

Chapter 1

Data Collection Methods and Instrumentation



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Abstract

Most students and would-be researchers are not quite familiar with the various methods of data collections used in the design of various studies and the different types of instruments used in each case. They are therefore tempted to use any of the methods they are familiar with notwithstanding their appropriateness for the study intended to be embarked upon. This chapter explains the different data collection methods and the various instruments used in the collection of data as well as determine when a particular instrument must or should be used for the data collection.

Keywords

Instrumentation, Design, Instruments, Data Collection Methods

1.1 Data Collection Methods

There are four main data collection methods used in the research process. These include: observation, survey, contact and experimental methods. These are individually explained below:

1.1.1 Observation Method

The observation method basically involves collecting the needed data for the study via observation only. Since data is only collect through observation of the research in this case, there are some limitations to this method. It is difficult to collect data on people's feelings based on observation. One cannot be precise to conclude that someone is happy when he or she is laughing. It would be quite deceptive; also, the researcher if he or she is the one to do the observation is expected to be present at the place or venue the data is expected to be collected.

There are different types of data collection through observation:

Structured (plan) observation

This is used for descriptive research, where the researcher needs to provide a descriptive view of the situation. It is referred to as structured because the researcher plans about how to describe the situation.

Unstructured (unplanned) observation

This is used for exploratory research. With the unstructured observation, the researcher explores the situation at hand so has no thought out plan of anything in specific to collect data on via observation.

Participatory method

This is used when the researcher is also a participant in the process being observed. Taking for example, a student who wants to study the character of his class in an Institution. Once he or she is part of the class and participates in all activities of the class while taking data through observation, then the method being adopted by such a student is a participatory method of observation. In this case the research has first hand information and experience on what is on the ground.

Non participatory method

With this method, the researcher is not a participant but only present to take data on a particular area of study via observation.

Disguised method

The disguised method is used when the researcher does the observation while disguising him or herself. This method is often used for investigative research.

1.1.2 Survey Method

The survey method involves collecting data on facts or opinions from people through the use of instruments such as questionnaire, opinionnaire and interview guides. Survey method is classified into two: structured and unstructured surveys.

Structured survey method

This involves collection of data using questionnaires or opinionnaire. It is referred to as structured because of the instruments used in the data collection. This is because a questionnaire or opinionnaire are set of structured questions

administered to targeted respondent who are required to give their responses for subsequent collection by the researcher.

Unstructured survey method

This method involves the use of an interview guide to collect data via interviewing of targeted respondent. It is referred to as an unstructured method because an interview guide does not contain a set of questions as a questionnaire or an opinionnaire. Instead, it has a list of items that serves as a guide for the interviewer to ask the necessary questions when he or she meets the targeted respondents (interviewees). The interviewer (the researcher) asks questions on item-by-item basis as indicated in the interview guide and can seek clarification on responses provided by the respondents (interviewees) until questions are exhausted on all items indicated in the guide.

1.2 Contact Method

The contact method is where the researcher deploys the instrument that would help collect data using means that can be used to reach the targeted clientele or the respondents. The contact methods include: mailing, telephoning, using face-to-face interview, focus group interview etc.

Mailing

This involves contacting the respondents via the mail where the appropriate data collection tool such as a questionnaire is sent to them for their responses. It has its own advantages and disadvantages. It reduces cost because the researcher does not have to travel to meet the respondents. However it is only respondents who are computer literate, and they are also likely to return their

responses at their own leisure and may not have clarification on some questions for appropriate responses to be provided.

Telephoning

This involves conducting an interview or collecting data via phoning the respondents. In this case the researcher uses the interview guide to interview the targeted respondents for their responses.

Face-to-face Interview

This is where the researcher collects data on the concepts (variable) under study by conducting one-on-one interview with each respondent using a designed interview guide. With this method, data collection allows the researcher to make clarifications on questions to enable the respondents to give appropriate responses. However the researcher or the interviewer needs to be present to make the needed clarifications for the respondents.

