RESEARCH METHODOLOGY

SEMESTER IV (SEC)

2nd Lecture

Question Pattern:

- *10 questions of 2 marks each=20*
- *4 questions of 5marks each=20*
- *4 questions of 10 marks each=40*

Unit 1: Methodological Issues 1

- *Locating the basic issues- theme based literature survey and motivation behind any study objectives of the study-development of writing skills*
- *Designing the sampling frame in case of field survey - the role of pilot survey*
- *The role of random numbers in drawing random sample*
- *Methods behind preparation of questionnaire in case of field survey*
- *Data entry after field survey*
- *Tabular representation of data and graphs for data interpretation*

1.4 Designing the sampling frame in case of field survey

The sample design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. More explicitly, the designing decisions happen to be in respect of:

(i) What type of data is required?

(ii) Where can the required data be found?

(iii) What periods of time will the study include?

(iv) What will be the sample design?

(v) What techniques of data collection will be used?

(vi) How will the data be analysed?

Keeping in view the above stated design decisions; one may split the overall research design into the following parts:

(a) *the sampling design* which deals with the method of selecting items to be observed for the given study;

(b) *the observational design* which relates to the conditions under which the observations are to be made;

(c) *the statistical design* which concerns with the question of how many items are to be observed and how the information and data gathered are to be analysed; and

(d) *the operational design* which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

What is a sampling frame?

According to the UN Secretariat's Statistics Division, "a simple definition of a sampling frame is the set of source materials from which the sample is selected. The definition also encompasses the purpose of sampling frames, which is to provide a means for choosing the particular members of the target population that are to be interviewed in the survey".

There are different types of sample designs based on two factors viz., **the representation basis** and the **element selection** technique. On the representation basis, the sample may be probability sampling or it may be non-probability sampling. Probability sampling is based on the concept of random selection, whereas non-probability sampling is 'non-random' sampling. On element selection basis, the sample may be either unrestricted or restricted. When each sample element is drawn individually from the population at large, then the sample so drawn is known as 'unrestricted sample', whereas all other forms of sampling are covered under the term 'restricted sampling'.
Thus, sample designs are basically of two types viz., non-probability sampling and probability sampling.

Non-probability sampling: Non-probability sampling is that sampling procedure which does not estimate the probability that each item in the population has of being included in the sample. Non-probability sampling is also known by different names such as **deliberate sampling**, **purposive sampling** and **judgement sampling**. In this type of sampling, items for the sample are selected deliberately by the researcher; his choice concerning the items remains supreme. In other words, under non-probability sampling the organisers of the inquiry **purposively** choose the particular units of the universe for constituting a sample on the belief that their selection will be typical or representative of the whole.

Probability sampling: Probability sampling is also known as 'random sampling' or 'chance sampling'. Under this sampling design, **every item of the universe has an equal chance of inclusion in the sample**. It is, so to say, a lottery method in which individual units are picked up from the whole group not deliberately but by some mechanical process. For the results obtained from random sampling, we can measure the errors of estimation or the significance of results. This is the basis of the superiority of random sampling design over the deliberate sampling design. Random sampling ensures the **law of Statistical Regularity** which states that if on an average the sample chosen is a random one, the sample will have the same composition and characteristics as the universe. This is the reason why random sampling is considered as the best technique of selecting a representative sample.

Properties of a sampling frame: As per the above definition, the sampling frame captures, in a statistical sense, the target population. Beyond that, a perfect sample frame is one that is ***complete, accurate*** and ***up-to-date***. Of course, such ideal properties may not be attainable in household surveys. Let us define them briefly.

Completeness: The ideal frame will be considered as **complete** (with respect to the target population) if all of its members (the universe) are covered by the frame.
Accuracy: We shall call a frame accurate if all members of the population have a chance to be included in the sample once and only once.
Up-to-date: This is quite obvious. A back-dated data may be both incomplete and/or inaccurate. Obsolete data may defeat the very purpose of the survey.

