UNIT-3: SAMPLING AND SCALING METHODS.

3.1 **Sampling Meaning**

In research terms a sample is a group of people, objects, or items that are taken from a larger population for measurement. The sample should be representative of the population to ensure that we can generalize the findings from the research sample to the population as a whole.

Dedifferentiate between Sample survey & Census Survey

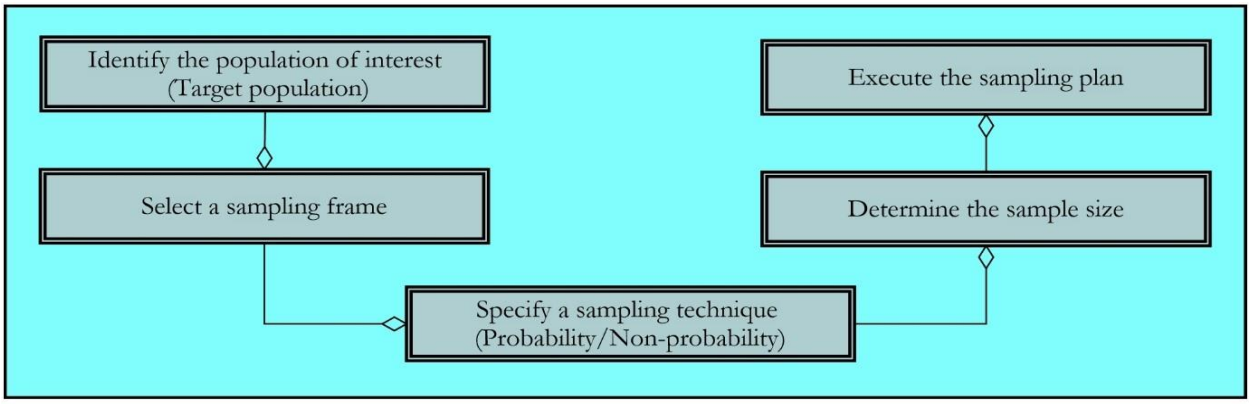
Point of difference	Census survey	Sample survey
1. Meaning	A systematic method that collects and records the data about the every members of the population is called Census.	Sampling refers to a portion of the population selected to represent the entire group, in all its characteristics.
2. Inclusion of sample	Each and every unit of the population.	Only a handful of units of the population.
3. Time required	It is a time consuming process, as it study entire population	It is a fast process, as it study part of population
4. Cost	Expensive method as it study entire population	Economical method, as it study part of population
5. Results/ Accuracy	Reliable and highly accurate , as 100% population participate and share their views.	Less reliable and accurate, due to the margin of error in the data collected.
6. Error	Minimum or no error in terms of result.	Depends on the size of the population.

7. Appropriate for	Population of heterogeneous (Different kind) nature.	Population of homogeneous (Similar kind) nature.

3.2 Process of sampling

Sampling is the process of selecting a small group (sample) from a larger population to represent the entire population for the purpose of research, analysis, or estimation.

Instead of studying the whole population (which may be time-consuming and expensive), sampling allows researchers to draw conclusions based on observations of a smaller, manageable group.



Sampling Process overview

1. Identify the Target population (Population of interest)

Target population refers to the group of individuals or objects to which researchers are interested in generalizing their findings. The target population is the group of individuals or objects, from which the sample might be taken. A well - defined population reduces the probability of including the participants who all are not suitable for the research objective.

1. Elements: members of population who will participate in research. Example housewives, student, product user, etc.

2. A sampling unit is an element, or a unit containing the element, that is available for selection at some stage of the sampling process. Example: house hold. College, Office, where elements are available.

3. Extent: Coverage in respect of geographical area, such as Gujarat state, few city, surat city or few area of surat city.

4. Time: It is A time period within which samples are drawn, example, 1st January 2021 to 31st January 2021

2. Select a sampling frame

It is a list of all sample elements to be studied. While selecting sample units from the population, it is sometimes desirable to choose a list of the population from which the researcher select units. Sampling frame is the group of individuals or objects from which researcher will draw his/her sample. It is the list of all units in a study population from which the sample is taken.

Example, List of aadhar card holder, voter ID detail, in case of student: attendance sheet of a college,

Sampling frame needs to be complete and accurate or else it may result in to error.

A good sampling frame is one where "*every element appears on the list separately, once only once, and nothing else appears on the list*" This type of perfect frame would indicate one-to-one correspondence between frame units and sampling units But such perfect frames are rather rare Accordingly, one has to use frames

with one deficiency or another, but one should ensure that the frame is not too deficient so as to be given up altogether

3. Specify the sampling technique

Sampling can be done through probability (random selection) or non-probability (non-random) technique. Now, if the sampling frame is approximately the same as the target population, random selection may be used to select sample.

