

# Research Methodology for Beginners



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Dr. V. Stephen  
T. Velmurugan

Website: [www.skyfox.co](http://www.skyfox.co)

Email: [skyfox@skyfox.org.in](mailto:skyfox@skyfox.org.in)



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## **AUTHOR INFORMATION:**

**Dr. V. Stephen. B.A., M.S.W., Ph.D.,**

Associate Professor

Department of Social Work

DMI – St. Eugene University

P.O.Box: 330081, Chibombo

Zambia.

**Mr. T. Velmurugan. M.S.W.,**

Lecturer

Department of Social Work

DMI – St. Eugene University

P.O.Box: 330081, Chibombo

Zambia.

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#### **Skyfox Publishing Group**

#987, Medical College Road

Thanjavur-613004

Tamil Nadu, India.

Phone: +918300123232

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Website: [www.skyfox.co](http://www.skyfox.co)

### **Headquarters &Marketing Office**

#### **Skyfox Publishing Group**

333 Cedar Street, PO Box 208002,

New Haven, United States.

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Tel: 203.737.5603 / Fax: 203.785.7446

Email: [skyfoxpublishing@gmail.com](mailto:skyfoxpublishing@gmail.com) / [skyfox@skyfox.org.in](mailto:skyfox@skyfox.org.in)

Website: [www.skyfox.co](http://www.skyfox.co)

# **Research Methodology for Beginners**

**Dr. V. Stephen. B. A., M.S.W., Ph.D.,  
Mr.T. Velmurugan., M.S.W.,**

From the desk of

**Dr. T. X. A. ANANTH, BBA, MSW, MBA, MPhil, PhD,**

President – University Council

Dear Learner,

Welcome to DMI – St. Eugene University!

I am sure you are expert in using the PC Tablets distributed by us. Now your world is open to Internet and using the tablet for your educational learning purposes. The very same book you are holding in your hand now is available in your V-Campus portal. All the teaching and learning materials are available in your portal.

As our Chancellor, Rev. Fr. Dr. J. E. Arulraj, mentioned, it is not just the success for DMI-St. Eugene University alone, it is success for the technology, it is success for the great nation of Zambia and it is success for the continent of Africa.

You can feel the improvement in the quality of the learning materials in the printed format. Improvement is done in quality of the content and the printing. Use it extensively and preserve it for your future references. This will help you to understand the subjects in a better way. The theories of the subjects have been explained thoroughly and the problems have been identified at learners' level. This book is made up of five units and every unit is mapped to the syllabus and discussed in detail.

I am happy at the efforts taken by the University in publishing this book not only in printed format, but also in PDF format in the Internet.

With warm regards



Dr. T. X. A. ANANTH

President – University Council

## **ABOUT THE AUTHORS**



Dr. V. Stephen, professional social worker with more than two decades of experience in the field of Women Empowerment, Water and Sanitation, HIV / AIDS, TB, Social Research, NGO Networking, Micro Finance, Local Governance and Community Health at grass root, middle and senior levels and teaching. With his rich field experience in varied sectors of the society, he found his calling to teach Social Work and took up the responsibility of an Associate Professor in Social Work at DMI - St. Eugene University, Lusaka, Zambia. He

has been working with DMI St. Eugene University from June 2018 to till date.

His areas of expertise in project management, programme implementation and supervisory support gained over the years of having worked with governmental / non-governmental organizations and funding agencies is immensely helping him to empower the student community to be employable. His technical skills and language skills are only adding credence to his flair for teaching using the tech platform effectively, thereby ensuring not only better reach but also engagement leading to enduring understanding for the students he teach.

His passion for research had lead him to publish 15 papers post his Doctorate in Social Work he obtained in the year 2014 having specialised in the area of local governance and women empowerment. He has also developed a keen interest in statistical analysis of data and has sharpened his analytical acumen over the years and he never shies away from passing his knowledge to fellow researchers and students alike.

He continues to strive to attain higher pinnacles in academia and is ethically bound and committed to ensure effective professional social work practice.



The Co-author **Mr. T. Velmurugan B.S.W., M.S.W., (Ph. D)** is working as Lecturer, Admission Coordinator, Vice-Principal (Academic) and Quality Assurance Officer at DMI - St. Eugene University, Zambia from 2015 onwards to till today. Before the current employment, he was with DMI – St. John Baptist University, Mangochi, Malawi for two years in the capacity as HOD in social work department. He has more than 10 Years of teaching and industrial experience in India and Abroad. He completed both Bachelor and Master degree in Social Work at India, specialist in community development from 2003 to 2008. At present, he is pursuing his Ph.D., in Social Work at Zambia. In his academic career, he taught to Bachelor and Master degree students on Social Work, Research Methodology and Field Work Practicum. He has published several articles in reputed journals and presented papers in different conferences. He is basically self-motivated and theme oriented team player.

For further communications kindly contact through email:[velusocialwork@gmail.com](mailto:velusocialwork@gmail.com)



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## **Chapter – I: BASIC RESEARCH CONCEPTS**

Research: concept, objectives, characteristics, ethics, and qualities of good researcher. Social work research: meaning, objectives, importance: difference between social research & social work research; steps in research

### **Concept of Research**

Research is a process to discover new knowledge. All research begins with a question and seeks appropriate answer. The term "research" is often loosely defined and thus used in a similar way. This unfortunate development results from a misconception about what is research. To properly understand what is research, it is good to start with common misconceptions about research. First, fact transferal is not research. Consider a typical high school research project. The teacher assigns a "research project" on some topic. The students went to the library, checked out several books, and might have copied several pertinent pages from the book. The typical student organized collected information and wrote up the "research report".

What these students did is information gathering and organization; it is nothing more or nothing less. No doubt the student went through some motions associated with research. But finding fact and fact transferal alone is not research. Transfer of information from one source, namely books and pertinent pages, to another source, namely the so-called research report, is nothing more than fact transferal, but not research. To my distress I find many college students repeat this same mistake by submitting a 'research report' which is nothing but fact transferal from one source to their report. A second misconception about research is that research is related to laboratory research (for example, in chemistry or biology in the natural sciences). When people hear term the "research", they often conjure up this image. But research is not limited to certain fields of study; it is characterized by the methods used.

What, then, is research? *Webster's Collegiate Dictionary* (1996) defines research as "studious inquiry or examination; esp: investigation or

experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws".

Research is defined as a careful consideration of study regarding a particular concern or a problem using scientific methods. According to the American sociologist Earl Robert Babbie, "Research is a systematic inquiry to describe, explain, predict and control the observed phenomenon. Research involves inductive and deductive methods."

### **Objectives of Research**

Purpose statements are realized through a set of research objectives or questions. Clearly formulated objectives (or questions) will help focus your research, structure your literature review, and guide your research design/methodology.

Research objectives (or questions) serve to narrow the purpose statement and are linked directly to the research findings. Research objectives (or questions) are the specific things you will achieve (or questions you will answer) in your research in order to accomplish your overall purpose.

Good research objectives are explicit and clearly defined, and there is a high probability of meeting them. Good research objectives are:

- Concrete statements describing what the research is trying to achieve,
- Achieved by undertaking the research,
- Grounded in the Problem Statement – not a rabbit pulled from a hat,
- Presented clearly and concisely,
- Logically/ conceptually linked,
- Comprehensive of the different aspects of the research problem you identified,
- Clearly phrased in operational terms, and
- Attainable within the expected timeframe and available resources for the study.

Johnson and Christensen (2014) offer five typical research objectives: 'exploration', 'description', 'explanation', 'prediction' and 'influence'. Qualitative and quantitative research studies can be linked to one or more of these five research objectives:

- 'Exploration' involves using mainly inductive methods to discover a concept, construct, phenomenon or situation and advance understanding, hypotheses or generalisations.
- 'Description' involves identifying and describing the antecedents, nature and aetiology of a phenomenon.
- 'Explanation' involves developing theory for the purpose of explaining the relationships among concepts or phenomena and determining reasons for the existence of events.
- 'Prediction' refers to using pre-existing knowledge or theory to predict what will occur at a later point in time.
- 'Influence' relates to manipulation of the setting or variable to produce an anticipated outcome.

Doran's (1981) criteria can be applied when setting research objectives. These are:

- Specific: be exact about what you are going to accomplish.
- Measurable: quantify the objectives.
- Appropriate: align with the needs of the target audience.
- Realistic: do you have the resources to make the objective happen?
- Time specific: state when you will achieve the objective.

These criteria are collectively known as SMART.

### **Characteristics of Research**

1. A systematic approach is followed in research. Rules and procedures are an integral part of research that set the objective of a research process. Researchers need to practice ethics and code of conduct while making observations or drawing conclusions.

2. Research is based on logical reasoning and involves both inductive and deductive methods.
3. The data or knowledge that is derived is in real time, actual observations in the natural settings.
4. There is an in-depth analysis of all the data collected from research so that there are no anomalies associated with it.
5. Research creates a path for generating new questions. More research opportunity can be generated from existing research.
6. Research is analytical in nature. It makes use of all the available data so that there is no ambiguity in inference.
7. Accuracy is one of the important character of research, the information that is obtained while conducting the research should be accurate and true to its nature. For example, research conducted in a controlled environment like a laboratory. Here accuracy is measured of instruments used, calibrations, and the final result of the experiment.

### **Research Ethics**

“The term ‘ethics’ usually refers to the moral principle and guiding conduct, which are held by a group or even a profession”. Ethics are the moral principles that a person must follow, irrespective of the place or time. Behaving ethically involves doing the right thing at the right time. Research ethics focus on the moral principles that researchers must follow in their respective fields of research. Research misconduct can have dire consequences.

Ethical decision making in academic research focuses on providing maximum benefits to the participants. Following ethical principles is indeed crucial for maintaining research integrity.

### **Ethical Principles of Research**

The following is a rough and general summary of some ethical principles that various codes address:

1. **Honesty:** Strive for honesty in all scientific communications. Honestly report data, results, methods and procedures, and publication status. Do not fabricate, falsify, or misrepresent

- data. Do not deceive colleagues, research sponsors, or the public.
2. **Objectivity:** Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research where objectivity is expected or required. Avoid or minimize bias or self-deception. Disclose personal or financial interests that may affect research.
  3. **Integrity:** Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.
  4. **Carefulness:** Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities, such as data collection, research design, and correspondence with agencies or journals.
  5. **Openness:** Share data, results, ideas, tools, resources. Be open to criticism and new ideas.
  6. **Respect for Intellectual Property:** Honor patents, copyrights, and other forms of intellectual property. Do not use unpublished data, methods, or results without permission. Give proper acknowledgement or credit for all contributions to research. Never plagiarize.
  7. **Confidentiality:** Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.
  8. **Responsible Publication:** Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.
  9. **Responsible Mentoring:** Help to educate, mentor, and advise students. Promote their welfare and allow them to make their own decisions.
  10. **Respect for colleagues:** Respect your colleagues and treat them fairly.
  11. **Social Responsibility:** Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.

12. **Non-Discrimination:** Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors not related to scientific competence and integrity.
13. **Competence:** Maintain and improve your own professional competence and expertise through lifelong education and learning; take steps to promote competence in science as a whole.
14. **Legality:** Know and obey relevant laws and institutional and governmental policies.
15. **Animal Care:** Show proper respect and care for animals when using them in research. Do not conduct unnecessary or poorly designed animal experiments.
16. **Human Subjects Protection:** When conducting research on human subjects, minimize harms and risks and maximize benefits; respect human dignity, privacy, and autonomy; take special precautions with vulnerable populations; and strive to distribute the benefits and burdens of research fairly.

### **The Importance of Research Ethics**

Research ethics are important for a number of reasons.

- They promote the aims of research, such as expanding knowledge.
- They support the values required for collaborative work, such as mutual respect and fairness. This is essential because scientific research depends on collaboration between researchers and groups.
- They mean that researchers can be held accountable for their actions. Many researchers are supported by public money, and regulations on conflicts of interest, misconduct, and research involving humans or animals are necessary to ensure that money is spent appropriately.
- They ensure that the public can trust research. For people to support and fund research, they have to be confident in it.
- They support important social and moral values, such as the principle of doing no harm to others.

## Five Dimensions of Research Ethics

The social scientists have identified five core dimensions of research ethics:

- (1) normative ethics, which includes meta-ethical questions;
- (2) compliance with regulations, statutes, and institutional policies;
- (3) the rigor and reproducibility of science;
- (4) social value; and
- (5) workplace relationships.

Most dimensions are important to multiple groups; yet, in their experience, certain groups tend to express concerns about issues within a certain dimension more than other groups do. Below, they describe each dimension and its groups of primary stakeholders. They illustrate some of the specific topics subsumed under each dimension through a series of questions commonly addressed when engaging the dimension.

1. Normative ethics: Normative ethics is ethics in the classic sense of determining what is right and wrong. Normative research ethics examines questions such as:
  - “Is informed consent necessary when patients are randomized to different, commonly accepted standards of care?”
  - “Is conducting harmful research on nonhuman animals that appear highly intelligent (e.g., chimpanzees and gorillas) ethical when the outcome may benefit humans?”
  - “Are some research questions (e.g., about the connection between genetics and traits such as criminality) forbidden if the consequences of the resulting knowledge could be socially harmful?”

Insofar as many different groups support research (or are complicit in research) including not only researchers but also research institutions, funding agencies, taxpayers, publishers, and members of



the public who consume the fruits of research. We are all stakeholders in normative ethics.

2. Compliance: Compliance consists of many different activities aimed at ensuring that those involved in actually conducting research (PIs, trainees, lab staff) follow federal research regulations, state laws, and institutional policies while they carry out their investigations. Compliance programs may address questions such as:
  - “Which training programs are mandatory and for whom?”
  - “When noncompliance especially serious or persistent noncompliance occurs, when does it need to be reported, to whom, and how?”
  - “What procedures can help a research team ensure that all informed consent forms have the proper stamp, date, and signature?”

Compliance rules often express commitment to an underlying value. For example, the value of participant self-determination underlies informed consent rules, and good stewardship of taxpayer dollars underlies rules about allowable costs on grants. Viewed from this perspective, everyone associated with research in some fashion has a stake in compliance. Nevertheless, different groups are primary stakeholders in different regards. Institutions and researchers frequently express concerns about administrative burdens and potential penalties; oversight bodies express concerns about noncompliance and their ability to enforce rules; and legislators express concerns when they receive reports of harm resulting from noncompliance.

3. Rigor and reproducibility: Rigor and reproducibility gets at the heart of what researchers typically mean by “good science.” Within the biomedical sciences, programs focused on enhancing the rigor and reproducibility of research ask questions such as:

- “Has the study included animal subjects or human participants from both biological sexes to foster the generalizability of findings?”
- “Have biological resources such as cell lines or antibodies been authenticated?”
- “Have data been appropriately documented and deposited in a repository to enable replication studies?”

Researchers care deeply about such matters. Their work is motivated by the desire to discover truth and to develop new technologies neither of which can occur when research is conducted in a sloppy manner. Because rigor and reproducibility largely constitute good science the only kind of science that can offer social value and justify risks to subjects and financial investment in research everyone is a stakeholder in this dimension.

4. Social value: Social value means that research addresses problems of importance to society, generating knowledge used to solve real-world problems through new technologies or procedures. Those who seek to promote social value may ask questions such as:
  - “Does the study address a socially important topic?”
  - “Has the public been engaged to identify priorities, and have these priorities been truly considered in developing research questions?”
  - “Does the study include an appropriate follow-up or dissemination plan to ensure that it has its intended impact?”

While scientists often view basic science as intrinsically valuable (and often of unforeseen practical value), this dimension acknowledges that science is rarely an individual, self-funded effort, and the priorities of stakeholders should have some influence on research priorities. Scientists have traditionally placed little emphasis on social value, yet its growing significance is readily apparent in several initiatives.

5. **Workplace relationships:** Workplace relationships at least labeled as such may be a newly identified aspect of research ethics. Although researchers may not have considered this dimension much previously, we believe it is integral to doing good research in a good manner. The specific form that respectful and effective workplace relationships take may vary significantly across cultures with different hierarchies and different workload expectations. Still, we submit that every culture harbours those who are good to work with (and for), and those who are not. The workplace relationships dimension of research ethics entails questions such as:
  - “Do members of the research team welcome diversity and treat one another with respect?”
  - “Does the PI set workloads and deadlines reasonably to enable work to be done without cutting corners or compromising quality?”
  - “Does open communication enables team members to express concerns about the quality of work or the work environment?”

In the broadest sense, everyone is a stakeholder in workplace relationships because when relationships turn sour, the risk of poor work performance, staff turnover, and even intentional sabotage increases, which can, in turn, threaten the quality of science; nevertheless, the most obvious stakeholders in this dimension are researchers themselves PIs, graduate students, postdocs, and research or lab staff. Typically, research staff and trainees those who work full-time in research labs and teams have less power than PIs and express the greatest concerns about workplace relationships.

### **Qualities of a Good Researcher**

1. **Friendly with Respondents.** A good researcher must have the quality to become friendly with respondents. It should have to talk to them in the same language in which the responding are answering and make happy made.

2. **Least Discouragement.** If the people are not co-operate to give correct data, the researcher should not be discouraged and face the difficulties, it would be called a good researcher.
3. **Free From Prejudice.** A researcher would be good if he has no prejudice or bias study about a problematic situation but he is capable of providing clear information's.
4. **Capacity of Depth Information.** A researcher should have the capacity to collect more and more information in little time.
5. **Accuracy.** A researcher would be said to be good, if he is accurate in his views. His ideas must be accurate one.
6. **Truthful.** A researcher must have to be truthful. Its idea would be free from false reports and saying information.
7. **Keen Observer.** It is the quality of a good researcher that he may have the ideas of keen and deep observation.
8. **Careful in Listening.** A researcher would be more careful in listening. He would have the quality of listening very low information's even whispering.
9. **Low Dependency on Common Sense.** A researcher should be called good if he has low dependency on common sense but keep in observation all the events and happenings.
10. **Least time Consumer.** Good researcher must have the capacity of least time consuming. It will have to do more work in a little time because of the shortage of time.
11. **Economical.** Good researcher must have control over his economic resources. He has to keep his finances within limits and spend carefully.
12. **Low Care of Disapprovals of Society.** A good researcher have no care of the approvals or disapprovals but doing his work with zeal and patience to it.
13. **Expert in Subject.** A researcher would be a good one if he has full command over his subject. He makes the use of his theoretical study in field work easily.
14. **Free From Hasty Statements.** It is not expected from a good researcher to make his study hasty and invalid with wrong statements. Its study must be based on reality & validity.

15. **Good in Conversation.** The conversation of a good researcher should be sympathetic and not boring. He must have the skill and art to be liked by the people.
16. **Having Clear Terminology.** A good researcher's terminology would be clear. It would be free from outwards to become difficult for the respondents to answer.
17. **Trained in Research Tools.** Research is impossible without its techniques and tools. So, it should be better for a researcher to know about the use of these tools.
18. **Dress and Behavior same to the area.** The dress and the behavior of the researcher should be same as to the study area. It is must for him to convince the people easily and adopt their dress.
19. **More Analytical.** A researcher would be different from other people of the society. On the basis of this quality he may observe the situation very well. Then he should be able to solve the problems easily.
20. **Equality and Justice.** A good researcher should believe on equality and justice. As equal to all type of people he may collect better information's from the respondents.