Focus Group Interview

The focus group interview is where the researcher invites experts or the technical individuals from various sectors capable of providing responses to the subject to be discussed or interview to be conducted. Each invited individual or respondent represents a particular group or company. These selected experts are camped at a convenient venue where a forum is held and questions asked by the researcher for the respondents (the experts) to provide responses in an open discussion.

1.3 Experimental Method

This method involves the designing of experiment in either the laboratory or field and measuring data using the appropriate apparatus. The data collected in this case are mostly quantitative unlike human behaviour or attitude which is very difficult to quantify.

1.4 Data Collection Instruments

Instruments or tools for data collection in research are not necessarily the physical ones one can think of when measuring in the physical sciences such as the devices but can be designed forms that are administered to targeted clientele of a population on which a research is being conducted on. Basically the instruments for data collection are broadly grouped into enquiry forms, observation, interview, sociometry and psychological test.

Inquiry forms

These are designed forms which are used to collect data on enquiries made by the researcher. They include the use of questionnaire, checklist, score-card, schedules, rating scale, opinionnaire and attitude scale.

1.4.1 Questionnaire

A questionnaire as earlier explained is a set of questions administered to respondents to solicit their responses. A questionnaire is used for the collection of data on facts and opinions from the respondents.

Normally on questionnaires, before the required questions are asked, a brief on the purpose and the intent of the work or study is given for the perusal of the

respondent. This is preceded by the questions related to the respondent's background and other sets of questions relating to achieving the objectives of the study in a logical sequence.

Basically three different question types can be used in the design of a questionnaire: open ended questions, closed ended questions and the combination of the two. The open ended questions are used in soliciting the respondent opinions and hence not limited by the provision of options to be chosen from. The data obtained from these type of questions are mostly qualitative. Closed ended questions have options provided by the researcher to limit the respondents. This type of question gives rise to quantitative data. However in the design of a questionnaire, both types of questions are employed.

Types of questions to avoid in the design of questionnaires:

Double barreled questions

These are two-in-one questions or compound questions – a single question that demands two answers. The problem with the use of such questions for design of questionnaires is that there is the tendency of the respondent answering one part of the question and leaving the other part, thus instead of two responses, one is provided. Example: What is your occupation and rank? It is good to rather ask: what is your rank? What is your occupation? This will allow the responses to be provided for both questions.

Use of double negatives

When asking questions in a questionnaire, one needs to avoid the use of double negatives as much as possible because it makes understanding difficult and a bit complicated. The researcher should not subject his respondents to such an ordeal of thinking when responding to questions within the questionnaire. If

respondents do not understand the questions, they are likely to provide wrong or misleading responses. Example: Is stealing not uncommon in your area? Instead of asking simply: Is stealing common in your area?

Prestige bias questions

In the design of questionnaire, questions that are asked bordering on respondents sensitivity such as age, educational status and health status are referred to as prestige bias questions. For instance, people generally are not comfortable with asking them questions on how old they are. In asking them about them on their ages, it is likely that they may give responses on ages they are comfortable of associating with, thus falsifying the data which eventually affects the outcome of the study. The best approach to asking such questions is the use of closed ended questions where respondents are given the options in the form of age ranges to select from. The same applies to other sensitive issues such as health status, educational level etc.

Avoid asking leading questions

Normally in the designing of questionnaires, questions are expected to be posed to the respondents in a chronological order: first-question-first. This allows the respondents to answer and follow through easily. Whenever any question is asked that forces the respondent to answer it when he or she is not in the position to respond, such a question can be referred to as a leading question. For instance, asking a respondent how many times he travels overseas when one has not asked whether the respondent has even travel abroad before can be regarded as a leading question. The same can be said of asking the respondents how many times he or she washes his or her car when no question has established whether the respondent has a car or not. They are questions that force the respondents to give responses that are likely not to be true.

Long winded questions

The questions must be kept simple and short in order to avoid ambiguity or confusing the respondent respondents. Such long sentence questions create confusion.

