

# Sampling Techniques and Research Tools

## Unit 4 Contents

	<b>Page</b>
<b>Unit introduction</b>	<b>1</b>
<b>Unit learning outcomes</b>	<b>1</b>
<b>What is sampling?</b>	<b>2</b>
<b>Sample and sample size</b>	<b>3</b>
<b>Types of sampling</b>	<b>3</b>
Probability sampling	4
Non-probability sampling	4
<b>Advantages of sampling</b>	<b>4</b>
<b>Methods of sampling</b>	<b>6</b>
Probability sampling methods	6
Non-probability sampling methods	10
<b>Selection of appropriate method of sampling</b>	<b>11</b>
<b>How to determine sample size</b>	<b>12</b>
<b>Research tools</b>	<b>16</b>
<b>Pre-requisites for field research</b>	<b>16</b>
Planning	16
Execution	19
<b>Types of research tools</b>	<b>22</b>
<b>Validity and consistency</b>	<b>28</b>
<b>Efficiency and reliability</b>	<b>28</b>
<b>Measurement</b>	<b>29</b>
<b>Data collection process</b>	<b>29</b>
<b>Unit summary</b>	<b>32</b>
<b>Answers to self-help questions</b>	<b>33</b>

# New HRD Module on Action Research

## Unit 4: Sampling Techniques and Research Tools

### Unit introduction

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In this unit, you will learn about various methods of sampling, difference between probability and non-probability sampling, advantages of sampling methods, selection of sample with the help of practical examples. You will also learn how to collect data -- primary and secondary techniques, their sources and methods of accuracy.

Before beginning an action research project, it is necessary to make a plan. Unit 4 examines the series of steps mainly planning and execution. Various types of research tools required for the planning are also discussed.

### Unit learning outcomes

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When you have worked through this unit you should be able to:

- distinguish various sampling procedures
- select an appropriate sample from the population

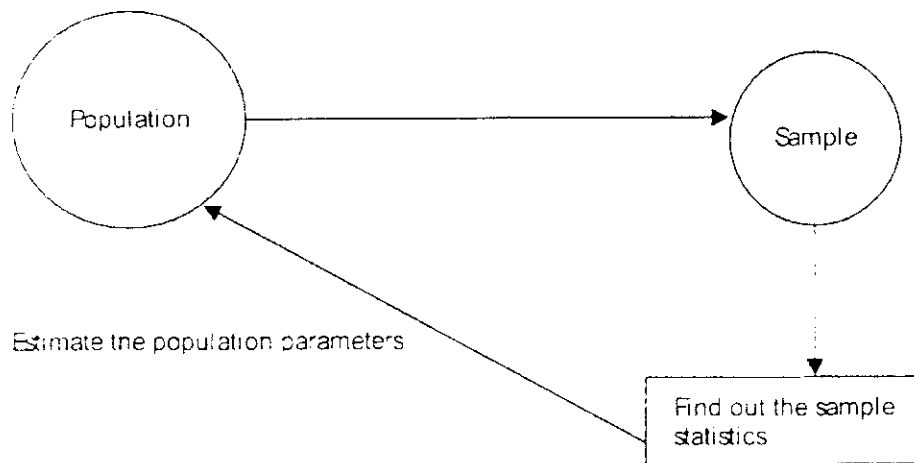
- distinguish between probability and non-probability sampling methods
- apply various research tools required for planning.

## What is sampling?

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A sample is a miniature picture of the entire group or aggregate from which it has been taken. A sample, in other words, is a smaller part of a large group. The entire group from which the sample has been taken is known as population. Sampling is the process of selecting a few from a bigger group to become the basis for estimating or predicting a fact, situation or outcome regarding the bigger group. A sample is a sub-group of the population you are interested in. Before giving the notion of sampling we will first define population. In a statistical investigation the interest usually lies in the assessment of the general magnitude and the study of variation with respect to one or more characteristics relating to individuals belonging to a group. This group of individuals under study is called a population or universe. The population may be finite or infinite. By a finite population, we shall mean a population which contains a finite number of members e.g. population of 500 boys in a college. By an infinite population we shall mean a population containing infinite members e.g. emission of alpha particles in a chemical process, or population of pressures at various points of the atmosphere. It is obvious that for any statistical investigation complete enumeration of the population is rather impracticable. For example: if we want to have an idea of the average

per capita (monthly) income of the people in U.K., we will have to enumerate all the earning individuals in the country, which is rather a very difficult task.



