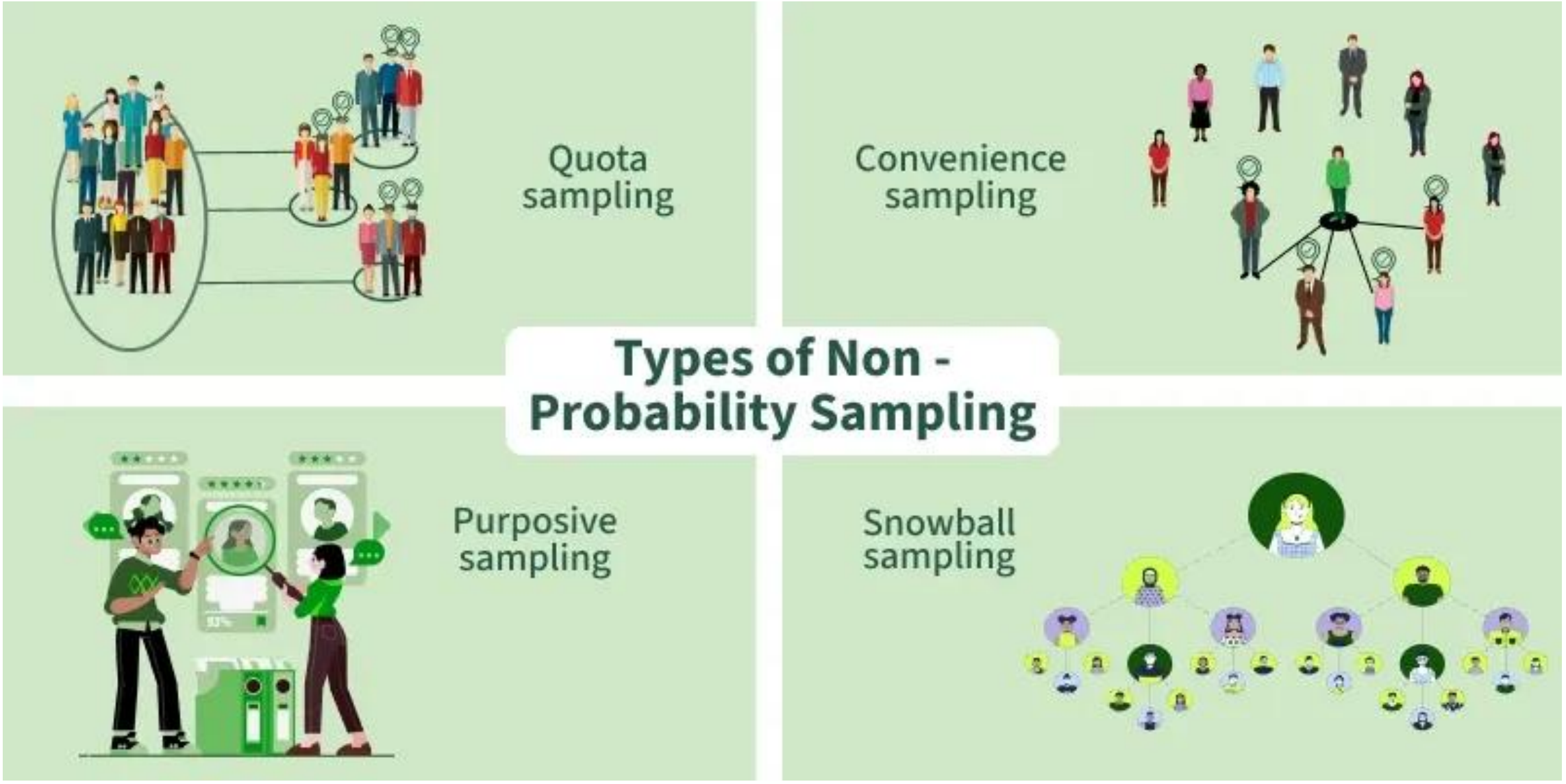
- and then recruit participants fitting these categories until each quota is met.