Length of Questionnaire – Content

The questionnaire must not be overly long but rather must capture precisely questions that will exhaust the content for which it has been designed to ensure the needed data is provided for analysis. When a questionnaire is excessively long, it scares or puts off the respondents who oftentimes have to take the decision between trading of their time for responding to the questionnaire and business schedule. The consequent result is likely to be them not making the time to response to one's questionnaire (opportunity cost).

Checklist

This is an enquiry form which has sets of questions posed at the respondents to whom it is administered for which they are to consent to by checking boxes created against each question posed. It is usually used by producers or service providers to assess the clients' / customers' / consumers' needs or requirement for a product purchased or service provided. In order to develop a checklist and used it as a tool for data collection, one needs to know the various aspects of the product or service requirements to be met so as to check against the statements or questions.

Schedule

A schedule gives the tasks or activities planned for execution with their defined times. Schedule can be used as a tool for data collection by checking

whether activities meet their planned schedule. Thus the researcher would check the schedule against the real situation to generate his or her data.

Score-card

During data collections, sheets are designed on which scores or data are entered for each and individual subject been researched on. All the scores on the sheets for each individual subject under study are then collected on a score-card.

Rating scale

These are scales used in collecting data based on the researchers judgment of an object or a subject, character and situation. This judgment is expressed on a scale of values by the researcher and mostly used for quality assessment. For instance the rating scale indicates the various degrees or amount of different degrees of quality expressed on a linear scale. Thus the assessors have to choose a value that best suites the objects being assessed based on his or her judgment of them. For example the performance of student can be indicated on the scale below:

Excellent	Very good	Good	Credit	Pass	Fail
6	5	4	3	2	0

Rating can be achieved in three main ways: adopting paired comparison; ranking and rating

Attitudinal scale

This is one of the enquiry forms used for data collection based on the researchers judgment on the attitude of the subject under study.

1.4.2 Opinionnaire

This is also a set of question administered to respondents which is intended to collect data that borders on their opinion.

An opinionnaire has the same features as questionnaire but the difference here is in the questions contained in them. They are all intended at soliciting the opinions of respondents. The example below is an idea of how an opinionnaire is analysed:

Table 1.1 *Analysis of a Sample Opinionnaire.*

	SD	D	U	A	SA	
	-2	-1	0	1	2	Averages
clients preference for a service						1.024
surface	1	4	17	33	41	1.135417
air	2	2	14	42	36	1.125
land	1	6	19	54	16	0.8125
Producers preference for supplying the service						-0.333
air	0	0	1	1	6	1.625
surface	3	3	0	2	0	-0.875
land	4	4	0	0	0	-1.5

There is a scale for SD which stands for strongly disagree and assigned a score of (-2); D, disagree with a score of (-1); U, neutral with a score of (0); A, agree with a score of (1); and SA, strongly agree with a score of (2).

The various numbers under each of these classifications in the sample of the opinionnaire are the frequencies of the data collected and based on individuals' opinions or choices of each of the services rendered. The frequencies have been used for the calculation of the averages of the opinions of individuals on the likes and dislikes of the services being provided.

1.4.3 Observation

When observation method is used for data collection, the researcher can collect the data using a designed observation sheet or a checklist, scorecards etc. These are designed by the researcher based on the data type that needs to be collected in order to achieve the objectives of the study.

1.4.4 Interview

For data collection via interviews, the appropriate tool used is the interview guide. The interview guide differ from the questionnaire in that whereas the questionnaire contains the set of questions that the respondents are to respond to, the interview guide does not contain the list of questions but rather the outlines of the information on which an interview would be conducted. For instance on a interview guide can contain some outlines which are expected to cover the scope of the study that is being undertaken. Outlines on the interview guide can look like the following:

- Biodata information of interviewee
- Information on operational procedure of a machine
- Technical knowledge of interviewee on the machine
- Maintenance information of the machine

As can be seen, these are only outlines that would aid the interviewer to ask the interviewee the relevant questions based on the scope of study.

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