Concept of sampling

Fig. 4.1

## Sample and sample size

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A finite subset of statistical individuals in a population is called a sample and the number of individuals in a sample is called the sample size.

## Types of sampling

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The various methods of sampling or different sampling designs can be grouped under two broad heads—probability and non-probability sampling methods.

## Probability sampling

If for each individual, there is a definite preassigned probability of being selected, the sampling is said to be probabilistic. Probabilistic sampling is also called random sampling. For example: if you have a pack of 52 cards then the probability of drawing any one of the card is  $1/52$  or probability of drawing an ace is  $4/52$  i.e.  $1/13$ .

## Non-probability sampling

In non-probability sampling, there is a fixed sampling rule but there is no probability attached to the mode of selection e.g. selecting every 10<sup>th</sup> individual from the list, starting with the first, or selecting every 10<sup>th</sup> line in a potato-field. If, however, the selection of the first individual is made in such a manner that each of the first 10 gets an equal chance of being selected, it becomes a case of mixed sampling—partly probabilistic and partly non-probabilistic.

If in particular, each individual of the population has an equal chance of being selected, then sampling is called unrestricted random sampling or simple random sampling.

## Advantages of sampling

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There is considerable saving in time, money and labour since only a part of the population has to be examined. In most of the cases our resources are limited in terms of money, labour and time within which the results of the survey should be obtained, it

is usually imperative to resort to sampling rather than complete enumeration. Moreover, the results of a sample survey are usually much more reliable than those obtained from a complete enumeration due to the following:

- (i) It is always possible to determine the extent of the sampling error.
- (ii) The non-sampling errors due to number of factors such as training of field workers, measuring and recording observation, location of units, biases to interviewers etc. are likely to be of a serious nature in complete enumeration than in a sample survey.
- (iii) If the population is too large, as For example: trees in a jungle, we are left with no way but to resort to sampling.
- (iv) If the testing is destructive e.g. testing of life of an electric tube or bulb etc. complete enumeration is impracticable and sampling technique is the only method to be used in such cases.
- (v) If the population is hypothetical, as For example: in coin-tossing problem where process may continue indefinitely (any number of times) sampling method is the only method of estimating the parameters of the universe.

Thus, the advantages of sampling techniques over complete enumeration can be sum up in four words: adaptability, speed, economy and scientific approach.

# Methods of sampling

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## A. Probability sampling methods

### (I) Simple random sampling (SRS)

The simplest and most commonly used type of probability sampling is simple random sampling. In this sampling, each member of the population has the same probability of being included in the sample. SRS may be with or without replacement. Simple random sampling is said to be with or without replacement according as any individual once selected is returned to the population or not before the next drawing is made.

In order to draw a random sample using SRS one may adopt either the lottery method or consult random number table.

**Lottery method:** Under this method, all items of the universe are numbered or named on separate slips of paper of identical size or shape. These slips are then folded and mixed up in a container. A blind fold selection is then made of the number of slips required to constitute the desired size of sample. For instance, if we have a list of 100 names and we want to take a sample of 10 persons out of a population of 100, we mix the list of names (each name on separate slip) thoroughly and then make a blind fold selection of 10 slips. These 10 slips constitute a sample of size 10.

**Random number method:** The lottery method becomes quite cumbersome to use as the size the

population increases. An alternative method of random selection is that of using the random number table.

The random numbers are generally obtained by some mechanism which when repeated a large number of times, ensures approximately equal frequencies for the numbers from 1 to 9.

Trippett's (1927) table of random numbers is most popularly used in practice. We give below the first forty sets from Trippett's table as an illustration of the general appearance of random numbers.