B. Non-Probability sampling

4. Quota Sampling

- Example- we want to gauge consumer interest in a new produce delivery service in Bangalore, focused on dietary preferences. We divide the population into meat eaters, vegetarians, and vegans, drawing a sample of 1000 people. Since the company wants to cater to all consumers, we set a quota of 200 people for each dietary group. In this way, all dietary preferences are equally represented in our research, and we can easily compare these groups. We continue recruiting until reach the quota of 200 participants for each subgroup.

B. Non-Probability sampling



Probability sampling

Simple random sampling

Cluster sampling

Types of Probability Sampling

Systematic sampling

Stratified random sampling

Difference

Feature	Probability Sampling	Non-Probability Sampling
Definition	Every member of the population has a known, non-zero chance of being selected.	Not every member has a chance of being selected; based on subjective judgment.
Basis of Selection	Random selection	Non-random selection
Types	Simple random sampling, systematic sampling, stratified sampling, cluster sampling	Convenience sampling, judgmental sampling, quota sampling, snowball sampling
Bias	Less bias due to random selection	Higher risk of bias due to subjective judgment
Representativeness	More representative of the population	Less representative of the population
Cost	More expensive	Less expensive

Data collection methods

- Data collection methods refer to the systematic techniques used to gather information for research purposes.

- They are broadly classified into:

• Primary Data Collection

&

• Secondary Data Collection

Data collection methods

- **Primary Data Collection-**

A. Survey Method

- Structured questionnaires (online/offline)
- Likert scale, multiple choice, open-ended questions
- Tools: Google Forms, Qualtrics, paper survey

✓ Suitable for large samples
✓ Used in descriptive and quantitative research

Data collection methods

- **Primary Data Collection-**

B. Interview Method

- Structured
- Semi-structured
- Unstructured

- ✓ Provides in-depth insights
  ✓ Useful in qualitative research

Data collection methods

Structured vs unstructured interviews

Structured interviews	Unstructured interviews
Formal, rigid structure	Relaxed, conversational
May feel impersonal or restrictive	Feels personal, more open interaction
Clear skill assessment, technical roles	Assessing creative personality
Limited, often pre-determined	Flexible, allows for deeper probing

Data collection methods

- **Primary Data Collection-**

C. Observation Method

- Participant observation
- Non-participant observation
- Structured observation checklist

- ✓ Useful in behavioral research
  ✓ Reduces self-report bias

Data collection methods

- **Primary Data Collection-**

D. Focus Group Discussion (FGD)

- 6–10 participants
- Moderated discussion

✓ Good for exploratory research
✓ Generates rich qualitative data

Data collection methods

- **Primary Data Collection-**

E. Experiment Method

- Controlled manipulation of variables

-

  ✓ Used in causal research
  ✓ Common in psychology & marketing

Data collection methods

- **Secondary Data Collection-**

A. Internal Sources

- Company records
- Sales reports
- HR databases
- Case studies

B. External Sources

- Government reports
- Research journals/ Cases
- Industry databases
- Websites
- Census data

Data collection tools / Research Tools

Tools for data collection-

- Questionnaire
- Interview- Structured, semi-structured, unstructured
- Focus group
- Observation- informed, not informed

Analysis tools-

- SPSS
- EXCEL
- Nvivo
- Python

Data collection tools / Research Tools

Kvale's nine types of question and our examples of questions:

1. *Introducing questions*: "Please tell me about your interest in bird watching."; "Have you ever seen a moose?"; "Why did you go to the National Park?".
2. *Follow-up questions*: getting the interviewee to elaborate his/her answer, such as "Could you say some more about that?"; "What do you mean by that ...?"; even "Yeeees?"
3. *Probing questions*: following up what has been said through direct questioning.
4. *Specifying questions*: "What did you do then?"; "How did he react to what you said?"
5. *Direct questions*: "Do you have your opinion on the lethal control of large carnivores in Norway?"; "Are you happy with the way you and your husband were treated while visiting the Park's interpretation centre?" Such questions are perhaps best left until towards the end of the interview, in order not to influence the direction of the interview too much.
6. *Indirect questions*: "What do most people round here think of the ways Park rangers treat local people living in the park?", perhaps followed up by "Is that the way you feel too?", in order to get at the individual's own view.
7. *Structuring questions*: "I would now like to move on to a different topic".