## **Social Work Research**

### **Meaning**

In a very broad sense, social work research is the application of research methods to solve problems that social workers confront in the practice of social work. It provides information that can be taken into consideration by social workers prior to making decisions, that affect their clients, programmes or agencies such as use of alternative intervention techniques or change or modification of programme / client / objectives and so forth.

Following are some of the situations which call for application of social work research methods and techniques:

- A social caseworker is interested in assessing the nature and extent of the problem of her client who has been facing marital maladjustment. She may be interested in obtaining information

about the actual or potential effectiveness of the client. She may also be keen to know to what extent the intervention would be effective.

- A group worker wishes to assess the extent to which the technique of role play is more or less effective than group discussion in increasing knowledge of drug abuse among school going children.
- A community organiser wants to know the views of the community before he takes a decision to change the programme objectives.
- A director of special school for mentally retarded children wants to know whether group therapy is as effective as individual therapy in increasing adaptability of mentally retarded children.
- A social work administrator is concerned about effectiveness of implementation of new programme launched.

### **Social Work Research: Definition**

Social work research may be defined as systematic investigation into the problems in the field of social work. The study of concepts, principles, theories underlying social work methods and skills are the major areas of social work research. It involves the study of the relationship of social workers with their clients; individuals, groups or communities on various levels of interaction or therapy as well as their natural relationships and functioning within the organizational structure of social agencies.

While on the theoretical side, social work research re-examines the special body of knowledge; concepts and theories, where as in the area of social work practice it tries to evolve a systematic theory and valid concepts, to know the efficacy of different methods / interventions of social work as to search for alternate innovative interventions and treatments.

Social work research, therefore, concerns itself with the problems faced by social workers. It encompasses those questions which are encountered in social work practices or in planning or administering

social work services which can be solved through research and which are appropriate for investigation under social work auspices.

### **Objectives of Social Work Research**

The objectives of social work research may be broadly categorized as follows:

- To discover new facts or verify and test old facts
- To understand the human behaviour and its interaction with the environment and the social institutions.
- To find out the causal connection between human activities and natural laws governing them.
- To develop new scientific tools, concepts and theories, which would facilitate reliable and valid study of human behaviour and social life.
- Study to establish, identify and measure the need for service.
- To measure the services offered as they relate to needs.
- To test, gauge and evaluate results of social work intervention.
- To list the efficacy of specific techniques of offering services.
- Studies in methodology of social work.

### **Importance of Social Work Research**

Social work is a practice profession. As such, the major objective of social work research is to search for answers to questions raised regarding interventions or practice effectiveness. In other words social work research attempts to provide knowledge about what interventions or treatments really help or hinder the attainment of social work goals. In addition, it also helps in searching for answers to problems or difficulties faced by social work practitioners in the practice of their profession. Ultimately it helps building knowledge base for social work theory and practice.

Social work research also deals with problems faced by professional social workers, social work agencies and community in its concern with social work functions. In other words in social work research the



problems to be investigated are always found in the course of doing social work or planning to do it.

It is obvious that in social work research the study of a problem is from the point of view of social work and that of professional social work. The designing of research problems, data collection and its interpretation will have to be attempted in a manner as would be useful to professional social work which would add new knowledge to the social work theory and practice and improve the efficiency of professional social workers.

Social work research is regarded as the systematic use of research concepts, methods, techniques and strategies to provide information related to the objectives of social work programmes and practices. Thus the unit of analysis of social work research could be individuals, groups, families or programme of the agency. That is, social work research, typically focuses on assessment of practitioner's work with individuals, groups, families, communities or appraisal of agencies or programmes that involve the continued efforts of practitioners with many clients. As such, the research design, data collection and analytic strategies in social work research vary as a function of unit of analysis and programme of agencies of social work practitioner.

Social work research is the use of the scientific method in the search of knowledge, including knowledge of alternate practice and intervention techniques, which would be of direct use to the social work profession and thus enhance the practice of social work methods. Social work research focuses on or confines itself to select aspects of behaviour and alternate models of behaviour modifications. Social work research helps to find ways and means to enhance social functioning at the individual, group, community and societal levels.

Social work research lays special emphasis on evaluation. This is one of the reasons that social work research is also understood as evaluative research. Under social work research, varieties of

evaluative researches are undertaken. Some of the researches are on impacts or effects, efficacy and effectiveness. Evaluation of agencies and its projects and programmes are some of the specialized areas of social work research.

### **Difference between Social Research & Social Work Research**

Social research implies discovery of some facts concealed in a social phenomenon or some laws governing it. It is mainly concerned with the cause and effect relationship of human behaviour and the discovery of new facts as well as the verification of old facts. Therefore, "we may define social research as the systematic method of discovering new facts or verifying old facts, their sequences, interrelationships, causal explanations and the natural laws which govern them."

While studying human behaviour and social problems and discovering new interrelations, new knowledge, new facts and verifying old ones, social research applies the scientific method and tries to establish the causal connection between various human activities and the natural laws governing them by means of logical and systematized methods because the human behaviour may be motivated by certain rules and laws and does not appear haphazardly. Briefly stated, social research implies scientific investigation conducted in the field of social as well as behavioral sciences.

It is generally believed that social research and social work research do not have much difference as the purpose of promoting the welfare of the humanity through investigation remains common to both. Whereas the social work research commences with practical problems, social research aims at producing such knowledge that can be of use in planning and executing the social work programmes. Social research also has the objective of accumulating knowledge for understanding the social life of human beings.

The social work research is an applied research which has the purpose of gaining knowledge in order to control or change human

behaviour. On the other hand, social research may have practical as well as theoretical concern. Social work research serves the objectives of social work. On the contrary, social research does not have any specific goal. The main objective is to enhance in the knowledge of any social science. Moreover the social work research renders helps to the social workers for dealing which social problems relating to their client which may be afflicting either individual or the group or community. Social research may be of use to social worker as well as entire field of social work as it helps in enhancing the knowledge of dealing with and understating human behaviour.

Social research tends to focus on the more broad aspects of society or large subcultures within society. Social work research tends to focus more on issues that affect individuals. For example, comparing two different treatment models for domestic violence shelters. Social work research can focus on issues that commonly affect people and can help to determine the prevalence of the issue among a population group. It can study different modes of treatments to help determine which mode is most effective and this can lead to “best practices” recommendations. Social work research can also be used in a “program analysis” which seeks to determine how well a certain treatment program is working.

Social research tends to have a macro focus whereas, social work research is more specifically focused on issues affecting individuals, on treatment modalities or on program evaluation.

### **The Process of Social Work Research**

It must be borne in mind that the process of social work research is not completely identical to social research. In fact, there are many similarities between this process and the traditional research process. The process however, has some additional steps designed to suit the objectives of social work research. By following the process social work researchers are in a position to know precisely what intervention was applied and how much effect was produced. The process also links research and practice.

Social work research starts with problem identification and setting up of goals. This is followed by the process of assessment (or need assessment) of the client's problems. During these initial stages, the researcher strives to obtain a clear and specific understanding of the problem, using assessment tools such as interviewing.

After the problem is identified and needs are assessed, the next step is to set up goals to be achieved. The goals are required to be specific, precisely defined and measurable in some way. The third step in the process is to have a pre-intervention measurement, that is, measurement prior to intervention; the pre-intervention measurement is used as basis from which to compare the client's condition after the intervention is introduced.

Next stage in the process is to introduce intervention. It is important here to note that only a single, coherent intervention be applied during any intervention phase. In the last stage, we assess the effects of intervention by comparing the two measurements, that is, pre-intervention measurement and measurements during intervention.

### **Steps in Research**

Scientific research involves a systematic process that focuses on being objective and gathering a multitude of information for analysis so that the researcher can come to a conclusion. This process is used in all research and evaluation projects, regardless of the research method (scientific method of inquiry, evaluation research, or action research). The process focuses on testing hunches or ideas in a park and recreation setting through a systematic process. In this process, the study is documented in such a way that another individual can conduct the same study again. This is referred to as replicating the study. Any research done without documenting the study so that others can review the process and results is not an investigation using the scientific research process.

The scientific research process is a multiple-step process where the steps are interlinked with the other steps in the process. If changes are made in one step of the process, the researcher must review all the other steps to ensure that the changes are reflected throughout the process. Parks and recreation professionals are often involved in conducting research or evaluation projects within the agency. These professionals need to understand the eight steps of the research process as they apply to conducting a study. The steps of the research process and provide an example of each step for a sample research study.

1. Selection of Research Problem
2. Extensive Literature Survey
3. Making Hypothesis
4. Preparing the Research Design
5. Sampling
6. Data collection
7. Data Analysis
8. Hypothesis Testing
9. Generalization and Interpretation
10. Preparation of Report

### **1. Selection of Research Problem**

The selection of topic for research is a difficult job. When we select a title or research statement, then other activities would be easy to perform. So, for the understanding thoroughly the problem it must have to discuss with colleagues, friend, experts and teachers. The research topic or problem should be practical, relatively important, feasible, ethically and politically acceptable.

### **2. Literature Review or Extensive Literature Survey**

After the selection of research problem, the second step is that of literature mostly connected with the topics. The availability of the literature may bring ease in the research. For this purpose academic journals, conference and govt. reports and library must be studied.

### **3. Making Hypothesis**

The development of hypothesis is a technical work depends on the researcher experience. The hypothesis is to draw the positive & negative cause and effect aspects of a problem. Hypothesis narrows down the area of a research and keep a researcher on the right path.

### **4. Preparing the Research Design**

After the formulation of the problem and creating hypothesis for it, research Design is to prepare by the researcher. It may draw the conceptual structure of the problem. Any type of research design may be made, depend on the nature and purpose of the study. During research design, the information about sources, skill, time and finance is taken into consideration.

### **5. Sampling**

The researcher must design a sample. It is a plan for taking its respondents from a specific areas or universe. The sample may be of two types:

1. Probability Sampling
2. Non-probability Sampling

### **6. Data collection**

Data collection is the most important work, is researcher. The collection of information must be containing on facts which is from the following two types of researcher.

1. Primary Data Collection: Primary data may be from the following.

1. Experiment
2. Questionnaire
3. Observation
4. Interview

2. Secondary data collection: it has the following categories:

1. Review of literature
2. Official and non-official reports
3. Library approach

## **7. Data Analysis**

When data is collected, it is forwarded for analysis which is the most technical job. Data analysis may be divided into two main categories.

Data Processing: it is sub-divided into the following. Data editing, Data coding, Data classification, Data tabulation, Data presentation, Data measurement

Data Exposition: Data Exposition has the following sub-categories. Description, Explanation, Narration, Conclusion/Findings, Recommendations / Suggestions.

## **8. Hypothesis Testing**

Research data is then forwarded to test the hypothesis. Do the hypothesis are related to the facts or not? To find the answer the process of testing hypothesis is undertaken which may result in accepting or rejecting the hypothesis.

## **9. Generalization and Interpretation**

The acceptable hypothesis is possible for researcher to arrival at the process of generalization or to make & theory. Some types of research has no hypothesis for which researcher depends upon on theory which is known as interpretation.

## **10. Preparation of Report**

A researcher should prepare a report for which he has done is his work. He must keep in his mind the following points:

- a) Report Design in Primary Stages: The report should carry a title, brief introduction of the problem and background followed by acknowledgement. There should be a table of contents, graphs and charts.
- b) Main Text of the Report: It should contain objectives, hypothesis, explanations and methodology of the research. It must be divided into chapters and every chapter explains separate title in which summary of the findings should be enlisted. The last



section would be clearly of conclusions to show the main theme of the R-study.

- c) **Closing the Report:** After the preparation of report, the last step in business research process contains of bibliography, references, appendices, index and maps or charts for illustration. For this purpose the information should more clearer.

### **Goals of Social Work Research**

Social work research offers an opportunity for all social workers to make differences in their practice. There is no doubt about the fact that social worker will be more effective practitioner guided by the findings of social work research. Thus, social work research seeks to accomplish the same humanistic goals, as does a social work method. Social work research deals with those methods and issues, which are useful in evaluating social work programmes and practices. It explains the methodology of social research and illustrates its applications in social work settings.

### **Limitations of Social Work Research**

A substantive part of social work practice is concerned with the micro-level practice, such as working with individuals, groups, or a community. Social work research has to take into consideration the limitations of micro level design of study and techniques. Social work research is basically a practice based research which mostly draws its inferences through inductive reasoning. That is, inferring something about a whole group or a class of objects from the facts or knowledge of one or few members of that group / class.

Thus, in practice based research inductive reasoning carries us from observation to theory through intervention / assessment. Practitioners, for example, may observe that delinquents tend to come from family with low socio-economic status. Based on the assumption that the parent-child bond is weaker in low socio-economic families and that such parents, therefore, have less control over their children, the practitioners may inductively conclude that a

weak parent-child bond leads to delinquency. Practice based research has to take into consideration the limitations of micro level practice. Accordingly, practice based research has to have special design of study and techniques.

## **Chapter – 2: RESEARCH PROBLEM**

Selection of problem: criteria and sources; surveying the field;  
Literature review: purpose; using library and internet, library ethics;  
Defining the problem: need and significance of the problem;  
Hypothesis: meaning, sources, characteristics, and types

### **Research Problem**

A research problem is the main organizing principle guiding the analysis of your paper. The problem under investigation offers us an occasion for writing and a focus that governs what we want to say. It represents the core subject matter of scholarly communication, and the means by which we arrive at other topics of conversations and the discovery of new knowledge and understanding.

Problems for research are everywhere. Take a good look around the world. We might see various kinds of vending machines placed everywhere. But have we thought of having a more user-friendly vending machine that is much easier to use? Or, we might be frustrated waiting for a public transportation that never shows up on time and we wish somebody can come out with a better system that prioritises punctuality. These are examples of problems which need to be relooked and researched. That is why we say that the heart of every research is the problem. Research problem is paramount to the success of a research effort. In ICT, the problems are broad and technology-centric.

According to Powers, Meenaghan & Twoomey (1985), potential research questions may occur to us on a regular basis but the process of formulating them in a meaningful way is not at all an easy task. As a beginner, it might be easy to formulate a problem but it requires considerable knowledge of both the subject of interest and research methodology. Once we examine a question more closely, we will realise the complexity of formulating a research problem into something that is researchable. It is essential for the problem we formulate to be able to withstand scrutiny in terms of the procedures

required. Hence, a student should spend considerable time in thinking to formulate a researchable research problem.

### **Selection of Research Problem**

When selecting a research problem for a research study, there are a few factors which we need to consider. These factors will ensure that our research process is more manageable and we will remain motivated. The table below shows the factors to consider in selecting a research problem.

**Consideration Factors in Selecting Research Problem**

<b>Sl. No.</b>	<b>Consideration Factor</b>	<b>Description</b>
1	Interest	<ul style="list-style-type: none"><li>• The most important criterion in selecting a research problem.</li><li>• The whole research process is normally time consuming and a lot of hard work is needed. If you choose a topic which does not greatly interest you, it would become difficult to keep up the motivation to write.</li></ul>
2	Expertise	<ul style="list-style-type: none"><li>• Before selecting a research problem, you need to ensure that you met certain level of expertise in the area you are proposing.</li><li>• Make use of the facts you learned during the study and of course your research supervisors will lend a hand as well.</li></ul>
3	Data availability	<ul style="list-style-type: none"><li>• If your research title needs collection of information (journal, reports, proceedings) before finalising the title, you need to make sure you have these materials available and in the relevant format.</li></ul>
4	Relevance	<ul style="list-style-type: none"><li>• Always choose a topic that suits your</li></ul>

Sl. No.	Consideration Factor	Description
		interest and profession. Ensure that your study adds to the existing body of knowledge. Of course, this will help you to sustain interest throughout the research period.
5	Ethics	<ul style="list-style-type: none"> <li>• In formulating the research problem, you should consider some ethical issues as well.</li> <li>• Sometimes, during the research period, the study population might be adversely affected by some questions.</li> <li>• In ICT, some scenarios might occur especially research related information security, which might concern certain authorities. Therefore, it is always good for you to identify ethics related issues during the research problem formulation itself.</li> </ul>

### Steps in Selection of Research Problem

The most essential part of your research project is obviously the formulating of a research problem. In other words, selecting your research topic. This is because of the quality and relevancy of your research work completely depends on it. The process in formulating a research problem requires a series of steps. There are 7 basic steps in formulating a research problem.

**1. Identify the Broad Study Area:** This is a great idea to thinking about the subject area of your interest. You should identify the field in which you would like to work a long time after your academic study or graduation. It will help you tremendously to get an interesting research topic. For example- if you do graduation in sociology, you must decide your research study area in sociology.

You might choose social problems like unemployment, road accident, community health, HIV/AIDS etc.

**2. Dissect the Broad Study Area into Subareas:** In this stage, you need to dissect and specify your research broad study area into some subareas. You would consult with your supervisor on this regard. Write down subareas. For example- if you select unemployment as your broad study area, then dissect it into unemployment & social stability, unemployment & crime, unemployment & individual frustration etc.

**3. Mark-up your Interest:** It is almost impossible to study all subareas. That's why you must identify your area of interest. You should select issues in which you are passionate about. Your interest must be the most important determinant of your research study. Once you selected your research study of interest, you should delete other subareas in which you do not feel interested.

**4. Study Research Questions:** In this step, you would point out your research questions under the area of interest as you decided in the previous stage. If you select unemployment as your study area, your questions might be "how unemployment impact on individual social status?" "How it affects social stability?" "How it creates frustration on individuals?" Define what research problem or question you are going to study?

**5. Set out Objectives:** Formulate your research main objectives and sub-objectives. Research objectives necessarily come from research questions. If you do study "Impact of unemployment on individual social status" as your research problem or research question. Then, set out what would you like to explore to address. For Example- your main objective might be to examine the unemployment status in a particular society or state.

**6. Assess your Objectives:** Now, you should evaluate your objectives to make sure the possibility of attaining them through

your research study. Assess your objectives in terms of time, budget, resources and technical expertise at your hand. You should also assess your research questions in light of reality. Determine what outcome will bring your study. Then, go to the next step.

**7. Check Back:** In this final step, you should review all the things what you have done till now in the purpose of your research study. Ask yourself about your enthusiasm. Do you have enough resources to step up? If you are quite satisfied, then you forward to undertake your research work.

### **Sub-problems in Research**

While constructing your research problem, you might come across several sub problems. Sub-problems are sub-parts of the main research problem you designed. As a student, you must be able to distinguish sub-problems that are an integral part of the main problem from things that look like problems but are nothing more than procedural issues. The latter is actually pseudo-sub problems which involve decisions the researcher must make before he/she can resolve the research problem and its sub problems.