2952	6647	3992	9792	7969	5911	3170	5624
4167	9524	1545	1396	7203	5356	1300	2693
2370	7483	3408	2762	3563	1089	6913	7691
0560	5246	1112	6107	6008	8125	4233	8776
2754	9143	1405	9025	7002	6111	8816	6446

If the size of the population is less than 100, the table is used as follows: suppose ten numbers from 0 to 80 are required. We start anywhere in table and can read horizontally, vertically, diagonally or in any methodical way. For example: if we start horizontally we obtain 29, 52, 66, 41, 39, 92, 97, 92, 79, 69, 59, 11, 31, 70, 56, 24, 41, 67 and so on. Ignoring the numbers greater than 80, we obtain for over purpose ten random numbers, namely, 29, 52, 66, 41, 39, 79, 69, 59, 11 and 31.

**Remark:** Other random numbers tables e.g. Fisher and Yates (1938), Kendall and Smith (1939), C. R. Rao, Mitra and Smith (1966), are also available in literature for use.



## **(ii) Stratified random sampling**

In this method, before drawing the random sample, one divides the population, say  $P$ , into several strata or sub-populations, say  $P_1, P_2, \dots, P_k$ , which are relatively homogeneous within themselves and the means of which are as widely different as possible. The sample, say  $p$ , is composed of  $k$  partial samples, say  $p_1, p_2, \dots, p_k$ , drawn at random from the corresponding stratas, generally without replacement.

Stratified random sampling has number of merits relative to simple random sampling.

- (a) In many situations stratified sampling will be administratively more convenient e.g. in taking a sample of villages from a particular state, we may take the districts as strata.
- (b) Stratified sampling will be more representative in the sense that here we can ensure that some individuals from each of the sub-population (strata) will be included in the sample.
- (c) Stratified sampling, moreover, has the merit of supplying not only an estimate for the population as a whole, but also separate estimates for individual stratas.

## **(iii) Multistage sampling**

In multistage sampling, the material to be sampled is regarded as composed of a number of first-stage (or primary) sampling units, each of which is made up of a

number of second-stage (or secondary) sampling units, each of which, in its turn, is made up of a number of third-stage (or tertiary) units, and so on, until we reach the ultimate sampling units in which we are interested. The sampling is also carried out in stages. At the first-stage, the first-stage sampling units are sampled by some suitable random method. At the second-stage, a sample of second-stage units is selected from each of the selected first-stage units, again by some suitable random method. Further, stages may be added, if necessary, to get a sample of the ultimate sampling units. For example: to get a sample of crop-fields growing rice in a particular state, one may first get a sample of districts, then a sample of villages from each selected district and finally a sample of crop-fields from each selected village.

#### **(iv) Systematic sampling**

A frequently used method of sampling when a complete list of the sampling units is available is systematic sampling. Suppose the  $N$  units of population are numbered from 1 to  $N$  and a sample of size  $n$  is to be selected such that  $n/N=1/k$ , (i.e.  $k= N/n$ ),  $k$  being an integer. Systematic sampling then consists in selecting at random a unit from the first  $k$  units and also selecting every subsequent  $k^{\text{th}}$  unit. This is a case of mixed sampling, which is partly probabilistic and partly non-probabilistic. This is probabilistic since the first number of the sample is selected at random (with equal probabilities) from the first  $k$  units and non-probabilistic since the other members in the sample are fixed by the choice of the first member.

The apparent advantages of this method over simple random sampling are the following:

- (a) It is much easier and quicker to draw a systematic sample and the work may be done by the laymen.
- (b) Intuitively, systematic sampling seems likely to give more precise estimates than simple random sampling. For example: the method of systematic sampling stratifies the population into  $n$  strata of  $k$  units each and one unit is selected from each stratum.

### **(v) Cluster sampling**

In this case the total population is divided, depending on problem under study, into some recognizable subdivisions which are termed as clusters and a simple random sample from these clusters is drawn. We then observe, measure and interview each and every unit in the selected clusters. For example: if we are interested in obtaining the income or the opinion data in a city, the whole city may be divided into  $N$  different blocks or localities (which determine the cluster) and a simple random sample of  $n$  blocks is drawn. The individual in the selected blocks determine the cluster sample.

## **B. Non-probability sampling methods**

### **(i) Judgment sampling or purposive sampling**

In this sample, the investigator exercises his judgment in the choice and includes those items in the sample which he thinks are most typical of the universe with

regard to the characteristic under investigation. For example: if a sample of 10 students is to be selected from a class of 60 for analysing the spending habits of students, the investigator would select 10 students who, in his opinion, are representative of the class.