Data, Data types and sources

Data are raw facts, figures, observations, or measurements collected for analysis.

- In business research:
  - Data helps in **decision making**
  - Data reduces uncertainty
  - Data supports hypothesis testing

- Example:
  - Sales numbers
  - Customer satisfaction scores
  - Employee performance ratings

Data, Data types and sources

Data	Information
Raw facts	Processed data
Unorganized	Organized & meaningful
Example: 120, 135, 150	“Sales increased by 15%”

Data types -

Sl. No.	Classification Basis	Data Types
1.	**By Nature**	Quantitative, Qualitative
2.	**By Measurement Level**	Nominal, Ordinal, Interval, Ratio
3.	**By Structure**	Structured, Semi-Structured, Unstructured
4.	**By Source**	Primary, Secondary
5.	**By Format**	Textual, Numerical, Visual, Audio, Multimedia
6.	**By Timeline**	Cross-sectional Data, Longitudinal Data

Data types - Classification

- Classification based on Source
- Classification based on Nature
- Classification based on time
- Classification based on Format
- Classification based on Measurement

Data types - Classification Based on Source

Primary Data

- Data collected first-hand by the researcher.
- Examples: Survey, Interview, Observation, Experiments, Focus group, Census

- Advantages:
  - ✓ Specific to research objective
  - ✓ More reliable

- Disadvantages:
  - ✗ Time consuming
  - ✗ Costly

Data types - Classification Based on Source

Secondary Data

- Data already collected by someone else.
- Sources: Government reports, Census data, Company records, Journals, Websites
- Advantages: Less expensive, Easily available
- Disadvantages: May not match research objective, May be outdated

Data types- Classification based on **Nature**

- Quantitative Data- Non-numerical data describing qualities or characteristics.

- Qualitative Data- Non-numerical data describing qualities or characteristics.

Data types- Classification based on **Nature**

- Quantitative Data-

Data that is numerical in nature and can be measured or counted.

Characteristics:

- Objective and standardized
- Supports statistical analysis
- Enables hypothesis testing

Examples:

- Test scores
- Age, income, weight
- Likert-scale responses

Data types- Classification based on **Nature**

- Qualitative Data- Data that is descriptive and characterizes properties, attributes, or experiences.

Characteristics:

- Subjective and context-rich
- Explored through interpretation
- Captures depth and complexity

Examples:

- Interview transcripts
- Field notes
- Open-ended survey responses
- Photos, videos

Data types- Classification based on time

1. Cross-Sectional Data

- Data collected at one point in time.
- Example: Customer satisfaction survey conducted in January 2026.
- Used for survey, satisfaction, attitude related research.

2. Time-Series Data

- Data collected over a period.
- Example: Monthly sales from 2020–2025.
- Used for Trend analysis, and forecasting.

Data types- Classification based on Format

Textual Data	Numerical Data	Visual Data	Audio Data	Multimedia Data
Words, sentences, or documents	Numbers and measurable values	Images, diagrams, videos, infographics	Voice recordings, music, natural sounds	Combination of text, audio, visuals, and animation
Found in interviews, transcripts, field notes, articles	Found in surveys, experiments, financial records	Found in ethnography, marketing, media studies	Found in interviews, podcasts, speech analysis	Found on websites, social media, e-learning platforms
Used in qualitative analysis	Used in quantitative/ statistical analysis	Used for interpretation & visual content analysis	Used for tone, emotion, speech content	Used for interactive and layered analysis

Data types- Classification based on Measurement

1. Nominal
2. Ordinal
3. Interval
4. Ratio

Data types- Classification based on Measurement

1. Nominal Data

- A nominal scale is the 1st level of measurement scale in which the numbers serve as "**tags**" or "**labels**" to classify or identify the objects.