On the other hand, if the sampling frame does not really represent the target population, the researcher may choose non-random selection which can give at least an idea about the population in his nearby area.

4.Determine the sample size

Sample size is a research term used for defining the number of individuals included in a research study to represent a population. The sample size references the total number of respondents included in a study.

Sample size can be determined on the basis of

1. Subjective method (Less sophisticated)

-Rule of thumb approach, which means 5% of total population.

-Conventional approach, which means average sample size of similar other studies.

2. Cost basis approach: The numbers of respondent which can be studies with available fund.

3.Statstical approach (More sophisticated)

Before you can calculate a sample size, you need to determine a few things about the target population and the level of accuracy you need

Population size. How many people are you talking about in total? …

Margin of error (confidence interval) …

Confidence level.

Standard deviation.

5. Specify sampling plan

This means that one should indicate how decisions made so far are to be implemented. For example, if a survey of households is to be conducted, a sampling plan should define a household, contain instructions to the interviewer as to how he should take a systematic sample of households, advise him on what he should do when no one is available on his visit to the household, and so on. These are some pertinent issues in a sampling survey to which a sampling plan should provide answers.

6. Select the sample

This is the final step in the sampling process. A good deal of office and fieldwork is involved in the actual selection of the sampling elements. Most of the problems in this stage are faced by the interviewer while contacting the sample-respondents.

3.3 Probabilistic & Non Probabilistic Sampling methods

3.3.1 Probability Sampling Methods

These methods ensure every member of the population has a known and equal chance of being selected. It minimizes bias and enables statistical generalization.

1. Simple Random Sampling

- Every individual in the population has an **equal and independent chance of selection**.
- **Technique:** Lottery method, random number tables, or computer-generated random numbers.
- **Example:** Picking 100 students randomly from a list of 1000 students.
- **Advantage:** Easy to understand and eliminates selection bias.
- **Limitation:** Requires a complete list of the population; can be time-consuming.

2. Systematic Sampling

- Selects the **first unit randomly**, then selects every *kth* element (e.g., every 5th or 10th) from an ordered list.
- **Formula:** k = Population size / Sample size
- **Example:** In a population of 1000, to select 100 samples, pick every 10th person.
- **Advantage:** Simple and quick.
- **Limitation:** If there is a hidden pattern in the list, it may bias the results.

3. Stratified Sampling

- The population is **divided into subgroups (strata)** based on certain characteristics (like gender, age, income), and then random samples are drawn from each stratum.
- **Example:** Dividing students into male/female and selecting proportional samples from both.
- **Advantage:** Ensures representation of all key subgroups.
- **Limitation:** Requires clear knowledge of population characteristics.

4. Cluster Sampling

- The population is divided into **clusters/groups**, usually based on geography or institutions. A random selection of clusters is made, and then **all or random individuals within these clusters** are surveyed.
- **Example:** Selecting 5 colleges randomly and surveying all students in those colleges.

- **Advantage:** Cost-effective for large and dispersed populations.
- **Limitation:** Results may be less precise if clusters are not homogeneous.

5. Multi-Stage Sampling / Area sampling

- A **combination of several sampling methods**, used when dealing with large populations.
- **Example:**
  - Stage 1: Randomly select cities
  - Stage 2: Randomly select schools in those cities
  - Stage 3: Randomly select students in selected schools.
- **Advantage:** Useful for large-scale surveys, saves cost and time.
- **Limitation:** Complex to design and analyze.

3.3.2 Non-Probability Sampling Methods

These methods **do not give every member an equal chance of selection**. They are quicker, easier, but prone to bias.

1. Convenience Sampling

- Selection based on **ease of access and availability**.
- **Example:** Surveying students present in the canteen.
- **Advantage:** Quick and cost-effective.
- **Limitation:** High potential for bias, not representative.

2. Judgmental (Purposive) Sampling

- The researcher **intentionally selects participants** who are best suited for the study purpose.
- **Example:** Selecting only subject experts for a specialized study.
- **Advantage:** Useful for focused, qualitative research.
- **Limitation:** Subjective selection can introduce bias.

3. Quota Sampling

- The population is divided into subgroups, and **quotas are set for each subgroup**.
- **Example:** Ensuring the sample has 50% males and 50% females.
- **Advantage:** Ensures representation of certain traits.
- **Limitation:** Selection within quotas is non-random, leading to bias.