### **(ii) Quota sampling**

This consists in specifying quotas of the samples to be drawn from different strata and then drawing the required samples from those strata by judgment sampling. Within the quotas, the selection of the sample items depends on personal judgment.

### **(iii) Accidental sampling**

In this method, you take the cases as and when you come across. For example: you may desire to study the behaviour of thieves. You may not be having a list of thieves present in your city. But as and when you come across a thief you can include this into the sample. You go on with the process until your sample reaches the designated size.

## **Selection of appropriate method of sampling**

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Having discussed the various methods of sampling the question now arises as to which method to adopt in a particular situation. It should be noted that one method cannot be regarded as best under all circumstances. A number of factors such as nature of problem, size of population, size of sample, time, money and labour etc. would influence the selection of a particular method of sampling.

Probability sampling methods have advantages over non-probability methods in the sense that

- (a) These are considered more reliable and accurate than non-probability samples.
- (b) They can be controlled in terms of sampling and non-sampling errors and moreover their errors can be estimated and reduced by choosing appropriate sampling design.

Appropriate sampling method generally requires the services of experts. Moreover, cost, earning labour factors also needs proper attention. The objectives of the study need careful attention in the selection of appropriate sampling design under different situation.

Thus a sample surely must be carefully planned and executed other-wise the results obtained may be inaccurate and misleading.

## **How to determine sample size**

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An important decision that has to be taken while adopting a sampling technique is about the size of the sample. Different opinions have been expressed by experts on this point. For example: some have suggested that the sample size should be 5% of the size of the population while others are of the opinion that sample size should be at least 10%. However, these views are of little use as in practice and appropriate sample size depends on various factors relating to the subject under investigation like the time

aspect, the cost aspect, the degree of accuracy desired etc. Sampling theory is of little help in arriving at a good estimate of the sample size in any particular situation. However, the following two consideration must be kept in mind in determining the appropriate size of the sample.

1. The size of the sample should increase as the variation in the individual items increase.
2. The greater the degree of accuracy desired, the large should be sample size.
3. Most of the time, information from previous studies can also be used as basis in determining the size of the sample.



### ***Self-help question 4.1***

Which one of the following statements are True or False. Tick mark in the appropriate box.

	T	F
1. Sample size is always random.	<input type="checkbox"/>	<input type="checkbox"/>
2. Smaller sample size leads to better results.	<input type="checkbox"/>	<input type="checkbox"/>
3. Smaller sampling error results into better estimate.	<input type="checkbox"/>	<input type="checkbox"/>
4. Non-sampling errors are due to factors such as, training of field workers, biases to interviews etc.	<input type="checkbox"/>	<input type="checkbox"/>
5. Complete enumeration is always preferred over sampling method.	<input type="checkbox"/>	<input type="checkbox"/>
6. Pre-testing of questionnaire is not required before sampling.	<input type="checkbox"/>	<input type="checkbox"/>
7. Probability sampling methods are more efficient than non-probability sampling.	<input type="checkbox"/>	<input type="checkbox"/>
8. Random number method and lottery method selects the different sampling units.	<input type="checkbox"/>	<input type="checkbox"/>
9. Judgment sampling, quota sampling and accidental sampling selects the same sampling units.	<input type="checkbox"/>	<input type="checkbox"/>
10. Systematic sampling is partly probabilistic and partly non-probabilistic.	<input type="checkbox"/>	<input type="checkbox"/>

*Compare your answers with those provided at the end of the unit.*



## Activity 4.1

1. Compare the relative advantages and disadvantages of the method of complete enumeration and the method of random sample survey. Explain with reasons the method you will adopt in enquiries relating to:
  - a. Survey of the rural area facilities
  - b. Development of youth programme in a community
2. If a sample is obtained by selecting every 10<sup>th</sup> item, what possible bias could result? Give examples. Why is this not a random sample?
3. How would you conduct a survey? What special points should be kept in mind in the:
  - a. Selection of a sample
  - b. Collection of data



# Research Tools

Statistical tools are indispensable in research work. Most of the advancements have taken place because of experiments conducted with the help of statistical tools. For example: experiments about crop yields and different varieties of fertilizers and different types of soils or the growth of animals under different diets or future predictions about environment are frequently designed and analysed with the help of research tools.