- A nominal scale usually deals with the **non-numeric variables** or the **numbers that do not have any value**.

Data types- Classification based on Measurement

1. Nominal Data

- Nominal scales classify data into distinct categories without any inherent order, so it doesn't matter which number comes first.
- For example, a nominal scale could classify people by gender (M/F) or place (rural or urban).

Examples: Gender, Religion, Blood group

- Used for Frequency analysis, Percentage etc.

Data types- Classification based on Measurement

1. Nominal Data

For example:

a) What is your gender?

- Male
- Female

b) What is the colour of your

- Black

Data types- Classification based on Measurement

2. Ordinal Data

- Ordinal scale is the 2nd level of measurement that reports the **ranking** and **ordering** of the data **without actually establishing the degree of variation between them.**
- Have a natural order. Rank, order, merit positions.
- Lack a meaningful zero point, and the difference between them can not be quantified.

Data types- Classification based on Measurement

2. Ordinal Data

- Indicates order but not interval between the them.- Likert scale

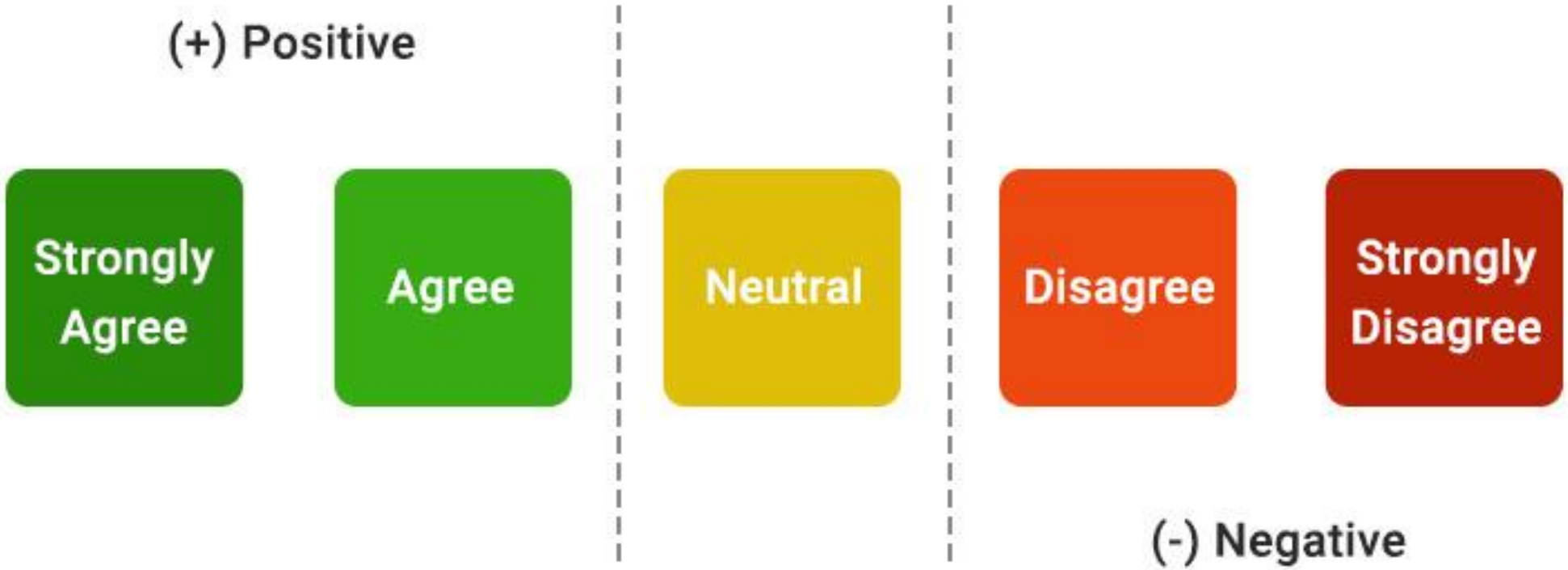
"How satisfied are you with our products?"