4. Snowball Sampling

- Existing participants **refer or recruit others** who fit the criteria.
- **Example:** Studying drug users or rare disease patients where direct access is difficult.
- **Advantage:** Effective for reaching hidden or hard-to-reach populations.
- **Limitation:** Non-representative, as it depends on social networks.

3.4 Meaning of scale & Attitude scale

Meaning of Scaling

Scaling in research refers to the process of assigning numbers or symbols to respondents' attitudes, opinions, behaviors, or characteristics according to a defined set of rules. It helps in quantifying abstract concepts like satisfaction, preferences, perception, or agreement levels, which are otherwise difficult to measure directly.

Purpose of Scaling

- To measure qualitative data like feelings, attitudes, opinions in a quantitative form.
- To compare responses across individuals or groups.
- To facilitate statistical analysis and interpretation of survey results.

Meaning of Attitude Scale

An Attitude Scale is a research tool or instrument used to measure and quantify people's attitudes, opinions, or feelings towards a particular object, topic, person, or event.

It helps convert subjective attitudes into measurable data, usually through a series of statements or questions where respondents indicate their level of agreement, preference, or feeling.

3.5 Types of Primary scale

1. Nominal Scale (Naming or Labeling Scale)

Meaning:

- A nominal scale is the **simplest level of measurement** that is used for **labeling or categorizing data without any order or ranking**.
- It identifies **different categories or groups**, but the numbers or names assigned have **no quantitative meaning**.

Examples:

- **Gender:** Male, Female, Other
- **Marital Status:** Single, Married, Divorced, Widowed
- **Blood Group:** A, B, AB, O

- **Religion:** Hindu, Muslim, Christian, Sikh
- **Customer ID Numbers:** 101, 102, 103 (numbers serve only as identifiers)

2. Ordinal Scale (Order or Ranking Scale)

Meaning:

- The ordinal scale **arranges data in an order or rank**, but the **differences between rankings are not specified or equal**.
- It indicates **relative position** but not the **magnitude of difference**.

Examples:

- **Education Level:** High School < Bachelor's < Master's < Doctorate
- **Customer Satisfaction:** Very Dissatisfied < Dissatisfied < Neutral < Satisfied < Very Satisfied
- **Socio-economic Class:** Lower Class < Middle Class < Upper Class
- **Competition Rank:** 1st, 2nd, 3rd place
- **Movie Rating:** 1 Star to 5 Stars

3. Interval Scale

Meaning:

- The interval scale shows both **order and equal intervals** between units, but it **lacks a true zero point**.
- Therefore, **ratios are not meaningful** (e.g., 30°C is not "twice as hot" as 15°C).

Examples:

- **Temperature:** Measured in Celsius or Fahrenheit (0°C does not mean 'no temperature').
- **IQ Scores:** 90, 100, 110 (difference between scores is meaningful).
- **Calendar Years:** 2000, 2020 (interval between years is meaningful, but no true zero year).
- **Time of Day:** 3 PM, 6 PM (intervals are equal but no true zero point).

4. Ratio Scale

Meaning:

- The ratio scale has all the properties of an interval scale **plus a true zero point**, allowing for **all types of mathematical operations**, including ratios.

Examples:

- **Weight:** 0 kg, 50 kg, 100 kg
- **Height:** 0 cm, 150 cm, 180 cm
- **Income:** ₹0, ₹50,000, ₹100,000
- **Age:** 0 years, 25 years, 50 years
- **Distance:** 0 km, 5 km, 10 km

Scale	Order	Equal Intervals	True Zero	Examples
Nominal	✗	✗	✗	Gender, Religion, Blood Group
Ordinal	✓	✗	✗	Satisfaction Level, Class Rank
Interval	✓	✓	✗	Temperature, IQ Scores, Calendar Years

Scale	Order	Equal Intervals	True Zero	Examples
Ratio	✓	✓	✓	Weight, Height, Income, Age

3.6 explain various comparative and non comparative scale attitude scale.

Comparative Scales (Relative Measures)

In Comparative Scales, respondents are asked to compare two or more objects and express a preference or ranking between them. Responses are relative rather than absolute.

1. Paired Comparison Scale

- **Definition:** The respondent is presented with **two items at a time** and asked to choose the preferred one based on a specific criterion (e.g., quality, price, design).
- **Example:**

"Which brand do you prefer for smart phones?"

- Option 1: Apple
- Option 2: Samsung

Answer: Apple

- **Advantage:**
  - Simple to understand and answer.
  - Suitable for **brand or product comparisons**.
- **Limitation:**
  - Becomes complex when the number of items increases.
  - Time-consuming if many pairs are compared.