There are four key characteristics of sub-problems:

- (a) Each sub problem should be a Completely Researchable Unit
- A sub-problem should constitute a logical sub-area of the larger research undertaking.
  - Each sub-problem might be researched as a separate subproject within the larger research goal.
  - The solutions to the sub-problems, taken together, combine to resolve the main problem.
  - It is essential that each sub-problem be stated clearly and succinctly (expressed briefly and clearly).
  - Often, a sub-problem is stated in the form of a question because it tends to focus the researcher's attention more directly on the research target of the sub-problem than does a declarative statement.



- After all, an interrogative attitude is what marks a true researcher.

(b) Each Sub problem must be Clearly Tied to the Interpretation of the Data

- At some point in the statement of the sub-problem – as within the main problem with the fact that data will be interpreted must be clearly evident
- This fact may be expressed as a part of each sub-problem statement, or it may occupy an entirely separate sub-problem.

(c) The Sub problems must Add Up to the Totality of the Problem

- After the sub-problems have been stated, check them against the statement of the main problem to see that nothing in excess of the coverage of the main problem is included.

(d) Sub problems should be small in Number

- If the main problem is carefully stated and properly limited to a feasible research effort, the researcher will find that it usually contains two to six sub-problems.
- Sometimes, the inexperienced researcher will come up with as many as 10, 15 or 20 sub-problems.

### **Criteria for Selection of Research Problem**

There are two factors in the selection of topic **external and personal**. An external criterion involves how the topic is important for the field, availability of both data and data collection methods and the administration is cooperative or not. Personal Criteria means researcher own interest, time and cost.

A criterion for selection of research problem depends on the following characteristics.

**Personal Inclination:** The chief motivation in the way of selecting research problem is the personal inclination of the researcher. If a

researcher has personal interest in the topic, he would select that problem for his research work.

**Resources Availability:** During the selection, a researcher will see to the resources available. If these resources like money, time, accommodation and transport are available to the selection place, then the selection of the problem is easy.

**Relative Importance:** The importance and the problem also play a vital role in the selection of research problem. If the problem is relatively important, then the researcher tends towards the selection of the problem.

**Researcher Knowledge:** The researcher knowledge should play a vital role in the selection of the research problem. The wisdom and experience of an investigator is required for well collection of the research data. He can bitterly select a problem.

**Practicality:** Practicality is also responsible for the selection. The practical usefulness of the problem is the main motivation for a researcher to attend it.

**Time-lines of the Problem:** Some problems take little time for its solution while others take more time. So, it depends on the time in which we have to complete his research work.

**Data Availability:** If the desired data is available to the researcher, then the problem would be selected.

**Urgency:** Urgency is a pinpoint in the way of the selection of research problem. Urgent problem must be given priority because the immediate solution can benefit the people.

**Feasibility:** Feasibility is also an important factor for the selection of the research problem. The researcher qualification, training and experience should match the problem.

**Area Culture:** The culture of the area for which a researcher conducts his research is also responsible for the selection of research problem.

### **Sources of Research Problem**

1. **Person experience:** Day-to-day personal experience of a researcher may serve as good source of ideas to formulate a research problem. For example, a researcher observed domestic violence suffered by wives of alcoholic husbands. This experience may provide ideas to identify several research problems related to domestic violence against women. There may be so many such life experiences of a researcher which could be used to develop a research problem.
2. **Practical experience:** Social workers get plenty of ideas to formulate research problems from their clinical / field experiences. Every curious social worker has several questions to be answered that are encountered during clinical / field experience. For example, a social worker finds that unrestricted visiting hours in surgical wards reduced the analgesic demand among postoperative patients.
3. **Critical appraisal of literature:** When we critically study books and articles relating to the subject of our interest, including research reports, opinion articles, and summaries of clinical issues, pertinent questions may arise in our mind. These may strike reader's mind indirectly by stimulating imagination and directly by stating what additional research is needed. For example, a social worker reads an article on the prevalence of poverty among remote rural communities.
4. **Previous research:** A body of knowledge should be developed on a sound foundation of re- search findings. Usually, at the end of a research, further research problems are suggested, based on the shortcomings of previous research, which can be

investigated. In social work profession, not much research has been yet done; therefore, this profession needs researchers who are willing to replicate or repeat other studies on different samples and settings where all the essential elements of the original study are held intact. Further refinements may be made in the experimental treatments, or more appropriate outcome measures may be identified.

5. **Existing theories:** Research is a process of theory development and theory testing. Social workers use many theories from other disciplines in their practices. If an existing theory is used in developing a researchable problem, a specific statement from the theory must be isolated. Generally, a part or parts of the theory are subjected to testing in the clinical / community situation. The testing of an existing theory is definitely needed in social work; therefore, they serve as good sources of research problems.
6. **Client feedback:** Research problems may be generated from the results of activities aimed to solicit beneficiary / client feedback. For example, at the time of intervention in the community based settings, a social worker obtained a feedback from the client / beneficiary. The client verbalized that the intervention strategies and methods adopted was a wonderful experience except the demonstration of condom usages in public. This feedback provided a concept for social worker to research on efficacy available alternative means of demonstration of condom usages to minimize the discomfort of community members.
7. **Performance improvement activities:** The performance improvement activities, also known as quality improvement activities, are used to improve processes and outcomes to meet regulatory requirement. In the process of performance activities, several issues merge that require answers through research.

Thus performance improvement activities also serve as an important source of research problem.

8. **Social issues:** Sometimes, topics are suggested by more global contemporary social or political issues of relevance to the health care community. For example, HIV/AIDS, female feticide, sexual harassment, domestic violence, and gender equality in health care and in research are some of the current social and political issues of concern for social work professionals.
9. **Brainstorming:** Brainstorming sessions are good techniques to find new questions, where an intensified discussion among interested people of the profession is conducted to find more ideas to formulate a good research problem. For example, ideas for studies may emerge from reviewing research priorities by having brainstorming session with other social workers, nurses, researchers, or teaching faculty.
10. **Intuition:** Traditionally, intuitions are considered good sources of knowledge as well as sources to find new research problems. It is believed that the reflective mind is a good source of ideas, which may be used to formulate a good research problem.
11. **Folklores:** Common beliefs could be right or wrong. For example, it is generally believed that studying just before the test decreases the score. We believe we should not study just before test to relax our mind. Researchers can conduct a research study on whether one should study before the test or not.
12. **Exposure to field situations:** During field exposure, researchers get variety of experiences, which may provide plenty of ideas to formulate research problems. For example, while working in field, a researcher observed a specific traditional practice for cure of a disease condition, which can be used as research problem to investigate its efficacy.

13. **Consultations with experts:** Experts are believed to have sound experience of their respective field, which may suggest a significant problem to be studied. In addition, experts may help in finding a current problem of discipline to be solved, which may serve as basis for formulation of research problem.

### **Surveying the field for selection of research problems**

As a research method, a survey collects data from subjects who respond to a series of questions about behaviours and opinions, often in the form of a questionnaire. The survey is one of the most widely used scientific research methods. The standard survey format allows individuals a level of anonymity in which they can express personal ideas.

Social scientists conduct surveys under controlled conditions for specific purposes. Surveys gather different types of information from people. While surveys are not great at capturing the ways people really behave in social situations, they are a great method for discovering how people feel and think or at least how they say they feel and think. Surveys can track preferences for presidential candidates or reported individual behaviours (such as sleeping, driving, or texting habits) or factual information such as employment status, income, and education levels.

A survey targets a specific population, people who are the focus of a study, such as college athletes, international students, or teenagers living with type 1 (juvenile-onset) diabetes. Most researchers choose to survey a small sector of the population, or a sample: that is, a manageable number of subjects who represent a larger population. The success of a study depends on how well a population is represented by the sample. In a random sample, every person in a population has the same chance of being chosen for the study. According to the laws of probability, random samples represent the population as a whole. For instance, a Gallup Poll, if conducted as a nationwide random sampling, should be able to provide an accurate

estimate of public opinion whether it contacts 2,000 or 10,000 people.

### **Needs of the Research Problem**

Research problem provides direction and defines the purpose(s) of any particular research, which could be one or combination of the followings:

- i. The filling of existing knowledge gap or gap in knowledge
- ii. Knowledge of the relationship among different aspects of nature or phenomenon
- iii. Testing and verification of new or old body of knowledge, theories or beliefs.
- iv. The need for theory construction
- v. Resolution and clarification of contradictory findings or classical problems
- vi. Informing changes in present practice?

Necessity of defining a research problem is important to formulate a research problem properly. Quite often we all hear that a problem clearly stated is a problem half solved. This statement signifies the need for defining a research problem. The problem to be investigated must be defined unambiguously for that will help to discriminate relevant data from the irrelevant ones.

A proper definition of research problem will enable the researcher to be on the track whereas an ill-defined problem may create hurdles. Questions like: What data are to be collected? What characteristics of data are relevant and need to be studied? What relations are to be explored. What techniques are to be used for the purpose? and similar other questions crop up in the mind of the researcher who can well plan his strategy and find answers to all such questions only when the research problem has been well defined.

Thus, defining a research problem properly is a prerequisite for any study and is a step of the highest importance. In fact, formulation of a problem is often more essential than its solution. It is only on careful

detailing the research problem that we can work out the research design and can smoothly carry on all the consequential steps involved while doing research.

### **Significance of the Research Problem**

There are several benefits of formulating a research problem. The actual research begins with the formulation of a research problem. It makes you well aware of the tasks that you have to perform in order to accomplish the research. Research is a process that you have to complete in a sequence. A research problem helps us formulate that sequence. Research problem also helps us avoid unnecessary steps during the research.

1. A research problem is the preliminary step in conducting a research study. A research problem helps you understand the research procedure in a better manner. Most beginners in research think that a research problem is easy to formulate but in reality it is not so. A research problem needs great thought on the part of the researcher in order to formulate a scientific research problem. A scientific research problem is one that can be solved using scientific procedures.
2. In actual the purpose of the research problem is to determine the objective and intention of the research, in the absence of an aim or objective we cannot determine the research methodology. A research problem can help us identify each and every step of the research process: the study design, sampling strategy, research instrument and research analysis.
3. The research problem should have great clarity since the research process in itself generates more questions. In the absence of a clear and well defined research problem the researcher can become confused. In addition the research question or research problem should have to be interesting so that the researcher become well engaged in the research. The passion of the researcher in conducting the research matters a lot in the research.



4. The research problem should have to be manageable within our resources; otherwise it will become difficult for us to undertake it. We should know about the time, energy and money that we have in order to design a manageable research.

Frequently we all hear that a problem clearly expressed is a problem half solved. This statement indicates the necessity of defining a research problem in research methodology. This actually results in a smoother progress on all the steps which are needed to follow.

### **Hypothesis**

Once the problem to be answered in the course of research is finally instituted, the researcher may, if feasible proceed to formulate tentative solutions or answers to it. These proposed solutions or explanations are called hypotheses which the researcher is obliged to test on the basis of fact already known or which can be made known.

If such answers are not formulated, even implicitly, the researcher cannot effectively go ahead with the investigation of his problem because, in the absence of direction which hypotheses typically provide, the researcher would not know what facts to look for and what relation or order to search for amongst them.

A research hypothesis is quite often a predictive statement, which is capable of being tested using scientific methods that involve an independent and some dependent variables. For instance, the following statements may be considered:

- Drinking sugary drinks daily leads to obesity or,
- The female students perform as well as the male students.

These two statements are hypotheses that can be objectively verified and tested. Thus, they indicate that a hypothesis states what one is looking for. Besides, it is a proposition that can be put to test in order to examine its validity.

## Definition

"Hypothesis may be defined as a proposition or a set of propositions set forth as an explanation for the occurrence of some specified group of phenomena either asserted merely as a provisional conjecture to guide some investigation in the light of established facts" (Kothari, 1988).

## Main Sources of Hypothesis in Research

A hypothesis may be formulated through a number of its sources. Following are the main sources of hypothesis.

- 1. Personal Experience:** On the basis of his personal experience he uses his mind and suggests some points for the eradication of a social problem through developing a good hypothesis. Greater the researcher experience lead to higher degree of formation.
- 2. Imagination & Thinking:** Creative thinking and imagination of a researcher sometimes help in formulating a good hypothesis. Personal ideas and the thinking capabilities of a researcher would lead to greater number of hypothesis formulation as well as control over the problem.
- 3. Observation:** In consideration and undertaking a research problem, observation is necessary. The collection of previous facts and current facts related to the problem lead to the formulation of a good hypothesis.
- 4. Scientific Theory:** Theory is capable in explaining all the facts relating to the problem. Scientific theory is a fertile source of hypothesis formulation. The theory which is used by a researcher may satisfied the needs of making it, because theory explains the known facts.
- 5. Previous Study:** Previous study is also a source of developing a concrete hypothesis. If a researcher uses previous knowledge about a phenomenon for a particular place, then another

researcher followed his techniques and formulates his own. For example increase in fertilizers and irrigation leads to higher production in agriculture in eastern province. Now another researcher studies his work and applies it to another province.

- 6. Culture:** Culture is the accumulation of ways of behaving and adoption in a particular place and time. While formulating a hypothesis for a problem, culture should be studied. If we want to study trends towards female education in a particular area, for this purpose we will study, traditions, family system, Norms, Values, region and education system of that area.

### **Purpose of a Hypothesis**

A hypothesis is used in an experiment to define the relationship between two variables. The purpose of a hypothesis is to find the answer to a question. A formalized hypothesis will force us to think about what results we should look for in an experiment.

The first variable is called the independent variable. This is the part of the experiment that can be changed and tested. The independent variable happens first and can be considered the cause of any changes in the outcome. The outcome is called the dependent variable. The independent variable in our previous example is not studying for a test. The dependent variable that you are using to measure outcome is your test score.

Let's use the previous example again to illustrate these ideas. The hypothesis is testable because we will receive a score on our test performance. It is measurable because we can compare test scores received from when we did study and test scores received from when we did not study.

### **Characteristics of a Hypothesis**

A hypothesis should have the following characteristic features

- 1.** It must be precise and clear. If it is not precise and clear, then the inferences drawn on its basis would not be reliable.

2. A hypothesis must be capable of being put to test. Quite often, the research programmes fail owing to its incapability of being subject to testing for validity. Therefore, some prior study may be conducted by the researcher in order to make a hypothesis testable. A hypothesis “is tested if other deductions can be made from it, which in turn can be confirmed or disproved by observation” (Kothari, 1988).
3. It must state the relationship between two variables, in the case of relational hypotheses.
4. It must be specific and limited in scope. This is because a simpler hypothesis generally would be easier to test for the researcher. And therefore, the researcher must formulate such hypotheses.
5. As far as possible, a hypothesis must be stated in the simplest language, so as to make it understood by all concerned. However, it should be noted that the simplicity of a hypothesis is not related to its significance.
6. It must be consistent and derived from the most known facts. In other words, it should be consistent with a substantial body of established facts. That is, it must be in the form of a statement which is most likely to occur.
7. It must be amenable to testing within a stipulated or reasonable period of time. No matter how excellent a hypothesis, a researcher should not use it if it cannot be tested within a given period of time, as no one can afford to spend a lifetime on collecting data to test it.
8. A hypothesis should state the facts that give rise to the necessity of looking for an explanation. This is to say that by using the hypothesis, and other known and accepted generalizations, a researcher must be able to derive the original problem condition. Therefore, a hypothesis should explain what it actually wants to explain, and for this, it should also have an empirical reference.

### **Types of Hypothesis**

A hypothesis is an approximate explanation that relates to the set of facts that can be tested by certain further investigations. There are

basically seven types, namely a) simple hypothesis, b) complex hypothesis, c) empirical hypothesis, d) null hypothesis, e) alternative hypothesis, f) logical hypothesis and g) statistical hypothesis. A research generally starts with a problem. Next, these hypotheses provide the researcher with some specific restatements and clarifications of the research problem.

- a. **Simple Hypothesis:** Simple hypothesis is that one in which there exists relationship between two variables one is called independent variable or cause and other is dependent variable or effect. For example
  - a. Smoking leads to Cancer
  - b. The higher ratio of unemployment leads to crimes.
- b. **Complex Hypothesis:** Complex hypothesis is that one in which as relationship among variables exists. In this type dependent as well as independent variables are more than two. For example
  - a. Smoking and other drugs leads to cancer, tension chest infections etc.
  - b. The higher ration of unemployment poverty, illiteracy leads to crimes like dacoit, Robbery, Rape, prostitution & killing etc.
- c. **Empirical Hypothesis:** Working hypothesis is that one which is applied to a field. During the formulation it is an assumption only but when it is put to a test become an empirical or working hypothesis.
- d. **Null Hypothesis:** Null hypothesis is contrary to the positive statement of a working hypothesis. According to null hypothesis there is no relationship between dependent and independent variable. It is denoted by 'H<sub>0</sub>'.
- e. **Alternative Hypothesis:** Firstly many hypotheses are selected then among them select one which is more workable and most efficient. That hypothesis is introduced latter on due to changes in the old formulated hypothesis. It is denote by "H<sub>1</sub>".

- f. **Logical Hypothesis:** It is that type in which hypothesis is verified logically. J.S. Mill has given four canons of these hypothesis e.g. agreement, disagreement, difference and residue.
- g. **Statistical Hypothesis:** A hypothesis which can be verified statistically called statistical hypothesis. The statement would be logical or illogical but if statistic verifies it, it will be statistical hypothesis.

### **Statistical Hypothesis Testing**

When a possible correlation or similar relation between phenomena is investigated, such as whether a proposed remedy is effective in treating a disease, the hypothesis that a relation exists cannot be examined the same way one might examine a proposed new law of nature. In such an investigation, if the tested remedy shows no effect in a few cases, these do not necessarily falsify the hypothesis.

Instead, statistical tests are used to determine how likely it is that the overall effect would be observed if the hypothesized relation does not exist. If that likelihood is sufficiently small (e.g., less than 1%), the existence of a relation may be assumed. Otherwise, any observed effect may be due to pure chance.

In statistical hypothesis testing, two hypotheses are compared. These are called the null hypothesis and the alternative hypothesis. The null hypothesis is the hypothesis that states that there is no relation between the phenomena whose relation is under investigation, or at least not of the form given by the alternative hypothesis. The alternative hypothesis, as the name suggests, is the alternative to the null hypothesis: it states that there is some kind of relation. The alternative hypothesis may take several forms, depending on the nature of the hypothesized relation; in particular, it can be two-sided (for example: there is some effect, in a yet unknown direction) or one-sided (the direction of the hypothesized relation, positive or negative, is fixed in advance).

Conventional significance levels for testing hypotheses (acceptable probabilities of wrongly rejecting a true null hypothesis) are .10, .05,

and .01. The significance level for deciding whether the null hypothesis is rejected and the alternative hypothesis is accepted must be determined in advance, before the observations are collected or inspected. If these criteria are determined later, when the data to be tested are already known, the test is invalid.

The above procedure is actually dependent on the number of the participants (units or sample size) that are included in the study. For instance, to avoid having the sample size be too small to reject a null hypothesis, it is recommended that one specify a sufficient sample size from the beginning. It is advisable to define a small, medium and large effect size for each of a number of important statistical tests which are used to test the hypotheses.