- 1- Totally Satisfied
- 2- Satisfied
- 3- Neutral
- 4- Dissatisfied
- 5- Totally Dissatisfied

"How happy are you with the customer service?"

- 1- Very Unhappy
- 2- Unhappy
- 3- Neutral
- 4- Unhappy
- 5- Very Unhappy

Data types- Classification based on Measurement



Data- Categorical Data

Categorical data refers to a type of information that can be stored and identified based on their names or labels. It is a form of qualitative data that can be grouped into categories rather than being measured numerically.

Categorical data often includes values and observations that can be categorized or grouped. Specifically, there are two types of categorical data:

- Nominal Data
- Ordinal Data

Data- Categorical Data

EXAMPLES

Categorical Data

Nominal

Gender

Male, Female,
Non-binary, Other

Favorite Ice Cream Flavor:

Vanilla, Chocolate,
Strawberry, Mint

Ordinal

Customer Satisfaction Levels:

Unsatisfied, Neutral,
Satisfied, Very Satisfied

Economic Status:

Low Income, Middle Income,
High Income

Data types- Classification based on Measurement

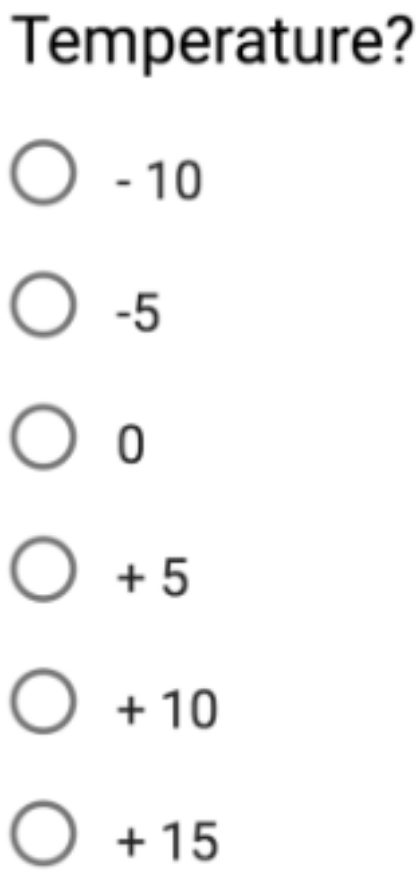
3. Interval Data

- An interval scale is one where there is order and the difference between two values is meaningful.
- Ordered units that have the same difference.
- When we have a variable that contains numeric values that are ordered and where we know the exact differences between the values.

Data types- Classification based on Measurement

3. Interval Data

- The values don’t have a “true zero.”
- Word 'interval' means 'space in between', which is important thing to remember - interval scales not only tell us about order but also about value between each item.