How to collect numerical data about the field of enquiry is explained in detail in the next unit and the main tools of research i.e. questionnaire, interview and case-studies are discussed in detail in this unit.

## Pre-requisites for field research

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There may be two main approaches in field research.

- (A) Planning
- (B) Execution

### (A) Planning

Proper planning is of paramount importance because the quality of survey results depends considerably on the preparation made before the survey is conducted. The following points must be kept in mind.

#### (i) Purpose

The objective should be clearly set out at the very beginning. This will invariably indicate the type of

information which is needed and the use to which the information obtained will be put. For example: if the object of an enquiry is to study the nature of price changes over a period of time, it would be necessary to collect data on commodity prices and it must be decided whether it would be helpful to study wholesale or retail prices and the possible uses of such information.

### **(ii) Scope**

The scope of the enquiry must be clearly understood by the investigator. For example: an enquiry relating to industrial relations may be undertaken with the help of data relating to trade union membership, industrial disputes, wages of workers etc. The factors exerts great influence on scope, namely, the object of inquiry, availability of time and availability of resources.

### **(iii) The unit of data collection**

Before organizing the task of collecting data, the statistical unit or units must be clearly defined for purpose of the investigation. The unit in terms of which the investigator counts or measures the variables or attributes selected for enumeration, analysis and interpretation is known as a "unit". For example: in a population census the statistical "unit" is a person. Similarly, if the number of houses in a particular area is counted then "unit" is house.

### **(iv) Sources of data**

After the purpose and scope have been defined, the next step is to decide about the sources of data. The

sources of information may be either primary or secondary. These were discussed in previous unit.

### **(v) Techniques of data collection**

There are two techniques of data collection namely, census and sample survey. A census is a complete enumeration of each and every unit of the universe whereas in a sample only a part of the universe is studied and conclusions about the entire universe are drawn on that basis.

### **(vi) The frame**

The term "frame" refers to a list, map or other specialization of units which constitute the available information relating to the population designed for a particular field of enquiry. For instance, if we want to find out the capital invested and the number of workers working in small-scale industries in a particular city, we must have a complete list of names and addresses of all the small-scale firms. This list of names and addresses will be called a "frame".

### **(vii) Degree of accuracy desired**

It may be pointed out that absolute accuracy is seldom possible in any field of enquiry because (a) it is based on estimates, (b) tools of measurement are not always perfect and (c) there may be unintentional bias on the part of the investigator. Hence, if an attempt is made to attain 100 per cent accuracy, it would not be reliable. Degree of accuracy desired primarily depends upon the object of enquiry. For example: in weighing gold even  $1/10^{\text{th}}$  of a gram makes difference whereas in weighing wheat or rice difference of a few grams has no significance. It is, therefore, desirable

that an eye be kept on the possible inaccuracies that are likely to arise due to clerical, technical and other types of errors so that they may be eliminated altogether or reduced to the minimum.

## **(B) Execution**

After a plan of data collection, the next step is execution. The execution stage requires following steps.

### **(i) Setting up an administrative organization**

The administrative organization required for an enquiry will depend very much on the nature and scope of the enquiry. Every opportunity should be taken to utilize existing administrative and office organization. When the enquiry covers a large area, supervision from a central office is likely to be difficult and in such cases it is best to establish regional offices. Very frequently, some existing organization can be used for this purpose.

### **(ii) Design of forms**

Careful attention should be given to the designing of various forms that will be used in the course of the enquiry.

### **(iii) Selection, training and supervision of field investigation**

In most cases, the data is to be collected through enumerators who work part-time or full-time. The nature of the enumerator's job is such that great care has to be exercised in his selection.

The enumerators should be properly trained, honest, intelligent and be able to create friendly atmosphere and put the respondent at his care. He should be able to ask the questions properly and intelligently and record the response accurately and completely. Suitable tests like intelligence test, aptitude test etc. can be employed for selecting the right type of enumerator. The field investigators should be trained enough so that they should know the definitions of the terms used in the questionnaire or schedule and the intricate problems involved in using them in the field. It is also necessary to watch carefully the work of the enumerators. The mere presence of supervisors in the field has a wholesome effect on their performance. The supervision should be carried out by senior staff, better qualified and more experienced person.