## Chapter – III: RESEARCH DESIGN

Meaning and types - exploratory, descriptive, diagnostic, quasi experimental and single subject research designs

### **Research Design**

A research design is the set of methods and procedures used in collecting and analysing measures of the variables specified in the problem research. The design of a study defines the study type and sub-type, research problem, hypotheses, independent and dependent variables, experimental design, and, if applicable, data collection methods and a statistical analysis plan. A research design is a framework that has been created to find answers to research questions.

### **Design versus Method**

Research design is different from the method by which data are collected. Many research methods texts confuse research designs with methods. It is not uncommon to see research design treated as a mode of data collection rather than as a logical structure of the inquiry. But there is nothing intrinsic about any research design that requires a particular method of data collection. Although cross-sectional surveys are frequently equated with questionnaires and case studies are often equated with participant observation (e.g. Whyte's Street Corner Society, 1943), data for any design can be collected with any data collection method. How the data are collected is irrelevant to the logic of the design.

Failing to distinguish between design and method will leads to poor evaluation of designs. Equating cross-sectional designs with questionnaires, or case studies with participant observation, means that the designs are often evaluated against the strengths and weaknesses of the method rather than their ability to draw relatively unambiguous conclusions or to select between rival plausible hypotheses.

### **Definition**

Research design is defined as a framework of methods and techniques chosen by a researcher to combine various components



of research in a reasonably logical manner so that the research problem is efficiently handled. It provides insights about “how” to conduct research using a particular methodology. Every researcher has a list of research questions which need to be assessed; this can be done with research design.

The sketch of how research should be conducted can be prepared using research design. Hence, the market research study will be carried out on the basis of research design.

The design of a research topic is used to explain the type of research (experimental, survey, correlational, semi-experimental, review) and also its sub-type (experimental design, research problem, descriptive case-study). There are three main sections of research design: Data collection, measurement, and analysis.

The type of research problem an organization is facing will determine the research design and not vice-versa. Variables, designated tools to gather information, how will the tools be used to collect and analyse data and other factors are decided in research design on the basis of a research technique is decided.

An impactful research design usually creates minimum bias in data and increases trust on the collected and analysed research information. Research design which produces the least margin of error in experimental research can be touted as the best.

The essential elements of research design are:

1. Accurate purpose statement of research design
2. Techniques to be implemented for collecting details for research
3. Method applied for analysing collected details
4. Type of research methodology
5. Probable objections for research
6. Settings for research study
7. Timeline

## 8. Measurement of analysis

### **Research Design Characteristics**

There are four key characteristics of research design:

**Neutrality:** The results projected in research design should be free from bias and neutral. Understand opinions about the final evaluated scores and conclusion from multiple individuals and consider those who agree with the derived results.

**Reliability:** If a research is conducted on a regular basis, the researcher involved expects similar results to be calculated every time. Research design should indicate how the research questions can be formed to ensure the standard of obtained results and this can happen only when the research design is reliable.

**Validity:** There are multiple measuring tools available for research design but valid measuring tools are those which help a researcher in gauging results according to the objective of research and nothing else. The questionnaire developed from this research design will be then valid.

**Generalization:** The outcome of research design should be applicable to a population and not just a restricted sample. Generalization is one of the key characteristics of research design.

### **Types of Research Design**

Social researchers ask two fundamental types of research questions:

- 1 What is going on (descriptive research)?
- 2 Why is it going on (explanatory research)?

## **DESCRIPTIVE RESEARCH**

### **Descriptive Research Design**

#### **Definition**

Descriptive research is defined as a research method that describes the characteristics of the population or phenomenon that is being

studied. This methodology focuses more on the “what” of the research subject rather than the “why” of the research subject.

In other words, descriptive research primarily focuses on describing the nature of a demographic segment, without focusing on “why” a certain phenomenon occurs. In other words, it “describes” the subject of the research, without covering “why” it happens.

For example, an apparel brand that wants to understand the fashion purchasing trends among New York buyers will conduct a demographic survey of this region, gather population data and then conduct descriptive research on this demographic segment. The research will then uncover details on “what is the purchasing pattern of New York buyers”, but not cover any investigative details on “why” the patterns exist. Because for the apparel brand trying to break into this market, understanding the nature of their market is the objective of the study.

### **Characteristics of Descriptive Research**

The term descriptive research then, refers to research questions, design of the research and data analysis that would be conducted on that topic. It is called an observational research method because none of the variables that are part of the research study are influenced in any capacity.

Some distinctive characteristics of descriptive research are:

1. **Quantitative research:** Descriptive research is a quantitative research method that attempts to collect quantifiable information to be used for statistical analysis of the population sample. It is an popular market research tool that allows to collect and describe the nature of the demographic segment.
2. **Uncontrolled variables:** In descriptive research, none of the variables are influenced in any way. This uses observational methods to conduct the research. Hence, the nature of the variables or their behavior is not in the hands of the researcher.

3. **Cross-sectional studies:** Descriptive research is generally a cross-sectional study where different sections belonging to the same group are studied.
4. **Basis for further research:** The data collected and analysed from descriptive research can then be further researched using different research techniques. The data also can help point towards the types of research methods are to be used for the subsequent research.

### **Applications of Descriptive Research with Examples**

Descriptive research can be used in multiple ways and for multiple reasons. Before getting into any kind of survey though, the survey goals and survey design is very important. Despite following these steps though, there is no way to know if the research outcome will be met. To understand the end objective of research goals, below are some ways organizations currently use descriptive research today:

- **Define respondent characteristics:** The aim of using close-ended questions is to draw concrete conclusions about the respondents. This could be the need to derive patterns, traits and behaviours of the respondents. It could also be to understand from a respondent, their attitude or opinion about the phenomenon in question. For example, understanding from millennials the hours per week they spend on browsing the internet. All this information helps the organization conducting the research make informed business decisions.
- **Measure data trends:** Data trends can be measured over time with statistical capabilities provided by descriptive research. Consider if an apparel company conducts research between different demographics like age groups from 24-35 and 36-45 on a new range launch of autumn wear. If one of those groups doesn't take too well to the new launch, this provides an insight into what clothes are like and what are not and the ones that are not, are dropped.
- **Conduct comparisons:** Organizations also use descriptive research to understand how different groups respond to a certain product or service. For example, an apparel brand creates a survey asking general questions that measure the

brands image. The same survey also asks demographic questions like age, income, gender, geographical location etc. This consumer research helps the organization understand what aspects of the brand appeal to the population and what aspects do not. It also helps in making product or marketing fixes or in some cases even create a new product line just to cater to a high growth potential, group.

- **Validate existing conditions:** Descriptive research is widely used to help ascertain the prevailing conditions and underlying patterns of the research object. Due to the non invasive method of research and the use of quantitative observation and some aspects of qualitative observation, each variable is observed and an in-depth analysis can be concluded. It is also used to validate any existing conditions that maybe prevalent in a population.
- **Conduct research at different times:** To ascertain if there are any similarities or differences, the research can be conducted at different periods of times. This also allows any number of variables to be evaluated. For the purpose of verification, studies on prevailing conditions can also be repeated to draw trends.

### **Descriptive Research Methods**

There are 3 distinctive methods to conduct descriptive research. They are:

- **Observational Method**

The observational method is the most effective method to conduct descriptive research and both quantitative observation and qualitative observation are used in this research method.

Quantitative observation is the objective collection of data which is primarily focused on numbers and values – it suggests “associated to, of or depicted in terms of a quantity”. Results of quantitative observation are derived using statistical and

numerical analysis methods. It implies observation of any entity that can be associated with a numeric value such as age, shape, weight, volume, scale etc. For example, the researcher can track if current customers will refer the brand by using a simple Net Promoter Score question.

Qualitative observation doesn't involve measurements or numbers but instead just monitoring characteristics. In this case the researcher observes the respondents from a distance. Since the respondents are in a comfortable environment, the characteristics observed are natural and effective. In descriptive research, the researcher can choose to be either a complete observer, an observer as a participant, a participant as an observer or a complete participant. For example, in a supermarket, a researcher can from afar monitor and track the selection and purchasing trends of the customers. This offers a deeper insight into the purchasing experience of the customer.

- **Case Study Method**

Case studies involve in-depth research and study of individuals or groups. Case studies lead to a hypothesis and widen a further scope of studying a phenomenon. However, case studies should not be used to determine cause and effect as they don't have the capacity to make accurate predictions because there could be a bias on the part of the researcher. The other reason why case studies are not an accurate way of conducting descriptive research is because there could be an atypical respondent in the research and describing them leads to poor generalizations and move away from external validity.

- **Survey Research**

In survey research, respondents answer through surveys or questionnaires, or polls. They are a popular market research tool to collect feedback from respondents. In order for a survey to gather good quality data, it should have good survey questions, which should be a balanced mix of open-ended

questions and close ended-questions. The survey method can be conducting online or offline which is makes it the go-to option for descriptive research where the sample size is very large.

### **Examples of Descriptive Research**

Some examples of descriptive research are:

1. A speciality food group launching a new range of barbecue rubs would like to understand what flavours of rubs are favoured by different sets of people. To understand the preferred flavour palette, they conduct a descriptive research study using different methods like observational methods in supermarkets. By also conducting a survey whilst collecting in-depth demographic information, offers insights about the preference of different markets. This can also help tailor make the rubs and spreads to different preferred meats in that demographic. Conducting a thorough descriptive research helps the organization tweak their business model and amplify marketing in core markets.
2. Another example of where descriptive research can be used is if a school district that wishes to evaluate teachers attitudes about using technology in the classroom. By conducting surveys and observing their comfortableness using technology through observational methods, the researcher can gauge what the can help understand if a full-fledged implementation can face an issues. This also helps in understanding if the students are impacted in any way with this change.

Some other problems and/or research questions that can lead to descriptive research are:

- Market researchers that want to observe habits of consumers.
- A company that wants to evaluate the morale of its staff.
- A school district that wants to understand if students will access online lessons rather than textbooks.
- An organization to understand if its wellness programs increase the overall health of the employees

## Advantages of Descriptive Research

Some of the major advantages of descriptive research are:

- **Data collection:** Descriptive research can be conducted by using specific methods like observational method, case study method and survey method. Between these 3, all major methods of data collection are covered which provides a lot of information. This can be used for future research or even developing hypothesis of your research object.
- **Varied:** Since the data collected is both qualitative and quantitative, it gives a holistic understanding of a research topic. This causes data that was not planned to be collected gets tracked and the data is varied, diverse and thorough.
- **Natural environment:** Descriptive research allows for the research to be conducted in the natural environment of the respondent and this ensures that high-quality and honest data is collected.
- **Quick to conduct and cheap:** As the sample size is generally large in descriptive research, the data collection is quick to conduct and is cheap.
- **Forms basis for decision-making:** As the data collected in descriptive research represents a larger population and is robust, it is easy to make decisions on the basis of the statistical analysis of that data.

## Disadvantages of Descriptive Research

Some of the major disadvantages of descriptive research are:

- **Confidentiality:** Respondents aren't always truthful if questions are too personal or they feel that they are being "watched". This may negate the validity of the data.
- **Halo effect:** If the research observer has a potential bias towards the research topic or some respondents in the



research, the observations then maybe considered as invalid or untrue.

- **Sample isn't representative:** Due to the randomness of the sample, it is very tough to validate that the sample is an accurate representation of the whole population.
- **No scope to learn cause:** Since descriptive research only focuses on the "what" of an objective or phenomenon, it does not delve into the "why or how" and that is a limitation in learning specific causes.

### **Explanatory Research**

Explanatory research focuses on why questions. For example, it is one thing to describe the crime rate in a country, to examine trends over time or to compare the rates in different countries. It is quite a different thing to develop explanations about why the crime rate is as high as it is why some types of crime are increasing or why the rate is higher in some countries than in others.

The way in which researchers develop research designs is fundamentally affected by whether the research question is descriptive or explanatory. It affects what information is collected. For example, if we want to explain why some people are more likely to be apprehended and convicted of crimes we need to have hunches about why this is so. We may have many possibly incompatible hunches and will need to collect information that enables us to see which hunches work best empirically.

Answering the 'why' questions involves developing causal explanations. Causal explanations argue that phenomenon Y (e.g. income level) is affected by factor X (e.g. gender). Some causal explanations will be simple while others will be more complex. For example, we might argue that there is a direct effect of gender on income (i.e. simple gender discrimination). We might argue for a causal chain, such as that gender affects choice of field of training

which in turn affects occupational options, which are linked to opportunities for promotion, which in turn affect income level. Or we could posit a more complex model involving a number of interrelated causal chains.

### **Quantitative and Qualitative Research**

Similarly, designs are often equated with qualitative and quantitative research methods. Social surveys and experiments are frequently viewed as prime examples of quantitative research and are evaluated against the strengths and weaknesses of statistical, quantitative research methods and analysis. Case studies, on the other hand, are often seen as prime examples of qualitative research ± which adopts an interpretive approach to data, studies 'things' within their context and considers the subjective meanings that people bring to their situation.

**Qualitative Research Design:** Qualitative research is implemented in cases where a relationship between collected data and observation is established on the basis of mathematical calculations. Theories related to a naturally existing phenomenon can be proved or disproved using mathematical calculations. Researchers rely on qualitative research design where they are expected to conclude "why" a particular theory exists along with "what" respondents have to say about it.

**Quantitative Research Design:** Quantitative research is implemented in cases where it is important for a researcher to have statistical conclusions to collect actionable insights. Numbers provide a better perspective to make important business decisions. Quantitative research design is important for the growth of any organization because any conclusion drawn on the basis of numbers and analysis will only prove to be effective for the business.

### **Exploratory Research Design**

Exploratory means to explore the hidden things, which are not clearly visible. Exploratory research is a type of research conducted

for a problem that has not been clearly defined. It also termed as formulate research studies.

For Example, It is one thing to describe the crime rate in a country, to examine trends over time or to compare the rates in different countries, it is quite different thing to develop explanations about why the crime rate is as high as it is why some types of crime are increasing or why the rate is higher in some countries than in others.

Exploratory Research provides insights into and comprehension of an issue or situation. It draws definitive conclusions only with extreme caution. Exploratory research is a type of research conducted because a problem has not been clearly defined.

Exploratory research helps determine the best research design, data collection method and selection of subjects. Given its fundamental nature, Exploratory Research often concludes that a perceived problem does not actually exist.

Exploratory research often relies on secondary research such as reviewing available literature and/or Data, or qualitative approaches such as informal discussions with consumers, employees, management or competitors and more formal approaches through in-depth interviews, focus groups, projective Methods, case studies or pilot studies. The internet allows for Research methods that are more interactive in nature.

### **Objectives of Exploratory Research Design**

- (1) Precise formulation of the problem.
- (2) Provide more knowledge to the research about the problem environment.
- (3) Establish priorities for further research.
- (4) Design appropriate information collection procedure for the given situation.
- (5) Determine nature of relationship between various factors associated in the

(6) Gather Information on the problems associated while doing conclusive.

### **Some tools used to conduct exploratory research**

**1. Secondary information:** Most often the best point to start research from is to study the previous research conducted in this area. If you study what others have found out, it will help you generate ideas, hypotheses and gain insights. For example if you are trying to conduct research to create an instrument that helps you measure customer satisfaction from your product or services then studying others' research will help you reach your objectives quicker. Literature reviews most often are a great tool to conduct exploratory research.

**2. Personal interviews:** Personal interviews are also a great tool of exploratory research and talking to people with expertise in the respective areas can help you achieve your objectives more easily. Moreover, it is important to be flexible because the sources from which you can gain the most valuable insights are always not obvious. Sometimes you may find the right information from your managers, sometimes from your customers and sometimes talking to your supply chain partners could help understand the issue better. However, while personal interviews are also used in descriptive research, the level of flexibility differs. In descriptive research you are somewhat bound by your questions and in exploratory research you have to be flexible and rather than sticking to your original questions, you must ask questions related to what you are hearing from people you are talking to.

**3. Focus groups:** Focus group is also a highly popular technique used to conduct exploratory research. A group of 8 to 12 people works on addressing a topic introduced by the moderator and the researcher. Focus groups have proved to be of special importance in :

- Letting marketing managers see how consumers respond to the company's efforts.

- Generating hypothesis that can be tested through the use of descriptive and causal research.
- Introducing a new product to the respondents to know their impression.
- Suggest the current market trends.
- Deriving real results from abstract data or finding how a survey response translates into real life reactions.

The popularity of focus groups is because of their effectiveness and efficiency as well as because researchers or decision makers can themselves attend them and observe the response of the participants live. However, a major disadvantage is that a group of just 8 to 12 people cannot be believed to be representative of the entire consumer group. Moreover one cannot conduct extra focus groups to convert findings of exploratory research into descriptive data.

**4. Case Analysis:** Analysing select cases also helps achieve the objectives of exploratory research. By doing an in-depth analysis of elect cases related to the topic one can reach his objectives. This approach is suitable when there are complex variables at work and to understand these complexities one may need to conduct intensive study. For example you want to know the reason or traits related to his level performance among your sales managers. You compare the top performers and bottom performers to check out which traits are common to the best performing salespeople.

**5. Projective techniques:** Projective techniques are useful where the researchers are exploring a topic on which the respondents do not speak directly and clearly. Sensitive topics involving people's personal lives fall obviously in this category. Projective techniques can be used to find out these deep hidden psychological motives which people would otherwise not reveal. Using a variety of communication and observable methods researchers explore these deep psychological motivations which otherwise do not reveal themselves at the surface.

### **Example of Exploratory Research Design:**

Freshbite is a one and half year old e-commerce start-up company delivering fresh foods as per the order to customer's doorstep through its delivery partners. The company operates in multiple cities. Since its inception, the company achieved a high sales growth rate. However, after completion of the first year, the sales started declining at brisk rate. Due to lack of historical data, the sales director was confused about the reasons for this decline in sales. He prefers to appoint a marketing research consultant to conduct an exploratory research study in order to discern the possible reasons rather than making assumptions. The prime objective of this research was not to figure out a solution to the declining sales problem, but rather to identify the possible reasons, such as poor quality of products and services, competition, or ineffective marketing, and to better understand the factors affecting sales. Once these potential causes are identified, the strength of each reason can be tested using causal research.

### **Diagnostic Research Design**

Here researcher wants to know about the root causes of the problem. He describes the factors responsible for the problematic situation. It is a problem solving research design that consists mainly:

1. Emergence of the problem
2. Diagnosis of the problem
3. Solution for the problem and
4. Suggestion for the problem solution

### **Difference between Descriptive Research Design and Diagnostic Research Design**

Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual, or of a group, whereas diagnostic research studies determine the frequency with which something occur or its association with something else. The studies concerning whether certain variables are associated are examples of diagnostic research studies. As against this, studies concerned with specific predictions, with narration of facts and

characteristics concerning individual, group or situation are all examples of descriptive research studies. Most of the social research comes under this category.

From the point of view of the research design, the diagnostic studies share common requirements and as such we may group together these two types of research studies. In descriptive as well as in diagnostic studies, the researcher must be able to define clearly, what he wants to measure and must find adequate methods for measuring it along with a clear cut definition of 'population' he wants to study. Since the aim is to obtain complete and accurate information in the said studies, the procedure to be used must be carefully planned. The research design must make enough provision for protection against bias and must maximise reliability, with due concern for the economical completion of the research study.