2. Rank Order Scale

- **Definition:** Respondents are asked to **rank multiple items** in order of preference or importance.
- **Example:**

Rank the following soft drink brands:

1. Coca-Cola
2. Pepsi
3. Sprite
4. Fanta

- **Advantage:**
    - Easy to administer when options are limited.
    - Helps in understanding **preference order**.
- **Limitation:**
    - Does not indicate the **magnitude of difference** between ranks.
    - Difficult if too many items need to be ranked.

3. Constant Sum Scale

- **Definition:** Respondents are given a **fixed number of points (e.g., 100)** to allocate across different attributes or items, indicating their relative importance.
- **Example:**

Distribute 100 points across these features of a mobile phone:

- Price: 30
- Battery life: 40
- Camera quality: 20
- Design: 10
- **Advantage:**

- Provides **quantitative data** about preferences.
- Captures the **importance weight** of each item.

- **Limitation:**
  - Requires effort from respondents to allocate points accurately.
  - May be confusing for some respondents.

4. Q-Sort Scaling

- **Definition:** Respondents are asked to **sort a set of statements, brands, or items into categories** based on their perceptions or preferences.
- **Example:**

  Sorting 10 advertising slogans into three piles:
- Most Effective
- Neutral
- Least Effective
- **Advantage:**
  - Useful in **psychological and social research**.
  - Provides insight into **subjective perceptions**.
- **Limitation:**
  - Time-consuming with many items.
  - Requires clear instructions.

<u>Non-Comparative Scales (Absolute Measures)</u>

In **Non-Comparative Scales**, respondents **evaluate each object or statement independently**, without comparing it to others.

1. Continuous Rating Scale (Graphic Rating Scale)

- **Definition:** Respondents **mark a point on a continuous line** between two extreme attributes to indicate their attitude.
- **Example:**

Rate your satisfaction:

| Very Unsatisfied ---------- Very Satisfied |

- **Advantage:**
  - Allows for **fine-grained responses**.
  - Visually appealing and easy for some respondents.
- **Limitation:**
  - Scoring can be subjective based on where the mark is placed.
  - Requires measurement tools to convert into data.

2. Itemized Rating Scales

This includes several structured scales:

a) Likert Scale

- **Definition:** Measures the **degree of agreement or disagreement** with a series of statements.
- **Example:**

"Online learning is effective."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- **Advantage:**

- Simple to construct and administer.
- Easy for respondents to understand.

- **Limitation:**
  - May lead to **central tendency bias** (choosing neutral).
  - Interval between points is assumed but may not be equal.

b) Semantic Differential Scale

- **Definition:** Measures attitudes using a scale with **bipolar adjectives** (opposites) on either end.
- **Example:**

  Rate the brand on:
- Expensive —— Cheap
- Innovative —— Traditional
- Reliable —— Unreliable
- **Advantage:**
  - Captures the **connotative meaning of concepts**.
  - Visually clear and structured.
- **Limitation:**
  - Requires carefully chosen bipolar adjectives.
  - Misinterpretation of terms can occur.

c) Stapel Scale

- **Definition:** A **unipolar rating scale** with a single adjective in the middle and numerical values ranging from **+5 to -5**, without a neutral point.
- **Example:**

Cleanliness of the hotel:

+5, +4, +3, +2, +1, 0, -1, -2, -3, -4, -5

- **Advantage:**
    - No need for bipolar adjectives.
    - Efficient for rating attributes.
- **Limitation:**
    - Less commonly used.
    - Some respondents may find the scale confusing.

Summary of Comparative & Non-Comparative Scales

Basis	Comparative Scale	Non-Comparative Scale
Meaning	Respondents **compare two or more items** directly.	Respondents **evaluate items independently**, without comparison.
Nature of Data	**Relative** preferences between options.	**Absolute** attitude or opinion on each item.
Examples	- Paired Comparison Scale - Rank Order Scale - Constant Sum Scale - Q-Sort Scale	- Continuous Rating Scale - Likert Scale - Semantic Differential Scale - Stapel Scale
Data Output	Shows **preference order or weight** among options.	Provides **individual ratings or levels of agreement**.
Suitability	Useful for **preference ranking and comparative analysis**.	Useful for **measuring attitude strength or intensity**.
Complexity	May be **tedious with many options** to compare.	Generally **simpler to administer**.

Basis	Comparative Scale	Non-Comparative Scale
Quantitative Analysis	Provides **relative ranking data**.	Provides **scale/score data for statistical analysis**.