#### **(iv) Control on the quality of the field work and the field edit**

The field checks should preferably be carried out on a random sub sample of units, and should be conducted in such a manner that investigators do not have prior knowledge of the work going to be checked. After the work of collection of data is complete and questionnaires or schedules are handed over by the enumerator to the supervisor while in the field, the supervisor should scrutinize these to check omissions, inconsistencies, illegible writing and other errors before they are passed on to the main centre for compilation and analysis.

#### **(v) Follow-up of non-response**

In spite of best efforts, some of the respondents may

not co-operate. One method of dealing with the non-response problem is to make a list of the non-respondents and take small sub-sample of them. Then with the help of supervisory staff, vigorous efforts can be made for appropriate response.

### **(vi) Processing of the data**

While editing it is necessary to see that the questionnaire are complete in every respect and the information supplied is consistent and accurate.

The responses in the edited questionnaires may be coded. The process of coding involves translating response in numerical terms in order to facilitate the analysis. For example: sex of the respondent may be coded as male-1, female-2. After the material is edited and coded, it is ready for analysis which may be carried out on computer or mechanically with the help of various formulas required for the analysis.

### **(vii) Preparation of report**

Two kinds of reports may be presented either a general report giving a description of the survey for the use of those who are primarily interested in the results or a technical report giving details of the sample design, computational procedures, accuracy and allied aspects.

In the general report the following aspects of the survey should be highlighted:

- (a) Purpose of the enquiry
- (b) Description of the coverage
- (c) Collection of information

- (d) Numerical results
- (e) Accuracy attained
- (f) Conclusions

## **Types of research tools**

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### **A. Direct observation method**

Under this method, the investigator personally comes in contact with the respondent from whom the information is to be obtained (Known as informants). He asks them questions pertaining to the enquiry and collects the desired information. Sometimes if an experiment is conducted in a laboratory then the respondents himself can note down the reading from the measuring instrument. Such a method is called direct observation method and generally this method gives us an accurate information.

Sometimes this method may be very costly where the number of persons to be interviewed is very large and they are spread over a wide area.

When the data are needed on the height and weight of say, 200 college students, they will be approached individually and the height (say in cm) of each measured with the tape and the weight (say in pound or Kg.) measured with a weighing machine. On the other hand, if data are required on the incidence of blindness among a group of people, one will just observe each member of the group and note whether he or she is blind or not. The direct method of data collection may, therefore, involve either measure or counting or bare observation.

## B. Interview method

In this method, enumerators go from one informant to another and elicit the required information. This method is used in population census. The data collected by this method are likely to be more accurate, since a tactful investigation, may persuade the informant to supply the required information the meaning of each question may be properly explained to him so that the answers may be correct and to the point.

## C. Questionnaire method

In economic and social enquires, information is almost collected by having someone to fill up a form or questionnaire. But a matter to be decided in whether the forms should be completed by an enumerator or investigator who collects data by asking questions and noting down answers, or whether these should be left with the respondent to be filled up of his own. In this method each informant (or respondent) is provided with a questionnaire, usually sent by mail with return postage prepaid, and is asked to supply the information in the form of answers to the questions. Obviously, this method can be effective only when the informants have attained a certain level of education. It can work, for instance, when a daily newspaper decided to conduct an opinion poll among its readers on some topical issue. Sometimes the respondents do not fill up the questionnaire completely and the blank entries fail to reflect the true state of the field of enquiry.

The questionnaire should be design in such a way so that it should cover all the aspects expected from the field of enquiry.



## **Pre-testing the questionnaire**

Before final form of the questionnaire is adopted it is desirable to carry out a preliminary experiment on a sample basis. There are many advantages of pre testing the questionnaire such as:

- (i) The investigator can find out, in due course of time, which questions ought to be deleted and which more ought to be added.
  
- (ii) An idea can be formed about the extent of non-response likely to take place.

The work of pre-testing the questionnaire must be done with utmost care and caution otherwise unnecessary and unwanted changes may be introduced. Proper testing, revising and re-testing questionnaire would yield high dividends.