The design in such studies must be rigid and not flexible and must focus attention on the following:

- Formulating the objective of the study (what the study is about and why is it being made?)
- Designing the methods of data collection (what techniques of gathering data will be adopted?)
- Selecting the sample (how much material will be needed?)
- Collecting the data (where can the required data be found and with what time period should the data be related?)
- Processing and analysing the data.
- Reporting the findings.

In a diagnostic study the first step is to specify the objectives with sufficient precision to ensure that the data collected are relevant. If this is not done carefully, the study may not provide the desired information.

Then comes the question of selecting the methods by which the data are to be obtained. In other words, techniques for collecting the information must be devised. Several methods (viz., observation,

questionnaires, interviewing, examination of records, etc.) with their merits and limitations, are available for the purpose and the researcher may use one or more of these methods. While designing data-collection procedure, adequate safeguards against bias and unreliability must be ensured. Whichever method is selected, questions must be well examined and be made unambiguous; interviewers must be instructed not to express their own opinion; observers must be trained so that they uniformly record a given item of behaviour. It is always desirable to pre-test the data collection instruments before they are finally used for the study purposes. In other words, we can say that "structured instruments" are used in such studies.

In most of the diagnostic studies the researcher takes out sample(s) and then wishes to make statements about the population on the basis of the sample analysis or analyses. More often than not, sample has to be designed. Different sample designs have been discussed in detail in a separate chapter in this book. Here we may only mention that the problem of designing samples should be tackled in such a fashion that the samples may yield accurate information with a minimum amount of research effort.

To obtain data free from errors introduced by those responsible for collecting them, it is necessary to supervise closely the staff of field workers as they collect and record information. Checks may be set up to ensure that the data collecting staff performs their duty honestly and without prejudice. "As data are collected, they should be examined for completeness, comprehensibility, consistency and reliability."

The data collected must be processed and analysed. This includes steps like coding the interview replies, observations, etc.; tabulating the data; and performing several statistical computations. To the extent possible, the processing and analysing procedure should be planned in detail before actual work is started. This will prove economical in the sense that the researcher may avoid unnecessary



labour such as preparing tables for which he later finds he has no use or on the other hand, re-doing some tables because he failed to include relevant data.

Coding should be done carefully to avoid error in coding and for this purpose the reliability of coders needs to be checked. Similarly, the accuracy of tabulation may be checked by having a sample of the tables re-done. In case of mechanical tabulation the material (i.e., the collected data or information) must be entered on appropriate cards which are usually done by punching holes corresponding to a given code. The accuracy of punching is to be checked and ensured.

Finally, statistical computations are needed and as such averages, percentages and various coefficients must be worked out. Probability and sampling analysis may as well be used. The appropriate statistical operations, along with the use of appropriate tests of significance should be carried out to safeguard the drawing of conclusions concerning the study.

Last of all comes the question of reporting the findings. This is the task of communicating the findings to others and the researcher must do it in an efficient manner. The layout of the report needs to be well planned so that all things relating to the research study may be well presented in simple and effective style.

Thus, the research design in case of descriptive/diagnostic studies is a comparative design throwing light on all points narrated above and must be prepared keeping in view the objective(s) of the study and the resources available.

However, it must ensure the minimisation of bias and maximisation of reliability of the evidence collected. The said design can be appropriately referred to as a survey design since it takes into account all the steps involved in a survey concerning a phenomenon to be studied.

The difference between research designs in respect of the above two types of research studies can be conveniently summarised in tabular form as under:

### Quasi Experimental Research Design

The prefix quasi means “resembling.” Thus quasi-experimental research is research that resembles experimental research but is not true experimental research. Although the independent variable is

Research Design	Type of study	
	Exploratory of Formulative	Descriptive/Diagnostic
Overall design	Flexible design (design must provide opportunity for considering different aspects of the problem)	Rigid design (design must make enough provision for protection against bias and must maximise reliability)
(i) Sampling design	Non-probability sampling design (purposive or judgement sampling)	Probability sampling design (random sampling)
(ii) Statistical design	No pre-planned design for analysis	Pre-planned design for analysis
(iii) Observational design	Unstructured instruments for collection of data	Structured or well thought out instruments for collection of data
(iv) Operational design	No fixed decisions about the operational procedures	Advanced decisions about operational procedures.

manipulated, participants are not randomly assigned to conditions or orders of conditions. Because the independent variable is manipulated before the dependent variable is measured, quasi-experimental research eliminates the directionality problem. But because participants are not randomly assigned making it likely that there are other differences between conditions; quasi-experimental research does not eliminate the problem of confounding variables. In terms of internal validity, therefore, quasi-experiments are generally somewhere between correlational studies and true experiments.

A quasi-experiment is an empirical interventional study used to estimate the causal impact of an intervention on target population without random assignment. Quasi-experimental research shares similarities with the traditional experimental design or randomized controlled trial, but it specifically lacks the element of random assignment to treatment or control. Instead, quasi-experimental

designs typically allow the researcher to control the assignment to the treatment condition, but using some criterion other than random assignment (e.g., an eligibility cut off mark).

In some cases, the researcher may have control over assignment to treatment. Quasi-experiments are subject to concerns regarding internal validity, because the treatment and control groups may not be comparable at baseline. With random assignment, study participants have the same chance of being assigned to the intervention group or the comparison group. As a result, differences between groups on both observed and unobserved characteristics would be due to chance, rather than to a systematic factor related to treatment (e.g., illness severity).

Randomization itself does not guarantee that groups will be equivalent at baseline. Any change in characteristics post-intervention is likely attributable to the intervention. With quasi-experimental studies, it may not be possible to convincingly demonstrate a causal link between the treatment condition and observed outcomes. This is particularly true if there are confounding variables that cannot be controlled or accounted for.

### **Types of Quasi-Experimental Designs**

There are several types of quasi-experimental designs, each with different strengths, weaknesses and applications. These designs include (but not limited to):

#### **Non-equivalent Groups Design**

Recall that when participants in a between-subjects experiment are randomly assigned to conditions, the resulting groups are likely to be quite similar. In fact, researchers consider them to be equivalent. When participants are not randomly assigned to conditions, however, the resulting groups are likely to be dissimilar in some ways. For this reason, researchers consider them to be non-equivalent. A non-equivalent groups design, then, is a between-

subjects design in which participants have not been randomly assigned to conditions.

Imagine, for example, a researcher who wants to evaluate a new method of teaching fractions to third graders. One way would be to conduct a study with a treatment group consisting of one class of third-grade students and a control group consisting of another class of third-grade students. This design would be a non-equivalent groups design because the students are not randomly assigned to classes by the researcher, which means there could be important differences between them. For example, the parents of higher achieving or more motivated students might have been more likely to request that their children be assigned to Ms. Williams's class. Or the principal might have assigned the "troublemakers" to Mr. Jones's class because he is a stronger disciplinarian. Of course, the teachers' styles, and even the classroom environments, might be very different and might cause different levels of achievement or motivation among the students. If at the end of the study there was a difference in the two classes' knowledge of fractions, it might have been caused by the difference between the teaching methods; but it might have been caused by any of these confounding variables.

Of course, researchers using a non-equivalent groups design can take steps to ensure that their groups are as similar as possible. In the present example, the researcher could try to select two classes at the same school, where the students in the two classes have similar scores on a standardized math test and the teachers are the same sex, are close in age, and have similar teaching styles. Taking such steps would increase the internal validity of the study because it would eliminate some of the most important confounding variables. But without true random assignment of the students to conditions, there remains the possibility of other important confounding variables that the researcher was not able to control.

### **Pre-test-Post-test Design**

In a pre-test-post-test design, the dependent variable is measured once before the treatment is implemented and once after it is implemented. Imagine, for example, a researcher who is interested in the effectiveness of an antidrug education program on elementary school students' attitudes toward illegal drugs. The researcher could measure the attitudes of students at a particular elementary school during one week, implement the antidrug program during the next week, and finally, measure their attitudes again the following week. The pre-test-post-test design is much like a within-subjects experiment in which each participant is tested first under the control condition and then under the treatment condition. It is unlike a within-subjects experiment, however, in that the order of conditions is not counterbalanced because it typically is not possible for a participant to be tested in the treatment condition first and then in an "untreated" control condition.

If the average post-test score is better than the average pre-test score, then it makes sense to conclude that the treatment might be responsible for the improvement. Unfortunately, one often cannot conclude this with a high degree of certainty because there may be other explanations for why the post-test scores are better. One category of alternative explanations goes under the name of history. Other things might have happened between the pre-test and the post-test. Perhaps an antidrug program aired on television and many of the students watched it, or perhaps a celebrity died of a drug overdose and many of the students heard about it. Another category of alternative explanations goes under the name of maturation. Participants might have changed between the pre-test and the post-test in ways that they were going to anyway because they are growing and learning. If it were a yearlong program, participants might become less impulsive or better listeners and this might be responsible for the change.

Another alternative explanation for a change in the dependent variable in a pre-test-post-test design is regression to the mean. This

refers to the statistical fact that an individual who scores extremely on a variable on one occasion will tend to score less extremely on the next occasion. For example, a bowler with a long-term average of 150 who suddenly bowls a 220 will almost certainly score lower in the next game. Her score will “regress” toward her mean score of 150. Regression to the mean can be a problem when participants are selected for further study because of their extreme scores. Imagine, for example, that only students who scored especially low on a test of fractions are given a special training program and then retested.

Regression to the mean all but guarantees that their scores will be higher even if the training program has no effect. A closely related concept and an extremely important one in psychological research is spontaneous remission. This is the tendency for many medical and psychological problems to improve over time without any form of treatment. The common cold is a good example. If one were to measure symptom severity in 100 common cold sufferers today, give them a bowl of chicken soup every day, and then measure their symptom severity again in a week, they would probably be much improved. This does not mean that the chicken soup was responsible for the improvement, however, because they would have been much improved without any treatment at all. The same is true of many psychological problems. A group of severely depressed people today is likely to be less depressed on average in 6 months. In reviewing the results of several studies of treatments for depression, researchers Michael Posternak and Ivan Miller found that participants in waitlist control conditions improved an average of 10 to 15% before they received any treatment at all. Thus one must generally be very cautious about inferring causality from pre-test-post-test designs.

Fortunately, many other researchers took up Eysenck’s challenge, and by 1980 hundreds of experiments had been conducted in which participants were randomly assigned to treatment and control conditions, and the results were summarized in a classic book by Mary Lee Smith, Gene Glass, and Thomas Miller. They found that

overall psychotherapy was quite effective, with about 80% of treatment participants improving more than the average control participant. Subsequent research has focused more on the conditions under which different types of psychotherapy are more or less effective.

### **Interrupted Time Series Design**

A variant of the pre-test-post-test design is the interrupted time-series design. A time series is a set of measurements taken at intervals over a period of time. For example, a manufacturing company might measure its workers' productivity each week for a year. In an interrupted time series-design, a time series like this one is "interrupted" by a treatment. In one classic example, the treatment was the reduction of the work shifts in a factory from 10 hours to 8 hours.

Because productivity increased rather quickly after the shortening of the work shifts, and because it remained elevated for many months afterward, the researcher concluded that the shortening of the shifts caused the increase in productivity. Notice that the interrupted time-series design is like a pre-test-post-test design in that it includes measurements of the dependent variable both before and after the treatment. It is unlike the pre-test-post-test design, however, in that it includes multiple pre-test and post-test measurements.

The dependent variable is the number of student absences per week in a research methods course. The treatment is that the instructor begins publicly taking attendance each day so that students know that the instructor is aware of who is present and who is absent. There is a consistently high number of absences before the treatment, and there is an immediate and sustained drop in absences after the treatment. On average, the number of absences after the treatment is about the same as the number before. This figure also illustrates an advantage of the interrupted time-series design over a simpler pre-test-post-test design. If there had been only one measurement of absences before the treatment at week 7 and one

afterward at week 8, then it would have looked as though the treatment were responsible for the reduction. The multiple measurements both before and after the treatment suggest that the reduction between weeks 7 and 8 is nothing more than normal week-to-week variation.

### **Combination Designs**

A type of quasi-experimental design that is generally better than either the non-equivalent groups design or the pre-test-post-test design is one that combines elements of both. There is a treatment group that is given a pre-test, receives a treatment, and then is given a post-test. But at the same time there is a control group that is given a pre-test, does not receive the treatment, and then is given a post-test. The question, then, is not simply whether participants who receive the treatment improve but whether they improve more than participants who do not receive the treatment.

Imagine, for example, that students in one school are given a pre-test on their attitudes toward drugs, then are exposed to an antidrug program, and finally are given a post-test. Students in a similar school are given the pre-test, not exposed to an antidrug program, and finally are given a post-test. Again, if students in the treatment condition become more negative toward drugs, this change in attitude could be an effect of the treatment, but it could also be a matter of history or maturation. If it really is an effect of the treatment, then students in the treatment condition should become more negative than students in the control condition. But if it is a matter of history (e.g., news of a celebrity drug overdose) or maturation (e.g., improved reasoning), then students in the two conditions would be likely to show similar amounts of change. This type of design does not completely eliminate the possibility of confounding variables, however. Something could occur at one of the schools but not the other (e.g., a student drug overdose), so students at the first school would be affected by it while students at the other school would not.



Finally, if participants in this kind of design are randomly assigned to conditions, it becomes a true experiment rather than a quasi experiment. In fact, it is the kind of experiment that Eysenck called for and that has now been conducted many times to demonstrate the effectiveness of psychotherapy.

### **Advantages of Quasi-Experimental Designs**

Since quasi-experimental designs are used when randomization is impractical and / or unethical, they are typically easier to set up than true experimental designs, which require random assignment of subjects. Additionally, utilizing quasi-experimental designs minimizes threats to ecological validity as natural environments do not suffer the same problems of artificiality as compared to a well-controlled laboratory setting. Since quasi-experiments are natural experiments, findings in one may be applied to other subjects and settings, allowing for some generalizations to be made about population. Also, this experimentation method is efficient in longitudinal research that involves longer time periods which can be followed up in different environments.

Other advantages of quasi experiments include the idea of having any manipulations the experimenter so chooses. In natural experiments, the researchers have to let manipulations occur on their own and have no control over them whatsoever. Also, using self-selected groups in quasi experiments also takes away to chance of ethical, conditional, etc. concerns while conducting the study.

### **Disadvantages of Quasi-Experimental Designs**

Quasi-experimental estimates of impact are subject to contamination by confounding variables. In the example above, a variation in the children's response to spanking is plausibly influenced by factors that cannot be easily measured and controlled, for example the child's intrinsic wildness or the parent's irritability. The lack of random assignment in the quasi-experimental design method may allow studies to be more feasible, but this also poses many challenges for the investigator in terms of internal validity. This deficiency in randomization makes it harder to rule out confounding variables and

introduces new threats to internal validity. Because randomization is absent, some knowledge about the data can be approximated, but conclusions of causal relationships are difficult to determine due to a variety of extraneous and confounding variables that exist in a social environment. Moreover, even if these threats to internal validity are assessed, causation still cannot be fully established because the experimenter does not have total control over extraneous variables.

Disadvantages also include the study groups may provide weaker evidence because of the lack of randomness. Randomness brings a lot of useful information to a study because it broadens results and therefore gives a better representation of the population as a whole. Using unequal groups can also be a threat to internal validity. If groups are not equal, which is sometimes the case in quasi experiments, and then the experimenter might not be positive what the causes are for the results.

### **Single-Subject Research Designs**

Single-subject research design is a research design most often used in applied fields of psychology, education, and human behaviour in which the subject serves as his/her own control, rather than using another individual/group. Researchers use single-subject design because these designs are sensitive to individual organism differences vs. group designs which are sensitive to averages of groups. Often there will be large numbers of subjects in a research study using single-subject design, however—because the subject serves as their own control, this is still a single-subject design. These designs are used primarily to evaluate the effect of a variety of interventions in applied research.

## **Requirements of Single-Subject Research Designs**

The following are requirements of single-subject designs:

- **Continuous assessment:** The behaviour of the individual is observed repeatedly over the course of the intervention. This ensures that any treatment effects are observed long enough to convince the scientist that the treatment produces a lasting effect.
- **Baseline assessment:** Before the treatment is implemented, the researcher is to look for behavioural trends. If a treatment reverses a baseline trend (e.g., things were getting worse as time went on in the baseline but the treatment reversed this trend) then this is powerful evidence suggesting (though not proving) a treatment effect.
- **Variability in data:** Because behaviour is assessed repeatedly, the single-subject design allows the researcher to see how consistently the treatment changes behaviour over time. Large-group statistical designs do not typically provide this information because repeated assessments are not usually taken and the behaviour of individuals in the groups are not scrutinized; instead, group means are reported.

## **Phases within single-subject research design**

- **Baseline:** this phase is one in which the researcher collects data on the dependent variable without any intervention in place.
- **Intervention:** this phase is one in which the researcher introduces an independent variable (the intervention) and then collects data on the dependent variable.
- **Reversal:** this phase is one in which the researcher removes the independent variable (reversal) and then collects data on the dependent variable.

It is important that the data are stable (steady trend and low variability) before the researcher moves to the next phase. Single-subject designs produce or approximate three levels of knowledge: (1) descriptive, (2) correlational, and (3) causal.

### **Flexibility of the design**

Single-subject designs are preferred because they are highly flexible and highlight individual differences in response to intervention effects. In general, single-subject designs have been shown to reduce interpretation bias for counselors when doing therapy.

### **Interpretation of data**

In order to determine the effect of the independent variable on the dependent variable, the researcher will graph the data collected and visually inspect the differences between phases. If there is a clear distinction between baseline and intervention, and then the data returns to the same trends/level during reversal, a functional relation between the variables is inferred. Sometimes, visual inspection of the data demonstrates results that statistical tests fail to find.

Researchers utilizing single-subject design begin with graphic analysis. During the baseline, data are repeatedly collected and then graphed on the behaviour of interest. This provides a visual representation of the subject's behaviour before application of the intervention. It is critical that several (three to five is often recommended) data points are collected during baseline to allow the researcher to describe the effects on the target behaviour during intervention.

In interpreting, the general strategy of all single-subject research is to use the subject as their own control. Experimental logic argues that the subject's baseline behaviour would match its behaviour in the intervention phase unless the intervention does something to change it. This logic then holds to rule out confound, one needs to replicate. It is the within-subject replication and allows for the determination of functional relationships. Thus the goal is:

- Demonstration
- Verification
- Replication

## Comparison of Single Subject Research Design and Large Sample Design

Comparison of Single-Subject and Large-Sample Approaches		
ISSUE	SINGLE SUBJECT	LARGE SAMPLE
Random assignment	Not applicable	Yes
Control groups	Not applicable	Yes
Manipulation	Yes	Yes
Determining reliability	Replications	Statistically
Determining generality	Replications	Sampling
Number of participants	Usually 1–5	Usually >10 per group
Flexibility of procedure	High	Low
Measurement of behavior	Continuous monitoring	Varies
Focus of interest	Individual	Group
Time to complete experiment	Relatively long term	Relatively short term
Knowledge of results	Moment to moment	After study is complete
Type I and Type II errors	Not applicable	Yes
Statistical assumptions	Not applicable	Yes
Statistical power	Not applicable	Yes
Laboratory experiments	Yes	Yes
Field experiments	Yes	Yes
Actuarial experiments	No	Yes
Comparison experiments	No	Yes

### **Advantages of the Single-Subject Research Designs**

Those who use the single-subject approach find it both a powerful and satisfying research method. One reason for this is that the method provides feedback quickly to the investigator about the effects of the treatment conditions. The experimenter knows relatively soon whether the treatment is working or not working. Day-to-day changes can be observed first hand, quickly and in individual participants. If changes are necessary on a day-to-day basis, they can be made. Seldom do scientists have available procedures that do this.