1.5 Importance of Pilot studies: The term *pilot study* is used in two different ways in social science research. It can refer to a feasibility study which is a "small scale version", done as a preparation for the main study. A pilot study is also used to test a particular research instrument. The reasons for conducting pilot studies
are:

- Developing and testing adequacy of research instruments
- Assessing the feasibility of a (full-scale) study/survey

- Establishing whether the sampling frame and technique are effective
- Identifying logistical problems which might occur using proposed methods
- Estimating variability in outcomes to help determining sample size
- Collecting preliminary data
- Determining what resources (finance, staff) are needed for a planned study
- Assessing the proposed data analysis techniques to uncover potential problems
- Developing a research question and research plan
- Convincing funding bodies that the main study is feasible and worth funding

Pilot studies can be based on quantitative and/or qualitative methods and large-scale studies might employ a number of pilot studies before the main survey is conducted. It is also very important to "test" the questionnaire, e.g. the wording and the order of the questions, or the range of answers on multiple-choice questions. Thus, a pilot study can check the internal validity of a questionnaire and lead to an improvement of the same.

Pilot studies may also try to identify potential practical problems in following the research procedure. For example, pilot studies can identify local politics or problems that may affect the research process.

Limitations of pilot studies: Pilot studies may also have a number of limitations, such as:

(a) the possibility of making inaccurate predictions or assumptions on the basis of pilot data; and
(b) problems arising from **contamination**;

"Contamination" may arise in two ways:

1. where data from the pilot study are included in the main results;
2. where pilot participants are included in the main study, but new data are collected from these people.

For such reasons, pilot studies are mostly not reported. However, it should be obvious from the above discussion that despite a few limitations, pilot studies play a very important role in survey-based research.

From what we have discussed above, we can list down the characteristics of a good sample design as under:
(a) Sample design must result in a truly representative sample.
(b) Sample design must be such which results in a small sampling error.
(c) Sample design must be viable in the context of funds available for the research study.
(d) Sample design must be such so that systematic bias can be controlled in a better way.
(e) Sample should be such that the results of the sample study can be applied, in general, for the universe with a reasonable level of confidence.

1.6 The role of random numbers in drawing random sample: We have already noted that **u**nder probability sampling design, **every item of the universe has an equal chance of inclusion in the sample**. For the results obtained from random sampling, we can measure the errors of estimation or the significance of results. Random sampling ensures the **law of Statistical Regularity** which states that if on an average the sample chosen is a random one, the sample will have the same composition and characteristics as the universe. This ensures that the results obtained would be representative of the population.

How to draw a random sample? Though various methods can be used, researchers often use a random number table. Various statisticians like Tippett, Yates, and Fisher have prepared tables of random numbers which can be used for selecting a random sample. Let us make use of Tippett's random number tables to

give an idea about the method involved. Tippett gave 10400 four figure numbers. He selected 41600 digits from the census reports and combined them into fours to give his random numbers which may be used to obtain a random sample.
We can illustrate the procedure by an example. First of all we reproduce the first thirty sets of Tippett's numbers

2952	6641	3992	9792	7979	5911
3170	5624	4167	9525	1545	1396
7203	5356	1300	2693	2370	7483
3408	2769	3563	6107	6913	7691
0560	5246	1112	9025	6008	8126

Suppose we are interested in taking a sample of 10 units from a population of 5000 units, bearing numbers from 3001 to 8000. We shall select 10 such figures from the above random numbers which are not less than 3001 and not greater than 8000. If we randomly decide to read the table numbers from left to right, starting from the first row itself, we obtain the following numbers: 6641, 3992, 7979, 5911, 3170, 5624, 4167, 7203, 5356, and 7483. (Example taken from **C.R. Kothari**, *Research Methodology: Methods and Techniques*, **2nd Edition**)

The units bearing the above serial numbers would then constitute our required random sample.

1.7 Methods behind preparation of questionnaire in case of field survey

A questionnaire is a research instrument consisting of a series of questions. It is perhaps the most important part of the survey process that accurately measures the opinions, experiences and behaviour of the public. Accurate random sampling and high response rates will be wasted if the information gathered is based on a poorly designed questionnaire consisting of ambiguous or biased questions.

Questionnaire design is a multistage process that requires attention to many details at once. As noted earlier, surveyors may conduct pilot tests in the early stages of questionnaire development in order to better understand how people think about an issue or comprehend a question. Pre-testing a survey is a vital step in the questionnaire design process to evaluate how people respond to the overall questionnaire and specific questions.