# Sample questionnaire on Super Market

## QUESTIONNAIRE: CONSUMER PREFERNECES

Note: Please tick mark (✓) in the square where necessary.

### A. Demographic and socio-economic information

1. Name:

Address:

Age:

Sex:

Male

Female

Marital status:

Married

Unmarried

Occupation:

Service

Business

Other

No. of members  
in the family

1 to 3

3 to 6

Over 6

Monthly income  
(in rupees)

From 1000-5000\*

From 5000-10000

From 10000-20000

Above 20000

### B. Consumer preference related information

2. How many times do you visit Super Market in a month?

1 - 5

5 - 10

Over 10

3. Do you prefer any particular day for shopping? Yes  No   
If yes, specify the day you prefer.

Son.  Mon.  Tues.  Wed.  Thurs.  Fri.  Sat.

\* If you are getting exactly Rs. 5000 put tick in second category i.e. 5000-10000, getting exactly 10000 put tick in third category i.e. 10000-20000.

4. Do you buy most of your daily requirements from the Super Market?

Yes  No

5(a). Are you attracted to the Market because of:

- i. Reasonable price? Yes  No
- ii. Reliability of price? Yes  No
- iii. No bargaining? Yes  No

5(b). Do you feel the profit-margin charged by the Super Market is reasonable? Yes  No

6. Do you prefer Super Market because of:

- i. Availability of most of your requirements under one roof? Yes  No
- ii. Certainty of getting goods? Yes  No
- iii. Wide selection and choice? Yes  No
- iv. Availability of quality goods? Yes  No
- v. Availability of goods in short supply? Yes  No
- vi. Surety about quality? Yes  No
- vii. Saving in shopping time? Yes  No

7(a). Do you find the sales assistants in the Super Market:

[Please tick mark ( ) in the square where necessary]

Attentive	<input type="checkbox"/>	Inattentive	<input type="checkbox"/>
Courteous	<input type="checkbox"/>	Rude	<input type="checkbox"/>
Cooperative	<input type="checkbox"/>	Incooperative	<input type="checkbox"/>
Efficient	<input type="checkbox"/>	Inefficient	<input type="checkbox"/>

7(b). Do you wish the café in the Super Market while Shopping?

Yes  No

7(c). Do you find any difficulty in locating the desired products?

Yes  No

7(d). Do you need parking facilities to make your visit easy?

Yes  No

8. Do you visit the Super Market because:

i. It is near your home? Yes  No

ii. It is on your way home? Yes  No

iii. It is centrally located? Yes  No

9(a). Are you a shareholder in the Super Market? Yes  No

9(b). Are you attracted by the shareholders discount? Yes  No

9(c). Do you prefer sales girls to salesman? Yes  No

9(d). Are you satisfied with the packing provided  
by the Super Market? Yes  No

10. Can you give first, second and third preferences for visiting the  
Super Market out of the following:

(Please write numbers in the squares)

Quality

Availability of all good under one roof

Price

Location

Time-saving

Shareholding interest

## Validity and consistency

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By the validity of a sample design we mean that it should enable us to obtain valid tests and estimates about the parameters of the population. The samples obtained by the technique of probability sampling satisfy this principle. This technique suggests that each and every unit selected in the sample has an equal chance of being selected in the sample.

An initial quality check should be carried out by the supervisory staff while the investigators are in the field. Accordingly, the schedules should be thoroughly scrutinized to examine the plausibility and consistency of the data obtained. The scrutiny or editing of the completed questionnaires will help in amending recording errors or in eliminating data that are obviously erroneous and inconsistent.

## Efficiency and reliability

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This principle impresses upon obtaining optimum results in terms of efficiency and cost of the design with the resources at our disposal.

The reciprocal of sampling variance of an estimate provides a measure of its efficiency while a measure of the cost of the design is provided by the total expenses incurred in terms of money and man power.

The principle of optimization consists in:

- i. Achieving a given level of efficiency at minimum cost

- ii. Obtaining maximum possible efficiency with given level of cost.

The principle of reliability is used to check whether the variables included in the study contains relevant information. This will help us to include only those variables which explains maximum variation. Split-half method, Pearson's Correlation methods are useful to determine reliability. The magnitude of the standard error gives an index of the precision of the estimate of the parameters. The reciprocal of the standard error is taken as the measure of reliability.