In contrast to the single-subject approach, a large sample statistical approach may take weeks or months of testing participants, calculating means, then performing statistical analyses, etc., and unfortunately, often nothing may be known about the effects of the treatment conditions until the final statistical analysis is complete. Even then, as we have seen, the derived knowledge is limited to statements regarding group performance and not to the performance of specific individual participants.

The single-subject method also allows us to draw strong conclusions regarding the factors controlling the dependent variable, yet the method does not use random assignment. The method allows strong conclusions because investigators employing it use procedures that provide rigorous control over environmental-experimental conditions with great emphasis on obtaining stable behaviour with each participant. To be an acceptable scientific work, the research must demonstrate for each participant that behaviour is controlled by the treatment condition and he or she must also show both intra- and inter participant replication. That is, control must be shown both within a single participant and also between the participants.

### **Limitations of the Single-Subject Research Designs**

One obvious limitation of the single-subject approach is that the method is unsuitable for answering actuarial types of questions. Questions such as, "How many of the one-hundred people exposed

to a particular treatment will respond favourably and how many will respond unfavourably?" A similar question relates to studies comparing two or more different treatments on the same behavioural measure.

For example, which of the various treatments is the most effective? Ineffective? Debilitating? The method cannot be used if you are interested in treating an entire group of participants, such as a classroom, in an identical way on a daily basis, i.e., when changes in procedures are made, they are made for everyone in the group at the same time and for the same period. A different method is also required if "after the fact" studies (ex post facto, correlational, passive observational) are of interest. Moreover, the single-subject approach makes heavy time demands. It may, on occasion, take several months to completely test a single participant under the various conditions of interest. Often researchers are unwilling or unable to devote the required time.

In addition to these limitations, there are also some recurring problems. Establishing a criterion and acquiring stable baselines for the response of interest are sometimes very difficult. Further, determining whether variability in behaviour is intrinsic or extrinsic can be troublesome. Non reversible (irreversible) behaviour poses its own set of problems and it precludes the use of a design in which the researcher removes the treatment to observe a return to baseline levels of responding. Failure to obtain intra- and inter-participant replication for whatever reason creates problems for the single-subject approach. Sometimes decisions regarding the necessary number of both intra- and inter-participant replications are largely subjective. Nevertheless, in spite of the limitations and problems described here, the single-subject method does provide researchers with another powerful way to assess behaviour.

## Chapter – IV: SAMPLING TECHNIQUES

**Universe and sampling: meaning, principles, types and techniques. Tools / instrument: steps involved in tool construction; Sources of data: primary and secondary data.**

**Universe** is known as population. From a statistical point of view, the term 'Universe' refers to the total of the items or units in any field of inquiry, whereas the term 'population' refers to the total of items about which information is desired. The attributes that are the object of study are referred to as characteristics and the units possessing them are called as elementary units. The aggregate of such units is generally described as population. Thus, all units in any field of inquiry constitute universe and all elementary units (on the basis of one characteristic or more) constitute population. Quite often, we do not find any difference between population and universe, and as such the two terms are taken as interchangeable. However, a researcher must necessarily define these terms precisely.

The population or universe can be finite or infinite. The population is said to be finite if it consists of a fixed number of elements so that it is possible to enumerate it in its totality. For instance, the population of a city, the number of workers in a factory are examples of finite populations. The symbol 'N' is generally used to indicate how many elements (or items) are there in case of a finite population. An infinite population is that population in which it is theoretically impossible to observe all the elements. Thus, in an infinite population the number of items is infinite i.e., we cannot have any idea about the total number of items. The number of stars in a sky, possible rolls of a pair of dice are examples of infinite population. One should remember that no truly infinite population of physical objects does actually exist in spite of the fact that many such populations appear to be very large. From a practical consideration, we then use the term infinite population for a population that cannot be enumerated in a reasonable period of



time. This way we use the theoretical concept of infinite population as an approximation of a very large finite population.

**Sampling** helps a lot in research. It is one of the most important factors which determines the accuracy of your research/survey result. If anything goes wrong with your sample then it will be directly reflected in the final result. There are lot of techniques which help us to gather sample depending upon the need and situation.

Sample is the subset of the population. The process of selecting a sample is known as sampling. Number of elements in the sample is the sample size.



### Principles of sampling

1) **Principle of statistical regularity:** this law is based upon mathematical theory of probability. It is based upon the following two conditions.

- i. **Large sample size:** as the sample size increases, the true characteristics of the population are more likely to reveal.
- ii. **Random selection:** the sample should be selected randomly in which each and every unit of the universe has an equal chance of being selected.

2) **Principle of inertia of large numbers:** – it is based upon the concept that as the sample size increases the better results we will

get. For example if we have to study the weight of the students studying in a college then fairly adequate sample of the students help us to arrive at good results.

3) **Principle of validity:** – if valid tests are derived only then sampling design is termed as valid.

4) **Principle of optimization:** – this principle states that with the help of sample one must be able to get optimum results with maximum efficiency and minimum cost.

### **Types of sampling**

There are two major types of sampling i.e. Probability and Non-probability Sampling.

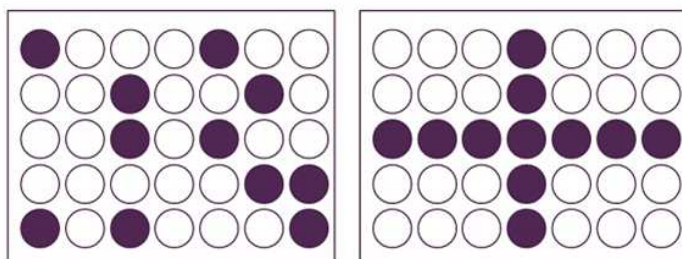
#### **Probability sampling**

Probability sampling is a type of sampling where each member of the population has a known probability of being selected in the sample. When a population is highly homogeneous, its each member has a known chance of being selected in the sample. For example, if we want to pick some sugar from any part of a bag containing sugar, the selected part will have similar characteristics. In such a case, each member has a known chance of being selected in a sample. Hence, the sample collected from any part of a bag containing sugar will be a true representative of the whole sugar. In such a situation, probability sampling is adopted. The extent of homogeneity of a population usually depends upon the nature of the research *e.g. who are the target respondents of the research*. For instance, you want to know community attitude towards a phenomenon. For such a study, the population serves as relatively a homogeneous group as every member of the population is the target respondents.

#### **Non-probability sampling**

Non-probability sampling is a type of sampling where each member of the population does not have known probability of being selected in the sample. In this type of sampling, each member of the

population does not get an equal chance of being selected in the sample. Non-probability sampling is adopted when each member of the population cannot be selected or the researcher deliberately wants to choose members selectively. For example, to study impacts of domestic violence on children, the researcher will not interview all the children but will interview only those children who are subjected to domestic violence. Hence, the members cannot be selected randomly. The researcher will use his judgment to select the members.



Probability Sampling Vs Non-Probability Sampling

Following techniques are used for probability sampling

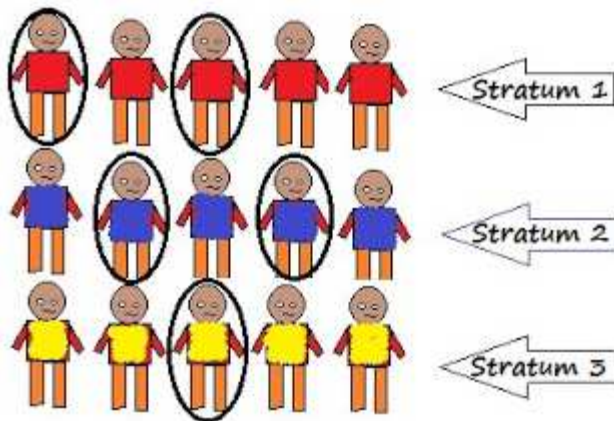
1. Simple Random Sampling
2. Stratified Random Sampling
3. Systematic Random Sampling
4. Cluster Sampling
5. Multistage Sampling

**Simple Random Sampling:** Every element has an equal chance of getting selected to be the part sample. It is used when we don't have any kind of prior information about the target population. For example: Random selection of 20 students from class of 50 students. Each student has equal chance of getting selected. Here probability of selection is  $1/50$



### Stratified Random Sampling

This technique divides the elements of the population into small subgroups (strata) based on the similarity in such a way that the elements within the group are homogeneous and heterogeneous among the other subgroups formed. And then the elements are randomly selected from each of these strata. We need to have prior



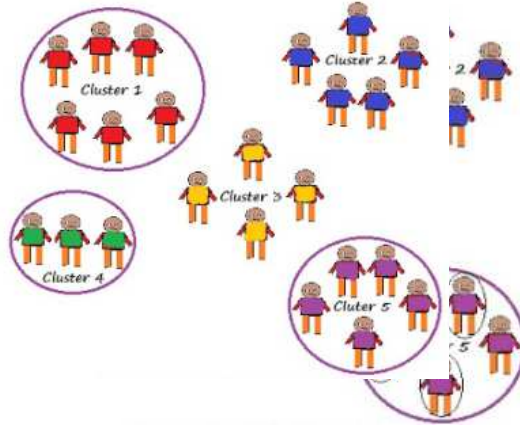
information about the population to create subgroups.

### Cluster Sampling

Our entire population is divided into clusters or sections and then the clusters are randomly selected. All the elements of the cluster are

used for sampling. Clusters are identified using details such as age, sex, location etc. Cluster sampling can be done in following ways:

**1. Single Stage Cluster Sampling:** Entire cluster is selected randomly for sampling.



**2. Two Stage Cluster Sampling:** Here first we randomly select clusters and then from those selected clusters we randomly select elements for sampling

### **Systematic Clustering**

Here the selection of elements is systematic and not random except the first element. Elements of a sample are chosen at regular intervals of population. All the elements are put together in a sequence first where each element has the equal chance of being selected.

For a sample of size  $n$ , we divide our population of size  $N$  into subgroups of  $k$  elements.

We select our first element randomly from the first subgroup of  $k$  elements.

To select other elements of sample, perform following:

We know number of elements in each group is  $k$  i.e  $N/n$

So if our first element is  $n_1$  then

Second element is  $n_1+k$  i.e  $n_2$

Third element  $n_2+k$  i.e  $n_3$  and so on..

Taking an example of  $N=20$ ,  $n=5$

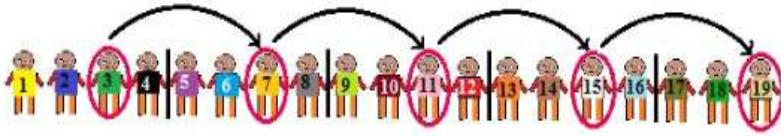
No of elements in each of the subgroups is  $N/n$  i.e  $20/5 = 4 = k$

Now, randomly select first element from the first subgroup.

If we select  $n_1 = 3$

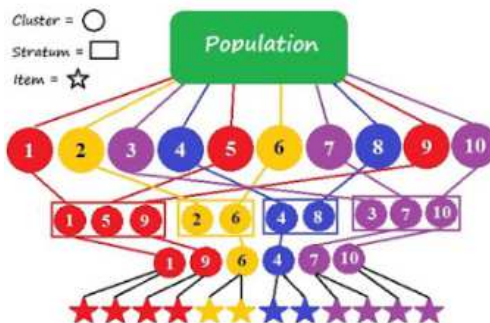
$n_2 = n_1 + k = 3 + 4 = 7$

$n_3 = n_2 + k = 7 + 4 = 11$



### Multi-Stage Sampling

It is the combination of one or more methods described above. Population is divided into multiple clusters and then these clusters are further divided and grouped into various sub groups (strata) based on similarity. One or more clusters can be randomly selected from each stratum. This process continues until the cluster can't be divided anymore. For example country can be divided into states, cities, urban and rural and all the areas with similar characteristics can be merged together to form a strata.



Following techniques of sampling are included in the non probability sampling:

1. Convenience sampling
2. Purposive sampling
3. Quota sampling (proportional and non proportional)
4. Referral / Snowball sampling

### **Convenience Sampling**

Here the samples are selected based on the availability. This method is used when the availability of sample is rare and also costly. So based on the convenience samples are selected. For example: Researchers prefer this during the initial stages of survey research, as it's quick and easy to deliver results.

### **Purposive Sampling**

This is based on the intention or the purpose of study. Only those elements will be selected from the population which suits the best for the purpose of our study.

For Example: If we want to understand the thought process of the people who are interested in pursuing master's degree then the selection criteria would be "Are you interested for Masters in..?" All the people who respond with a "No" will be excluded from our sample.

### **Quota Sampling**

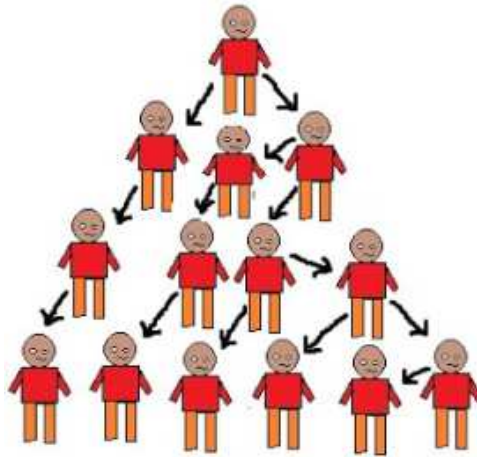
This type of sampling depends of some pre-set standard. It selects the representative sample from the population. Proportion of characteristics/ trait in sample should be same as population. Elements are selected until exact proportions of certain types of data is obtained or sufficient data in different categories is collected. For example: If our population has 45% females and 55% males then our sample should reflect the same percentage of males and females.

### **Referral /Snowball Sampling**

This technique is used in the situations where the population is completely unknown and rare. Therefore we will take the help from the first element which we select for the population and ask him to

recommend other elements who will fit the description of the sample needed. So this referral technique goes on, increasing the size of population like a snowball.

For example: It's used in situations of highly sensitive topics like HIV Aids where people will not openly discuss and participate in surveys to share information about HIV Aids. Not all the victims will respond to the questions asked so researchers can contact people they know or volunteers to get in touch with the victims and collect information. Helps in situations where we do not have the access to sufficient people with the characteristics we are seeking. It starts with finding people to study.



### **Tools for Research**

The selection of suitable instruments or tools is of vital importance for successful research. Different tools are suitable for collecting various kinds of information for various purposes. The research worker may use one or more of the tools in combination for his purpose. Research students should therefore familiarise themselves with the varieties of tools with their nature, merits and limitations. They should also know how to construct and use them effectively. The systematic way and procedure by which a complex or scientific task is accomplished is known as the technique. Techniques is the



practical method, skill or art applied to a particulate task. So, as a researcher we should aware of both the tools and techniques of research.

The major tools of research in education can be classified broadly into the following categories.

A. Inquiry forms

- a) Questionnaire
- b) Checklist
- c) Score-card
- d) Schedule
- e) Rating Scale
- f) Opinionnaire
- g) Attitude Scale

B. Observation

C. Interview

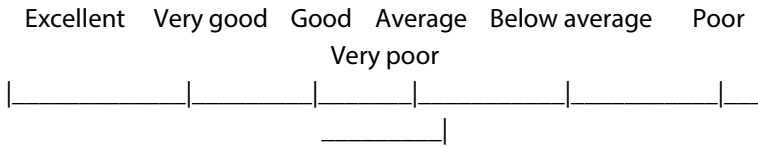
D. Sociometry

E. Psychological Tests

- a) Achievement Test
- b) Aptitude Test
- c) Intelligence Test
- d) Interest inventory
- e) Personality measures etc.

### **Rating scale**

Rating scale is one of the enquiry forms. Form is a term applied to expression or judgment regarding some situation, object or character. Opinions are usually expressed on a scale of values. Rating techniques are devices by which such judgments may be quantified. Rating scale is a very useful device in assessing quality, specially when quality is difficult to measure objectively. For Example, "How good was the performance?" is a question which can hardly be answered objectively. Rating scales record judgment or opinions and indicates the degree or amount of different degrees of quality which are arranged along a line is the scale. For example: How good was the performance?



This is the most commonly used instrument for making appraisals. It has a large variety of forms and uses. Typically, they direct attention to a number of aspects or traits of the thing to be rated and provide a scale for assigning values to each of the aspects selected. They try to measure the nature or degree of certain aspects or characteristics of a person or phenomenon through the use of a series of numbers, qualitative terms or verbal descriptions. Ratings can be obtained through one of three major approaches:

- Paired comparison
- Ranking and
- Rating scales

**Attitude scale**

Attitude scale is a form of appraisal procedure and it is also one of the enquiry term. Attitude scales have been designed to measure attitude of a subject of group of subjects towards issues, institutions and group of peoples.

Opinion and attitude are used sometimes in a synonymous manner but there is a difference between two. You will be able to know when we will discuss about opinionnaire. An opinion may not lead to any kind of activity in a particular direction. But an attitude compels one to act either favourably or unfavourably according to what they perceive to be correct. We can evaluate attitude through questionnaire. But it is ill adapted for scaling accurately the intensity of an attitude. Therefore, Attitude scale is essential as it attempts to minimise the difficulty of opinionnaire and questionnaire by defining the attitude in terms of a single attitude object. All items, therefore, may be constructed with graduations of favour or disfavour.

Examples of Some Attitude Scale:

Two popular and useful methods of measuring attitudes indirectly, commonly used for research purposes are:

- Thurstone Techniques of scaled values.
- Likert's method of summated ratings.

**Thurstone Technique:** Thurstone Technique is used when attitude is accepted as a one-dimensional linear Continuum. The procedure is simple. A large number of statements of various shades of favourable and unfavourable opinion on slips of paper, which a large number of judges exercising complete detachment sort out into eleven plies ranging from the most hostile statements to the most favourable ones. The opinions are carefully worded so as to be clear and unequivocal. The judges are asked not express tier opinion but to sort them at their face value. The items which bring out a marked disagreement between the judges un-assigning a position are discarded. Tabulations are made which indicate the number of judges who placed each item in each category.

**The Likert Scale:** The Likert scale uses items worded for or against the proposition, with five point rating response indicating the strength of the respondent's approval or disapproval of the statement. This method removes the necessity of submitting items to the judges for working out scaled values for each item. It yields scores very similar to those obtained from the Thurstone scale. It is an important over the Thurstone method.

### **Opinionnaire**

Opinion is what a person says on certain aspects of the issue under considerations. It is an outward expression of an attitude held by an individual. Attitudes of an individual can be inferred or estimated from his statements of opinions.

