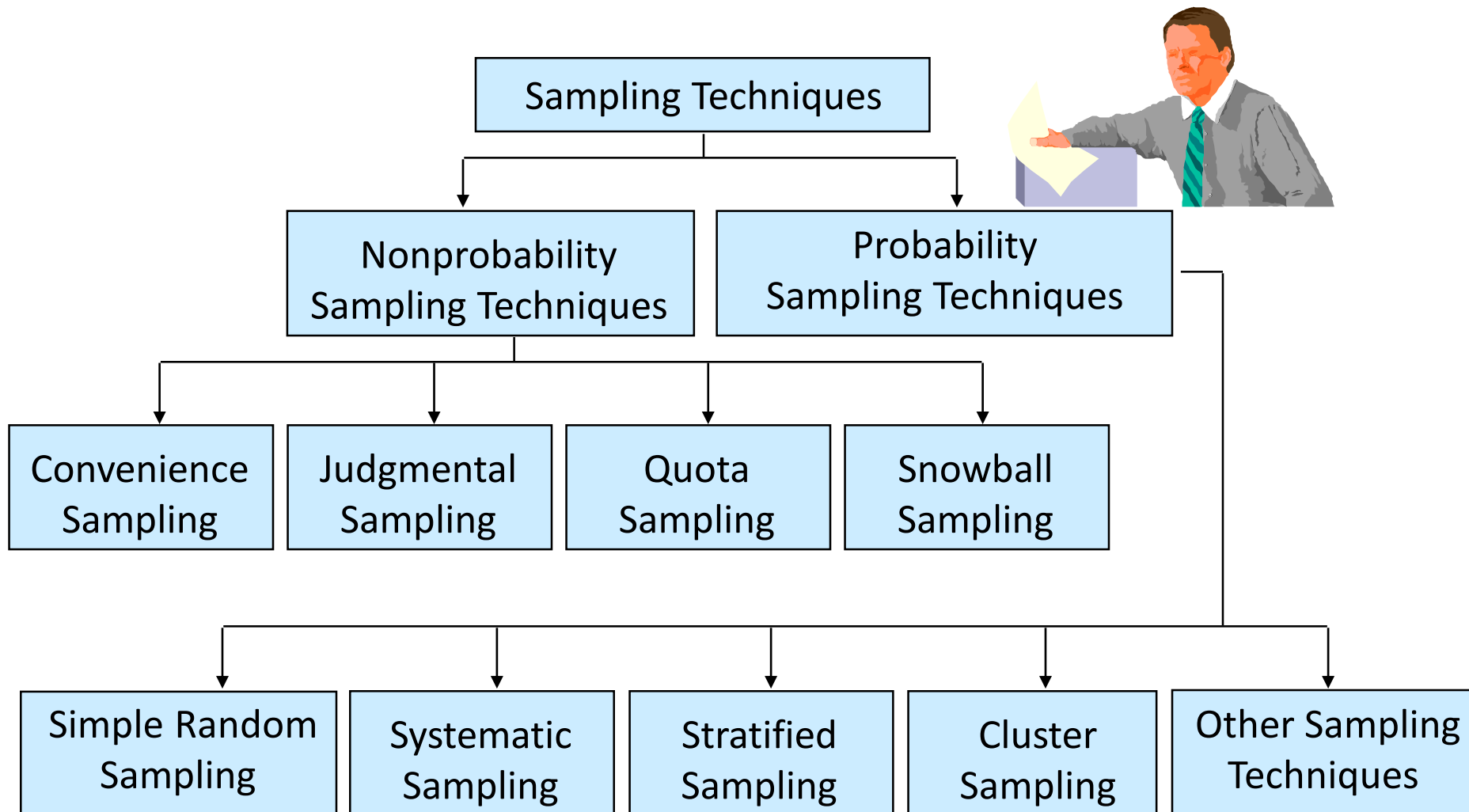# Types of Probability Sampling

# Classification of Sampling Techniques

# Probability versus Nonprobability Sampling

- Probability Sampling
  - A sampling technique in which every member of the population has a known, nonzero probability of selection.

- Nonprobability Sampling
  - A sampling technique in which units of the sample are selected on the basis of personal judgment or convenience.
  - The probability of any particular member of the population being chosen is unknown.

# Probability Sampling Designs

- *Simple random sampling*

- *Systematic sampling*

- *Stratified sampling*

  – Proportionate

  – Disproportionate

- *Cluster sampling*

# 1. Simple Random Sampling

- Each element in the population has a known and equal probability of selection.

- Each possible sample of a given size (n) has a known and equal probability of being the sample actually selected.

- This implies that every element is selected independently of every other element.

- e.g. Lottery

# 2. Systematic Sampling

- The sample is chosen by selecting a random starting point and then picking every $i^{th}$ element in succession from the sampling frame.

- The sampling interval, **i,** is determined by dividing the population size N by the sample size n and rounding to the nearest integer.

For example, there are 100,000 elements in the population and a sample of 1,000 is desired.  In this case the sampling interval, i, is 100.  A random number between 1 and 100 is selected.  If, for example, this number is 23, the sample consists of elements 23, 123, 223, 323, 423, 523, and so on.

**If the ordering of the elements produces a cyclical pattern, systematic sampling may decrease the representativeness of the sample.**

# 3. Stratified Sampling

- A two-step process in which the population is partitioned into subpopulations, or strata.

- The strata should be mutually exclusive and collectively exhaustive in that every population element should be assigned to one and only one stratum and no population elements should be omitted.

- Next, elements are selected from each stratum by a random procedure.

- The elements within a stratum should be as homogeneous as possible, but the elements in different strata should be as heterogeneous as possible.

- The stratification variables should also be closely related to the characteristic of interest.

- In **proportionate stratified sampling**, the size of the sample drawn from each stratum is proportionate to the relative size of that stratum in the total population.

- In disproportionate stratified sampling, the size of the sample from each stratum is not related to the size of the specific stratum.

# 4. Cluster Sampling

- The target population is first divided into mutually exclusive and collectively exhaustive subpopulations, or clusters.

- Then a random sample of clusters is selected, based on a probability sampling technique such as SRS (simple random sampling).

- For each selected cluster, either all the elements are included in the sample (one-stage) or a sample of elements is drawn probabilistically (two-stage).

- **Elements within a cluster should be as heterogeneous as possible, but clusters themselves should be as homogeneous as possible.**

# Selecting a Sampling Design

*When to use stratified sampling*

- **If primary research objective is to compare groups**
- **Using stratified sampling may reduce sampling errors**

*When to use cluster sampling*

- **If there are substantial fixed costs associated with each data collection location**
- **When there is a list of clusters but not of individual population members**