## Measurement

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The data collected from the field of enquiry must be free from measurement errors. The measurement errors can be reduced by applying skilled workers and sensitive instruments and also with the help of repeated observations.

## Data collection process

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The main steps involved in the planning and execution of a sample survey may be grouped somewhat arbitrarily under the following heads:

### 1. Objectives of the survey

The first step is to define in clear and concrete terms, the objectives of the survey. The sponsors of the survey should take care that these objectives are commensurate with the available resources in terms

of money, manpower and the time limit required for the availability of the results of the survey.

## **2. Defining the population to be sampled**

The population i.e. the aggregate of objects from which sample is chosen should be defined in clear and unambiguous terms. For example: if we are looking for growth rate of youths in a population then the age groups physical conditions (not handicapped or disabled) etc. should be clearly defined.

## **3. The frame and sampling units**

In order to cover the population decided upon, there should be some list, map or other acceptable material, called the frame, which serves as a guide to the population to be covered. A good frame is hard to come by and only experience helps to construct a good frame.

The population must be capable of division into what are called sampling units for purposes of sample selection. The sampling units must cover the entire population and they must be distinct, unambiguous and non-overlapping in the sense that every element of the population belongs to one and only one sampling unit. For example: in socio-economic survey for selecting people in a town, the sampling unit must be an individual person, a family, a household or a block in a locality.

## **4. Data to be collected**

The data should be collected keeping in view the objectives of the survey. The tendency should not be

to collect too many data some of which are never subsequently examined and analysed.

## **5. The questionnaire or schedule**

The important part of survey is the construction of the questionnaire (to be filled in by the respondent) or schedule of enquiry (to be completed by the interviewer) which requires special skill, special technique as well as familiarity with the subject matter under study. The question should be clear, brief, corroborative, non-offending, courteous in tone, unambiguous and to the point so that not much scope of guessing is left on the part of the respondent or the interviewer. Generally, interview or questionnaire methods are used for collection of data.

## **6. Non-respondents**

Quite often (due to practical difficulties), the data cannot be collected for all the sampled units. For example: the selected respondent may not be available at his place or he may fail or even refuse to give certain information when contacted. This incompleteness, called non-response, obviously tends to change the results. Such cases of non-response should be handled with caution in order to draw unbiased and valid conclusions. The reasons for non-response should be recorded by the investigator.

## **7. Selection of proper sampling design**

The size of the sample, the procedure of selection and the estimation of the population parameters along with their margins of uncertainty are some of the important statistical problems that should receive most careful attention.



## 8. The pre-test

From practical point of view a small pretest (i.e. trying out the questionnaire and field methods on a small scale) has been found to be immensely useful. It always helps to decide upon effective method of asking questions and results in the improvement of questionnaire. Moreover, it might disclosed certain problems and troubles that will otherwise quite serious on a large scale survey such as “the cost and the time may exceed the available money and stipulated period”.

## 9. Information gained for future surveys

Any completed survey is helpful in providing a note of caution and taking lessons from it for designing future surveys. The information regarding mean, standard deviation and the nature of variability of the principal measurement helps in recognizing and rectifying the mistakes committed in the execution of the survey.

## Unit summary

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In this unit, you have covered the following main points:

- The meaning and importance of sampling
- Selection of appropriate sample size
- Types of sampling
  - ❖ Probability sampling
  - ❖ Non-probability sampling
- Merits of sampling
- Various sampling methods
  - ❖ Simple random sampling

- ❖ Stratified random sampling
- ❖ Multistage sampling
- ❖ Systematic sampling
- ❖ Cluster sampling
- Selection of appropriate sampling method
- Pre-requisites for field research
  - ❖ Planning
  - ❖ Execution
- Guidelines for selection, training and supervision of field investigators
- The importance of quality in field work
- Guidelines for preparation of report
- Types of research tools
  - ❖ Direct observation method
  - ❖ Interview method
  - ❖ Questionnaire method
- Identification of problem and designing valid questionnaire.

## Answers to self-help questions

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### Self-help question 4.1

1. True
2. False
3. True
4. True
5. False
6. False
7. True
8. True
9. False
10. True