An opinionnaire is defined as a special form of inquiry. It is used by the researcher to collect the opinions of a sample of population on certain facts or factors the problem under investigation. These

opinions on different facts of the problem under study are further quantified, analysed and interpreted.

### **Questionnaire**

A questionnaire is a form prepared and distributed to secure responses to certain questions. It is a device for securing answers to questions by using a form which the respondent fills by himself. It is a systematic compilation of questions that are submitted to a sampling of population from which information is desired. Questionnaire relies on written information supplied directly by people in response to questions. The information from questionnaires tends to fall into two broad categories – ‘facts’ and ‘opinions’. It is worth stressing that, in practice, questionnaires are very likely to include questions about both facts and opinions.

### **Types:**

Questionnaire can be of various types on the basis of its preparation.

They are like:

- Structured v/s Non Structured
- Closed v/s Open
- Fact v/s Opinion Structured

**Non-Structured Questionnaire:** The structured questionnaire contains definite, concrete and directed questions, where as non-structured questionnaire is often used in interview and guide. It may consist of partially completed questions.

**Closed v/s Open Questionnaire:** The question that call for short check responses are known as restricted or closed form type. For Example, they provide for marking a yes or no, a short response or checking an item from a list of responses.

**Fact and Opinion:** In case of fact questionnaire, the respondent is expected to give information of facts without any reference to his opinion or attitude about them. But in case of opinion questionnaire

the respondent gives the information about the facts with his own opinion and attitude.

### **Checklist**

A checklist is a type of informational job aid used to reduce failure by compensating for potential limits of human memory and attention. It helps to ensure consistency and completeness in carrying out a task. A basic example is 'to do list'. A more advanced checklist which lays out tasks to be done according to time of a day or other factors. The checklist consists of a list of items with a place to check, or to mark yes or no.

### **Sociometry**

Sociometry is a qualitative method for measuring social relationships. It was developed by psychotherapist Jacob L. Moreno and Helen Hall Jennings in their studies of the relationship between social structures and psychological well-being, and used during remedial teaching.

Within sociology, sociometry has two main branches: research sociometry, and applied sociometry.

**Research sociometry** is action research with groups exploring the socio-emotional networks of relationships using specified criteria e.g. Who in this group do you want to sit beside you at work? Who in the group do you go to for advice on a work problem? Who in the group do you see providing satisfying leadership in the pending project? Sometimes called network explorations, research sociometry is concerned with relational patterns in small (individual and small group) and larger populations, such as organizations and neighbourhoods.

**Applied sociometry:** Applied sociometrists utilize a range of methods to assist people and groups review, expand and develop their existing psycho-social networks of relationships. Both fields of

sociometry exist to produce through their application, greater spontaneity and creativity of both individuals and groups.

### **Psychological tests**

Among the most useful and most frequently employed tools of educational research psychological tests occupy a very significant position. Psychological tests are described to describe and measure a sample of certain aspects of human behaviour or inner qualities. They yield objective descriptions of some psychological aspects of an individual's personality and translate them in quantitative terms. As we have mentioned earlier there are various kinds of psychological tests. In this unit we will discuss 'Aptitude tests' and 'Inventories'.

**Aptitude Tests:** "Aptitude tests attempt to predict the capacities or the degree of achievement that may be expected from individuals in a particular activity". Aptitude is a means by which one can find the relative knowledge of a person in terms of his intelligence and also his knowledge in general.

### **Inventory**

Inventory is a list, record or catalogue containing list of traits, preferences, attitudes, interests or abilities used to evaluate personal characteristics or skills. The purpose of inventory is to make a list about a specific trait, activity or programme and to check to what extent the presence of that ability types of Inventories like

- Interest Inventory and
- Personality Inventory

**Interest Inventory:** Persons differ in their interests, likes and dislikes. Interests are significant element in the personality pattern of individuals and play an important role in their educational and professional careers. The tools used for describing and measuring interests of individuals are the interest inventories or interest blanks. They are self report instruments in which the individuals note their own likes and dislikes. They are of the nature of standardised

interviews in which the subject gives an introspective report of his feelings about certain situations and phenomena which is then interpreted in terms of interests.

The use of interest inventories is most frequent in the areas of educational and vocational guidance and case studies. Distinctive patterns of interest that go with success have been discovered through research in a number of educational and vocational fields. Mechanical, computational, scientific, artistic, literary, musical, social service, clerical and many other areas of interest have been analysed in terms of activities. In terms of specific activities, a person's likes and dislikes are sorted into various interest areas and percentile scores calculated for each area. The area where a person's percentile scores are relatively higher is considered to be the area of his greatest interests, the area in which he would be the happiest and the most successful.

A **personality inventory** is a self-assessment tool that career counselors and other career development professionals use to help people learn about their personality types. It reveals information about individuals' social traits, motivations, strengths and weaknesses, and attitudes. Experts believe these factors play an important role in job and career success and satisfaction.

### **Observation**

Observation offers the researcher a distinct way of collecting data. It does not rely on what people say they do, or what they say they think. It is more direct than that. Instead, it draws on the direct evidence of the eye to witness events first hand. It is a more natural way of gathering data. Whenever direct observation is possible it is the preferable method to use.

Observation method is a technique in which the behaviour of research subjects is watched and recorded without any direct contact. It involves the systematic recording of observable phenomena or behaviour in a natural setting.

**Types of Observation:** On the basis of the purpose of observation may be of varied type like:

- Structured and Unstructured
- Participant and Non-participant

**Structured and Unstructured Observation:** In the early large stage of an investigation, it is necessary to allow maximum flexibility in observation to obtain a true picture of the phenomenon as a whole. In the early stage, if we attempt to restrict the observation to certain areas, then there will be the risk of overlooking some of the more crucial aspects. As the investigator studies the significant aspects and observes some restricted aspects of the situation to derive more and rigorous generalizations. So in the first stage of observation, the observation is wide and unstructured and as the investigation proceeds observation gets restricted and structured.

**Participant and Non-Participant Observation:** In participant observation, the observer becomes more or less one of the groups under observation and shares the situation as a visiting stranger, an attentive listener, an eager learner or as a complete participant observer, registering, recording and interpreting behaviour of the group.

In non-participant observation, the observer observes through one way screens and hidden microphones. The observer remains a looker from group. He keeps his observation as inconspicuous as possible. The purpose of non-participant observation is to observe the behaviour in a natural setting. The subject will not shift his behaviour or he will not be conscious that someone is observing his behaviour.

## **Interviews**

Interviews are an attractive proposition for the project researcher. Interviews are something more than conversation. They involve a set of assumptions and understandings about the situation which are not normally associated with a casual conversation. Interviews are also



referred as an oral questionnaire by some people, but it is indeed much more than that. Questionnaire involves indirect data collection, whereas Interview data is collected directly from others in face to face contact. As you know, people are hesitant to write something than to talk. With friendly relationship and rapport, the interviewer can obtain certain types of confidential information which might be reluctant to put in writing.

### **Types of Interview**

Interviews vary in purpose, nature and scope. They may be conducted for guidance, therapeutic or research purposes. They may be confined to one individual or extended to several people. The following discussions describe several types of interview.

**Structured Interview:** Structured interview involves tight control over the format of questions and answers. It is like a questionnaire which is administered face to face with a respondent. The researcher has a predetermined list of questions. Each respondent is faced with identical questions. The choice of alternative answers is restricted to a predetermined list. This type of interview is rigidly standardised and formal. Structured interviews are often associated with social surveys where researchers are trying to collect large volumes of data from a wide range of respondents.

**Semi-Structured Interview:** In semi-structured interview, the interviewer also has a clear list of issues to be addressed and questions to be answered. There is some flexibility in the order of the topics. In this type of interviewee is given chance to develop his ideas and speak more widely on the issues raised by the researcher. The answers are open-ended and more emphasis is on the interviewee elaborating points of interest.

**Unstructured Interview:** In case of unstructured interview, emphasis is placed on the interviewee's thoughts. The role of the researcher is to be as unintrusive as possible. The researcher introduces a theme or topic and then letting the interviewee develop

his or her ideas and pursue his or her train of thought. Allowing interviewees to speak their minds is a better way of discovering things about complex issues. It gives opportunity for in depth investigations.

**Single Interview:** This is a common form of semi structured or unstructured interview. It involves a meeting between one researcher and one informant. It is easy to arrange this type of interview. It helps the researcher to locate specific ideas with specific people. It is also easy to control the situation in the part of the interviewer.

**Group Interview:** In case of group interview, more than one informant is involved. The numbers involved normally about four to six people. Here you may think that it is difficult to get people together to discuss matters on one occasion and how many voices can contribute to the discussion during any one interview. But the crucial thing to bear in mind, here is that a group interview is not an opportunity for the researcher to questions to a sequence of individuals, taking turns around a table. 'group' is crucial here, because it tells us that those present in the interview will interact with one another and that the discussion will operate at the level of the group. They can present a wide range of information and varied viewpoints.

**Focus Group Interview:** This is an extremely popular form of interview technique. It consists of a small group of people, usually between six and nine in number. This is useful for non-sensitive and non-sensitive and noncontroversial topics. The session usually revolve around a prompt, a trigger, some stimulus introduced by the interviewer in order to 'focus' the discussion. The respondents are permitted to express themselves completely, but the interviewer directs the live of thought. In this case, importance is given on collective views rather than the aggregate view. It concentrates on particular event or experience rather than on a general line of equality.

## **STEPS INVOLVED IN TOOL CONSTRUCTION**

### **Step 1: Definition and elaboration of the construct intended to be measured**

The first step in instrument development is conceptualization, which involves defining the construct and the variables to be measured. Use the International Classification of Functioning, Disability and Health (ICF) or the model by Wilson and Clearly (1995) as a framework for your conceptual model. When the construct is not directly observable (latent variable), the best choice is to develop a multi-item instrument. When the observable items are consequences of (reflecting) the construct, this is called a reflective model. When the observable items are determinants of the construct, this is called a formative model. When you are interested in a multidimensional construct, each dimension and its relation to the other dimensions should be described.

### **Step 2: Choice of measurement method (e.g. questionnaire/physical test)**

Some constructs form an indissoluble alliance with a measurement instrument, e.g. body temperature is measured with a thermometer; and a sphygmomanometer is usually used to assess blood pressure in clinical practice. The options are therefore limited in these cases, but in other situations more options exist. For example, physical functioning can be measured with a performance test, observations, or with an interview or self-report questionnaire. With a performance test for physical functioning, information is obtained about what a person can do, while by interview or self-report questionnaire information is obtained about what a person perceives he/she can do.

### **Step 3: Selecting and formulating items**

To get input for formulating items for a multi-item questionnaire you could examine similar existing instruments from the literature that measure a similar construct, e.g. for different target population, and talk to experts (both clinicians and patients) using in-depth interview techniques. In addition, you should pay careful attention to the

formulation of response options, instructions, and choosing an appropriate recall period.

#### **Step 4: Scoring issues**

Many multi-item questionnaires contain 5-point item scales, and therefore are ordinal scales. Often a total score of the instrument is considered to be an interval scale, which makes the instrument suitable for more statistical analyses. Several questions are important to answer:

How can you calculate (sub) scores? Add the items, use the mean score of each item, or calculate Z-scores.

Are all items equally important or will you use (implicit) weights? Note that when an instrument has 3 subscales, with 5, 7, and 10 items respectively, the total score calculated as the mean of the mean score of each subscale differs from the total score calculated as the mean of all items.

How will you deal with missing values? In case of many missings (>5-10%) consider multiple imputation.

#### **Step 5: Pilot study**

Be aware that the first version of the instrument you develop will (probably) not be the final version. It is sensible to (regularly) test your instrument in small groups of people. A pilot test is intended to test the comprehensibility, relevance, and acceptability and feasibility of your measurement instrument.

#### **Step 6: Field-testing**

Most evaluations require the use of a data collection tool; a survey or other data collection instrument. Evaluators either need to adopt or adapt tools “off the shelf” or create new ones. Either method can pose challenges: Tools that have been developed for one evaluation may not prove suitable for another, at least not without careful

modification. At the same time, creating new tools requires expertise in measurement and instrument design.

### **SOURCES OF DATA**

Data collection plays a very crucial role in the statistical analysis. In research, there are different methods used to gather information, all of which fall into two categories, i.e. primary data, and secondary data. As the name suggests, primary data is one which is collected for the first time by the researcher while secondary data is the data already collected or produced by others.

There are many differences between primary and secondary data, which are discussed in this article. But the most important difference is that primary data is factual and original whereas secondary data is just the analysis and interpretation of the primary data. While primary data is collected with an aim for getting solution to the problem at hand, secondary data is collected for other purposes.

<b>BASIS FOR COMPARISON</b>	<b>PRIMARY DATA</b>	<b>SECONDARY DATA</b>
Meaning	Primary data refers to the first hand data gathered by the researcher himself.	Secondary data means data collected by someone else earlier.
Data	Real time data	Past data
Process	Very involved	Quick and easy
Source	Surveys, observations, experiments, questionnaire, personal interview, etc.	Government publications, websites, books, journal articles, internal records etc.

<b>BASIS FOR COMPARISON</b>	<b>PRIMARY DATA</b>	<b>SECONDARY DATA</b>
Cost effectiveness	Expensive	Economical
Collection time	Long	Short
Specific	Always specific to the researcher's needs.	May or may not be specific to the researcher's need.
Available in	Crude form	Refined form
Accuracy and Reliability	More	Relatively less

### **Primary Data**

Primary data is data originated for the first time by the researcher through direct efforts and experience, specifically for the purpose of addressing his research problem. Also known as the first hand or raw data. Primary data collection is quite expensive, as the research is conducted by the organisation or agency itself, which requires resources like investment and manpower. The data collection is under direct control and supervision of the investigator.

The data can be collected through various methods like surveys, observations, physical testing, mailed questionnaires, questionnaire filled and sent by enumerators, personal interviews, telephonic interviews, focus groups, case studies, etc.

### **Methods of primary data collection**

1. Personal investigation: The surveyor collects the data himself/herself. The data so collected is reliable but is suited for small projects.

2. Collection via Investigators: Trained investigators are employed to contact the respondents to collect data.
3. Questionnaires: Questionnaires may be used to ask specific questions that suit the study and get responses from the respondents. These questionnaires may be mailed as well.
4. Telephonic Investigation: The collection of data is done through asking questions over the telephone to give quick and accurate information.

### **Secondary Data**

Secondary data implies second-hand information which is already collected and recorded by any person other than the user for a purpose, not relating to the current research problem. It is the readily available form of data collected from various sources like censuses, government publications, internal records of the organisation, reports, books, journal articles, websites and so on.

Secondary data offer several advantages as it is easily available, saves time and cost of the researcher. But there are some disadvantages associated with this, as the data is gathered for the purposes other than the problem in mind, so the usefulness of the data may be limited in a number of ways like relevance and accuracy.

Moreover, the objective and the method adopted for acquiring data may not be suitable to the current situation. Therefore, before using secondary data, these factors should be kept in mind.

### **Methods of secondary data collection**

1. Official publications such as the Ministry of Finance, Statistical Departments of the government, Federal Bureaus, Agricultural Statistical boards, etc. Semi-official sources include Commercial Banks, Boards of Economic Enquiry, etc.
2. Data published by Chambers of Commerce and trade associations and boards.
3. Articles in the newspaper, from journals and technical publications.

## **Differences between Primary and Secondary Data**

The fundamental differences between primary and secondary data are discussed in the following points:

1. The term primary data refers to the data originated by the researcher for the first time. Secondary data is the already existing data, collected by the investigator agencies and organisations earlier.
2. Primary data is a real-time data whereas secondary data is one which relates to the past.
3. Primary data is collected for addressing the problem at hand while secondary data is collected for purposes other than the problem at hand.
4. Primary data collection is a very involved process. On the other hand, secondary data collection process is rapid and easy.
5. Primary data collection sources include surveys, observations, experiments, questionnaire, personal interview, etc. On the contrary, secondary data collection sources are government publications, websites, books, journal articles, internal records etc.
6. Primary data collection requires a large amount of resources like time, cost and manpower. Conversely, secondary data is relatively inexpensive and quickly available.
7. Primary data is always specific to the researcher's needs, and he controls the quality of research. In contrast, secondary data is neither specific to the researcher's need, nor he has control over the data quality.
8. Primary data is available in the raw form whereas secondary data is the refined form of primary data. It can also be said that secondary data is obtained when statistical methods are applied to the primary data.
9. Data collected through primary sources are more reliable and accurate as compared to the secondary sources.

As seen from the above discussion that primary data is an original and unique data, which is directly collected by the researcher from a



source according to researcher's requirements. As opposed to secondary data which is easily accessible but are not pure as they have undergone through many statistical treatments.

## **Chapter – V: DATA COLLECTION, ANALYSIS & REPORT WRITING**

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes. The data collection component of research is common to all fields of study including physical and social sciences, humanities, business, etc. While methods vary by discipline, the emphasis on ensuring accurate and honest collection remains the same.

### **The importance of ensuring accurate and appropriate data collection**

Regardless of the field of study or preference for defining data (quantitative, qualitative), accurate data collection is essential to maintaining the integrity of research. Both the selection of appropriate data collection instruments (existing, modified, or newly developed) and clearly delineated instructions for their correct use reduce the likelihood of errors occurring.

Consequences from improperly collected data include

- inability to answer research questions accurately
- inability to repeat and validate the study
- distorted findings resulting in wasted resources
- misleading other researchers to pursue fruitless avenues of investigation
- compromising decisions for public policy
- causing harm to human participants and animal subjects

While the degree of impact from faulty data collection may vary by discipline and the nature of investigation, there is the potential to cause disproportionate harm when these research results are used to support public policy recommendations.

Issues related to maintaining integrity of data collection:

The primary rationale for preserving data integrity is to support the detection of errors in the data collection process, whether they are made intentionally (deliberate falsifications) or not (systematic or random errors).

The quality assurance and quality control as two approaches that can preserve data integrity and ensure the scientific validity of study results. Each approach is implemented at different points in the research timeline:

1. Quality assurance - activities that take place *before* data collection begins
2. Quality control - activities that take place *during* and *after* data collection

Quality Assurance: Since quality assurance precedes data collection, its main focus is 'prevention' (i.e., forestalling problems with data collection). Prevention is the most cost-effective activity to ensure the integrity of data collection. This proactive measure is best demonstrated by the standardization of protocol developed in a comprehensive and detailed procedures manual for data collection. Poorly written manuals increase the risk of failing to identify problems and errors early in the research endeavour. These failures may be demonstrated in a number of ways:

- Uncertainty about the timing, methods, and identify of person(s) responsible for reviewing data
- Partial listing of items to be collected
- Vague description of data collection instruments to be used in lieu of rigorous step-by-step instructions on administering tests
- Failure to identify specific content and strategies for training or retraining staff members responsible for data collection
- Obscure instructions for using, making adjustments to, and calibrating data collection equipment (if appropriate)
- No identified mechanism to document changes in procedures that may evolve over the course of the investigation.