Data types- Classification based on Measurement

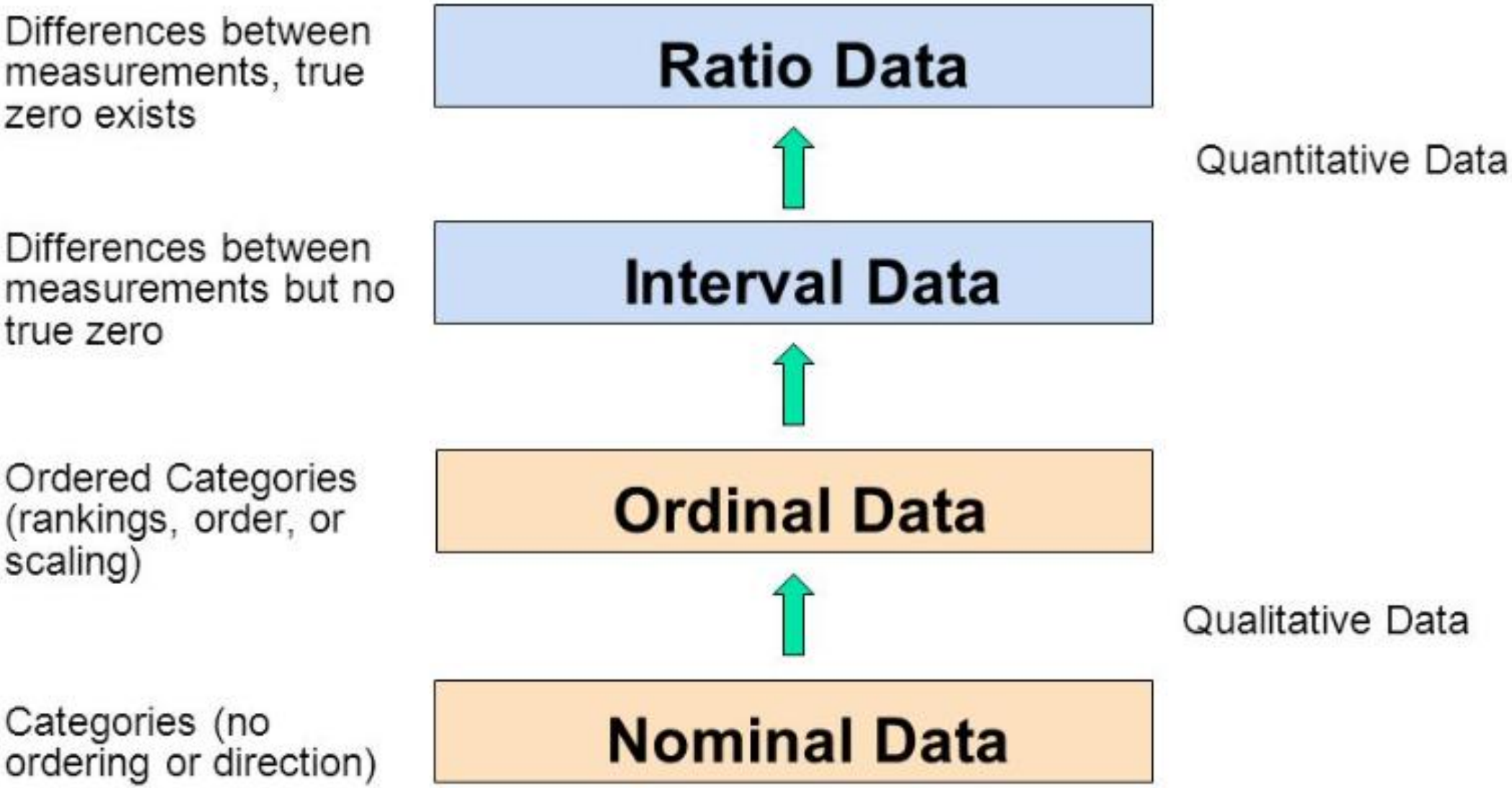
4. Ratio Data

- Ratio data involves ordered units that have the same difference. Ratio values are the same as interval values, except they do have an absolute zero.
- Good examples are height, weight, length, etc.
- Interval Data can take negative values, whereas Ratio data cannot be negative.