A questionnaire may be classified in several ways. One important classification is based on the nature of the questions asked. A questionnaire may contain:

- Open-ended questions: These allow the responded the liberty to answer in his own words, and often offer his explicit impression or interpretation of a certain issue
- Multiple choice questions:
- Dichotomous questions: Only 'Yes' or 'No' type answers permitted
- Ranking or scaling questions: The respondent is requested to assign a number (typically from 1-10 or 1-5) to something; depending on his/her assessment of the same (may be the usefulness of some policy).

The advantages of the questionnaire method: The merits claimed on behalf of this method are as follows:

- There is low cost even when the universe is large and is widely spread geographically.

- It is free from the bias of the interviewer; answers are in respondents' own words.
- Respondents have adequate time to give well thought out answers.
- Large samples can be used and thus the results can be made more reliable.

The main demerits of this system are:

- Low rate of return of the duly filled in questionnaires; bias due to no-response is often indeterminate.
- It can be used only when respondents are educated and cooperating.
- The control over questionnaire may be lost once it is sent.
- There is a possibility of ambiguous replies or omission of replies altogether to certain questions; interpretation of omissions is difficult.
- It is difficult to know whether willing respondents are truly representative.

The preliminary decisions in questionnaire designing:

There are nine steps involved in the development of a questionnaire:

1. Decide the information required.
2. Define the target respondents.
3. Choose the method(s) of reaching your target respondents.
4. Decide on question content.
5. Develop the question wording.
6. Put questions into a meaningful order and format.
7. Check the length of the questionnaire.
8. Pre-test the questionnaire.
9. Develop the final survey form.

Qualities of a good questionnaire:

There are no hard-and-fast rules about how to design a questionnaire, but there are a number of points that can be borne in mind:

1. A well-designed questionnaire should meet the research objectives. This is usually not entirely possible. Every survey is bound to leave some questions unanswered and provides a need for further research but the objective of good questionnaire design is to 'minimise' these problems.

2. It should obtain the most complete and accurate information possible. The questionnaire designer needs to ensure that respondents fully understand the questions and are not likely to refuse to answer, lie to the interviewer or try to conceal their attitudes. A good questionnaire is organised and worded to encourage respondents to provide accurate, unbiased and complete information.

3. A well-designed questionnaire should make it easy for respondents to give the necessary information and for the interviewer to record the answer. It should be arranged so that sound analysis and interpretation are possible.

4. It would keep the interview brief and to the point and be so arranged that the respondent(s) remain interested throughout the interview.

5. Question sequencing should be done in such a way as to make the relation of one question to another readily apparent to the respondent, with questions that are easiest to answer being put in the beginning. The first few questions are particularly important because they are likely to influence the attitude of the

respondent and in seeking his desired cooperation. The opening questions should be such as to arouse human interest. The following type of questions should generally be avoided as opening questions in a questionnaire:

1. Questions that put too great a strain on the memory or intellect of the respondent;
2. Questions of a personal character;
3. Questions related to personal wealth, etc.

Relatively difficult questions must be placed near the end so that even if the respondent decides not to answer such questions, considerable information would have already been obtained. Thus, question-sequence should usually go from the general to the more specific and the researcher must always remember that the answer to a given question is a function not only of the question itself, but of all previous questions as well.

Home Assignment

Study the above thoroughly and set:

- Five 2-mark questions
- Two 5-mark questions, and
- Two 10-mark questions

Setting sensible questions is difficult and it will not be possible unless you study the matter thoroughly. After setting the questions, answer them and mail at bubkam@gmail.com. Last day for sending questions and answers (5+2+2, or nine questions and nine answers) is 31.05.2020

One word of caution: As indicated in the SEC write-up uploaded earlier (first part), our experience with the data analysis questions (Semester III SEC paper) tells us that having a sound grasp over the relevant (or not so relevant) statistical concepts (for example, in this part, the concept of random sampling occupies a very prominent place) will perhaps be more important than the subject matter solemnly outlined in the syllabus. So, I will not be surprised if students face many questions on, say, sampling error, random variable, hypothesis testing etc. So, you should never part with the company of your Statistics textbook.