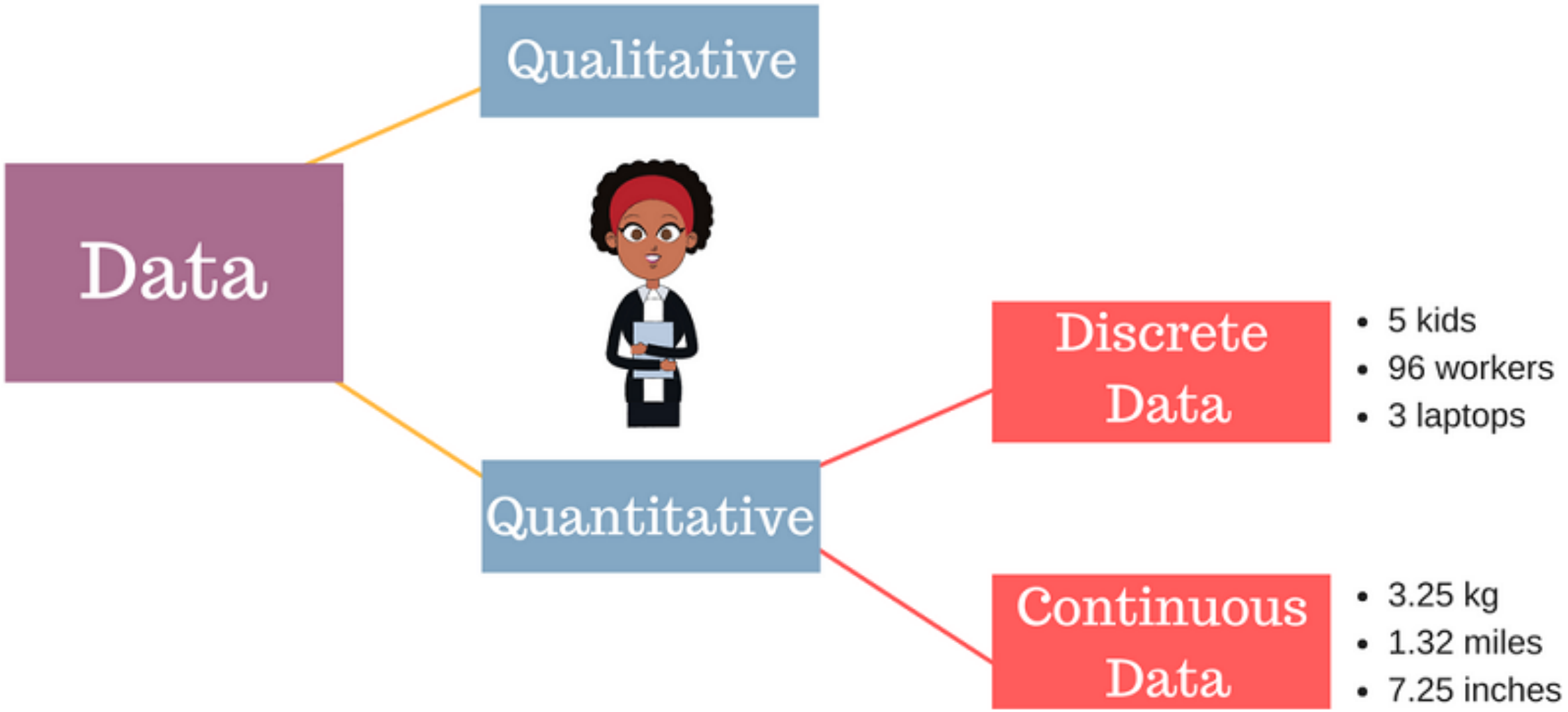
Data types- Classification based on Measurement

Scale Type	Description	Example	Mathematical Operation
Nominal	Categorical, no order	Gender, Religion	Count, Mode
Ordinal	Ranked categories	Satisfaction level	Median, Percentile
Interval	Ordered, equal gaps, no true zero	Temperature (°C)	Mean, Standard Deviation
Ratio	All interval properties + absolute zero	Income, Age, Height	All mathematical operations

Data types- Classification based on Measurement



Data types- Discreate & Continuous



Data Analysis Tools- Quantitative

- Excel- Frequency, Data representation
- SPSS- Factor analysis, Descriptive analysis, Regression
- AMOS, PLS SEM
- Jamovi
- Python, R,
- Tableau, Power BI- For visualization

Data Analysis Tools- Qualitative

Used for thematic analysis, grounded theory, coding, content analysis.

- **Nvivo**
- Coding interviews, focus groups
- Text, audio, video analysis

- **ATLAS.ti -** Thematic mapping and network visualization

- **MAXQDA-** Mixed-method support

THANK YOU!