An important component of quality assurance is developing a rigorous and detailed recruitment and training plan. Implicit in

training is the need to effectively communicate the value of accurate data collection to trainees. The training aspect is particularly important to address the potential problem of staff who may unintentionally deviate from the original protocol. This phenomenon, known as 'drift', should be corrected with additional training, a provision that should be specified in the procedures manual.

Given the range of qualitative research strategies (non-participant/ participant observation, interview, archival, field study, ethnography, content analysis, oral history, biography, unobtrusive research) it is difficult to make generalized statements about how one should establish a research protocol in order to facilitate quality assurance. Certainly, researchers conducting non-participant/participant observation may have only the broadest research questions to guide the initial research efforts. Since the researcher is the main measurement device in a study, many times there are little or no other data collecting instruments. Indeed, instruments may need to be developed on the spot to accommodate unanticipated findings.

Quality Control: While quality control activities (detection/monitoring and action) occur during and after data collection, the details should be carefully documented in the procedures manual. A clearly defined communication structure is a necessary pre-condition for establishing monitoring systems. There should not be any uncertainty about the flow of information between principal investigators and staff members following the detection of errors in data collection. A poorly developed communication structure encourages lax monitoring and limits opportunities for detecting errors.

Detection or monitoring can take the form of direct staff observation during site visits, conference calls, or regular and frequent reviews of data reports to identify inconsistencies, extreme values or invalid codes. While site visits may not be appropriate for all disciplines,

failure to regularly audit records, whether quantitative or qualitative, will make it difficult for investigators to verify that data collection is proceeding according to procedures established in the manual.

Quality control also identifies the required responses, or 'actions' necessary to correct faulty data collection practices and also minimize future occurrences. These actions are less likely to occur if data collection procedures are vaguely written and the necessary steps to minimize recurrence are not implemented through feedback and education.

Examples of data collection problems that require prompt action include:

- errors in individual data items
- systematic errors
- violation of protocol
- problems with individual staff or site performance
- fraud or scientific misconduct

In the social/behavioural sciences where primary data collection involves human subjects, researchers are taught to incorporate one or more secondary measures that can be used to verify the quality of information being collected from the human subject. For example, a researcher conducting a survey might be interested in gaining a better insight into the occurrence of risky behaviours among young adult as well as the social conditions that increase the likelihood and frequency of these risky behaviours.

To verify data quality, respondents might be queried about the same information but asked at different points of the survey and in a number of different ways. Measures of 'Social Desirability' might also be used to get a measure of the honesty of responses. There are two points that need to be raised here, 1) cross-checks within the data collection process and 2) data quality being as much an observation-level issue as it is a complete data set issue. Thus, data quality should

be addressed for each individual measurement, for each individual observation, and for the entire data set.

Each field of study has its preferred set of data collection instruments. The hallmark of laboratory sciences is the meticulous documentation of the lab notebook while social sciences such as sociology and cultural anthropology may prefer the use of detailed field notes. Regardless of the discipline, comprehensive documentation of the collection process before, during and after the activity is essential to preserving data integrity.

### **Types of Research Data**

Data may be grouped into four main types based on methods for collection: observational, experimental, simulation, and derived. The type of research data you collect may affect the way you manage that data. For example, data that is hard or impossible to replace (e.g. the recording of an event at a specific time and place) requires extra backup procedures to reduce the risk of data loss. Or, if you will need to combine data points from different sources, you will need to follow best practices to prevent data corruption.

**Observational Data:** Observational data are captured through observation of a behaviour or activity. It is collected using methods such as human observation, open-ended surveys, or the use of an instrument or sensor to monitor and record information such as the use of sensors to observe noise levels at the Mpls/St Paul airport. Because observational data are captured in real time, it would be very difficult or impossible to re-create if lost.

**Experimental Data:** Experimental data are collected through active intervention by the researcher to produce and measure change or to create difference when a variable is altered. Experimental data typically allows the researcher to determine a causal relationship and is typically projectable to a larger population. These types of data are often reproducible, but it often can be expensive to do so.

**Simulation Data:** Simulation data are generated by imitating the operation of a real-world process or system over time using computer test models. For example, to predict weather conditions, economic models, chemical reactions, or seismic activity. This method is used to try to determine what would, or could, happen under certain conditions. The test model used is often as, or even more, important than the data generated from the simulation.

**Derived / Compiled Data:** Derived data involves using existing data points, often from different data sources, to create new data through some sort of transformation, such as an arithmetic formula or aggregation. For example, combining area and population data from the Twin Cities metro area to create population density data. While this type of data can usually be replaced if lost, it may be very time-consuming (and possibly expensive) to do so.

### **Data Collection Methods**

Data collection is a process of collecting information from all the relevant sources to find answers to the research problem, test the hypothesis and evaluate the outcomes. Data collection methods can be divided into two categories: secondary methods of data collection and primary methods of data collection.

**Secondary Data Collection Methods:** Secondary data is a type of data that has already been published in books, newspapers, magazines, journals, online portals etc. There is an abundance of data available in these sources about your research area in business studies, almost regardless of the nature of the research area. Therefore, application of appropriate set of criteria to select secondary data to be used in the study plays an important role in terms of increasing the levels of research validity and reliability.

These criteria include, but not limited to date of publication, credential of the author, reliability of the source, quality of discussions, depth of analyses, the extent of contribution of the text to the development of the research area etc.

**Primary Data Collection Methods:** Primary data collection methods can be divided into two groups: quantitative and qualitative.

Quantitative data collection methods are based in mathematical calculations in various formats. Methods of quantitative data collection and analysis include questionnaires with closed-ended questions, methods of correlation and regression, mean, mode and median and others.

Quantitative methods are cheaper to apply and they can be applied within shorter duration of time compared to qualitative methods. Moreover, due to a high level of standardisation of quantitative methods, it is easy to make comparisons of findings.

Qualitative research methods, on the contrary, do not involve numbers or mathematical calculations. Qualitative research is closely associated with words, sounds, feeling, emotions, colours and other elements that are non-quantifiable.

Qualitative studies aim to ensure greater level of depth of understanding and qualitative data collection methods include interviews, questionnaires with open-ended questions, focus groups, observation, game or role-playing, case studies etc. Your choice between quantitative or qualitative methods of data collection depends on the area of your research and the nature of research aims and objectives.

### **Questionnaire**

Questionnaires can be handed out or sent by mail and later collected or returned by stamped addressed envelope. This method can be adopted for the entire population or sampled sectors.

Questionnaires may be used to collect regular or infrequent routine data, and data for specialised studies. While the information in this section applies to questionnaires for all these uses, examples will concern only routine data, whether regular or infrequent. Some of



the data often obtained through questionnaires include demographic characteristics, fishing practices, opinions of stakeholders on fisheries issues or management, general information on fishers and household food budgets.

A questionnaire requires respondents to fill out the form themselves, and so requires a high level of literacy. Where multiple languages are common, questionnaires should be prepared using the major languages of the target group. Special care needs to be taken in these cases to ensure accurate translations.

In order to maximise return rates, questionnaires should be designed to be as simple and clear as possible, with targeted sections and questions. Most importantly, questionnaires should also be as short as possible. If the questionnaire is being given to a sample population, then it may be preferable to prepare several smaller, more targeted questionnaires, each provided to a sub-sample. If the questionnaire is used for a complete enumeration, then special care needs to be taken to avoid overburdening the respondent. If, for instance, several agencies require the same data, attempts should be made to co-ordinate its collection to avoid duplication.

### **The Interview Schedule**

As fun as spontaneous or on-the-spot interviews may seem to be, they will still bomb if no preparation was put into it. Those “ambush” interviews you see on television? They are not completely random or “on-the-spot” as they are presented to be. The questions asked have already been prepared beforehand, and they are often contained in an interview schedule.

An interview schedule is basically a list containing a set of structured questions that have been prepared, to serve as a guide for interviewers, researchers and investigators in collecting information or data about a specific topic or issue. The schedule will be used by the interviewer, who will fill in the questions with the answers received during the actual interview.

### **Advantages of an Interview Schedule**

1. An interview schedule facilitates the conduct of an interview. Since the questions have already been prepared beforehand, it is easier to carry out and complete the interview.
2. It increases the likelihood of collecting accurate information or data. The questions, which were already prepared beforehand, are expected to be well-thought out and have focus, so they target the “heart of the matter”, thereby ensuring that the answers obtained are correct or accurate. According to Lindlof & Taylor, interview schedules can increase the reliability and credibility of data gathered.
3. It allows interviewers and researchers to get more information, since they can ask follow-up queries or clarifications to the questions they have prepared. Thus, the information gathered is more relevant and useful.
4. The rate and amount of responses are higher. Often, interviews are time-bound. Interviewers are given only a limited amount of time to ask all their questions and get the answers. If he came prepared, then he can utilize that time properly. Otherwise, he will be wasting a lot of time, thinking about what question to ask next. The next thing he knows, time is up, and he barely got anything substantial from the interviewee.
5. It offers flexibility and high customization, and may be used when interviewing different types of people. The interviewer can prepare it with the respondents in mind. For example, an interviewer may have prepared a job interview schedule for the recruitment of a construction worker or labourer. When he is tasked to interview candidates for a senior management position, he may also use the same schedule, but with several adjustments.

### **Disadvantages of an Interview Schedule**

1. It can be time-consuming. Preparation of the interview schedule can take quite a chunk of the time of an

interviewer, especially if it is for an extensive or in-depth interview. Significant amounts of research must be performed in order to be able to craft good questions.

2. There is a high risk that the interview and its results may suffer from the bias of the interviewer, as he is the one that will choose the questions to be asked during the interview.
3. Variability may be high when the interview schedule is used by multiple interviewers. This may result to unreliable information gathered during the interviews.

### **Types of Interview Schedules**

There are two major types of interview schedules or guides that are widely used by interviewers.

**In-depth interview schedule:** This is used for open-ended interviews, which are aimed at obtaining in-depth information, often on serious topics or sensitive issues. The questions are open-ended, with prompts provided for the interviewer to ask for clarification or further information if necessary.

The interviewee is given more room or leeway to talk about all the topics that will crop up during the interview, so he is free to use his own words and let the ideas flow out of him easily. The key characteristics of this interview schedule are listed below.

- The schedule contains indications of the interviewee's awareness of the purpose of the interview and how long it will take.
- The questions must be crafted to provide answers relevant to the topic or issue. For example, if it is a job interview, the questions should address the matter on whether the applicant being interviewed possesses the qualifications and credentials that make him suitable for the open position. If the interview is for purposes of research or investigation, the questions should answer the main problem or topic of the research or investigation.

- All questions should be relevant, or have an impact on the purpose or objective of the interview. Remove any irrelevant questions, or those with answers that won't be of any use to you.
- It takes the one-step-at-a-time approach, with each question meant to tackle only one issue, instead of addressing several issues all at one. This has a tendency to confuse not only the interviewee, but also the interviewer, and result in the latter losing control of the direction of the interview.
- Instead of using questions answerable with a Yes or No, the questions are open-ended, which can be used as a starting or reference point for more questions. This way, the interviewer can go deeper in getting information he needs.
- The questions are neutral, avoiding leading questions that have the potential to dictate the answer to the interviewee.

**Structured interview schedule:** This type of interview schedule is often compared with the format used in survey forms or questionnaires because of their similarities. The difference lies in the usage; obviously, the interview schedule is used by the interviewer during a face-to-face interaction, while the questionnaire is simply filled out by the respondent.

This interview schedule contains the questions that will be asked, and it is also where the interviewer will record the answers to those questions. Essentially, preparing an interview schedule for a structured interview is the same as preparing a questionnaire. It's just that the questionnaire will be used solely by the interviewer, and the respondent or interviewee will not get to lay their eyes on the contents.

For more flexibility, however, some interviewers combine the features of these two types when they prepare their interview schedule. It would really be up to the interviewer, and what he deems to be most effective in achieving his objectives.

## **Observation**

Observation, as the name implies, is a way of collecting data through observing. Observation data collection method is classified as a participatory study, because the researcher has to immerse herself in the setting where her respondents are, while taking notes and/or recording.

Observation as a data collection method can be structured or unstructured. In structured or systematic observation, data collection is conducted using specific variables and according to a pre-defined schedule. Unstructured observation, on the other hand, is conducted in an open and free manner in a sense that there would be no pre-determined variables or objectives.

## **Advantages of Observation**

Observation data collection method include direct access to research phenomena, high levels of flexibility in terms of application and generating a permanent record of phenomena to be referred to later. At the same time, observation method is disadvantaged with longer time requirements, high levels of observer bias, and impact of observer on primary data, in a way that presence of observer may influence the behaviour of sample group elements.

It is important to note that observation data collection method may be associated with certain ethical issues. Fully informed consent of research participant(s) is one of the basic ethical considerations to be adhered to by researchers. At the same time, the behaviour of sample group members may change with negative implications on the level of research validity if they are notified about the presence of the observer.

## **Participant Observation**

The participant observation means watching the events or situation or activities from inside by taking part in the group to be observed. He freely interacts with the other group members, participates in various activities of the group, acquires the way of life of the

observed group or his own, and studies their behaviour or other activities not as an outsider but by becoming a member of that group.

Goode and Hatt define participant observation as “the procedure used when the investigator can go disguise himself as to be accepted as a member of the group”. So in this kind of observation the observer has to stay as a member in the group he wants to study.

According to P.V. Young, “the participant observer using non-controlled observation, generally lives or otherwise shares in the life of the group which he is studying”.

Some of the examples of studies using the method of participant observation are: W.F. White’s study of Cornville social and Athletic Club and P.V. Young’s study of Molokan people. The famous studies of Margaret Mead on primitive societies were also based on participant observation.

For the success of participant observation it is essential that the respondents being studied should not have any doubt about the intention of the research worker. A fruitful result of participant observation is very much dependent upon the resourcefulness, tactfulness, personality manners and wit of the research worker.

### **Advantages of Participant Observation:**

The following are the merits of participant observation:

- a) **Observation of natural behaviour:** The natural behaviour of the respondent can be studied by participant observation. When a group knows that they are going to be observed by a stranger, they feel conscious, uncomfortable and therefore neutrality in their behaviour and activity is lost. But in case of the participant observation, the respondents do not know that they are being observed. So their behaviour is not constrained by the conscious feeling of being observed by a stranger.

- b) **Closeness with the group:** In participant observation, the observer has a very good rapport with the respondents. He has a very close primary relationship with the group members. Because of this he can participate in all activities from a close angle and thus can better interpret the situation than a non-participant observer.
- c) **Studying the real character:** Often in order to study the actual behaviour, the group research requires close participation and contact with the group members. Through participant observation the observer can make an intensive and inclusive study of the group and can gain into the real character of such group.
- d) **Better Understanding:** In participant observation the observer can better understand the feeling of the respondents than an outsider. For example, a person who is actually living in a slum area can realise the feeling and hardship of the slum dwellers in a better way than an outsider.
- e) **Participation provides opportunity to learn more about an event:** The chief advantage of participant observation is that in it the observer gets an opportunity to interact with the group regarding various activities of them. He can thus learn the significance of these activities that are actually not open for observation. It is generally easier for the respondent to describe about the event on right occasion than before or after it.

### **Disadvantages of Participant Observation:**

The following are the disadvantages of the participant observation:

- a) **Lack of objectivity:** By becoming members of a group and participating very closely in it, the observer may lose his objectivity. His emotional and sentimental association with the group kills his impartiality and unbiased analysis. He may develop some soft corner for that group member and because of this; he may often justify their evil activities as just activity.
- b) **Often close association brings biased interpretation:** Because of his close association and emotional participation with the group members the researcher creates a special position for

himself in that group. He may be influenced or pleased by this and begins to support them blindly. Due to this he observes the things from his own personal point of view rather than scientific point of view.

- c) **Misses important issues due to familiarity:** Due to much familiarity many crucial events appear to the participant observer as of little or no significance. Therefore, he misses many of the important issues. But a stranger pays much attention even to a small thing, as this appears new to him.
- d) **Limited range of experience:** In participant observation the observer is confined himself to a particular group. So his experience becomes very deep, but the range of his experience becomes very limited.
- e) **Involvement in groupism:** The active participation and proximity of the observer with the group may involve him in quarrels and group factionalism. He cannot avoid taking side of one faction. But if he does so, he loses his status as an impartial observer whom everybody is ready to co-operate. So it destroys the very purpose of the research and the researcher finds it very difficult to get proper information from the group.
- f) **Limits of participant observation:** There are certain situations in which the participant observation is not possible. For example, it is not possible to observe criminals or prisoners.

### **Non-Participant Observation:**

When the observer observes the group passively from a distance without participating in the group activities, it is known as non-participant observation. Here he does not try to influence them or take part in the group activities.

However, purely non-participant observation is extremely difficult. One cannot penetrate into the heart of a matter without proper participation in it. One really cannot imagine a kind of relationship, when the researcher is always present but never participates. This situation is hardly conducive for both the observer and the group. A



combination of both participant and non-participant method is sometimes selected.

The observer actively participates in some of the ordinary activities and observes passively from distance in others. Many sociologists therefore treat a non-participant observation in practice as only a quasi-participant observation. It is easier for the observer to perform both the roles than to disguise himself completely.

### **Advantages of Non-Participant Observation:**

Following are the merits of participant observation:

- a) **Objectivity and neutrality:** If an observer participates in the event actively and emotionally he may try to justify the evil things of the group as just things. In this frame of mind he cannot analyse the phenomena with neutrality. But in non-participant observation, the objectivity or neutrality can be maintained. The observer in this type of observation gives a detached and unbiased view about the group.
- b) **Command respect and co-operation:** In case of non-participant observation the researcher plays an impartial role. Therefore every member of the group gives him a special status and co-operate with his study.
- c) **More willingness of the respondent:** Often people do not feel shy to disclose their secrets, weaknesses or informal things to a stranger. But they always become reluctant to disclose these things to a known person.
- d) **Careful analysis:** In participant observation because of the much familiarity with the events, sometimes the observer does not realize the significance of some events and neglects them. But in non-participant observation the researcher does not even miss a minute thing. He carefully judges the merits and demerits of each and every phenomenon under study.
- e) **Freedom from groupism:** In non-participant observation the researcher always maintains his impartial status. His aloofness from petty conflicts helps him to carry his research work more smoothly.

### **Disadvantages of Non-Participant Observation:**

The following are the disadvantages of non-participant observation:

- a) **Subjectivity:** In non-participant observation the observer does not have clarity about certain events or activities. He cannot clear his doubts by asking various questions to the group members. Therefore he has to simply understand and interpret what he sees. This lack of understanding may make some of his findings biased and coloured by his personal prediction, belief and pre-conception.
- b) **Inadequate observation:** The observer can observe only those events which take place in front of him. But that is not enough and only a part of the phenomena as a vast range of information required for the research. He can know many things about the group when he participates in the group and interacts with the group members.
- c) **Unnatural and formal information:** The members of a group become suspicious of a person who observes them objectively. In front of an outsider or stranger they feel conscious and provide only some formal information's in an unnatural way. It creates bias and what the observer collects is not actual or normal thing but only formal information's.

**Inconvenience to the respondents:** The members of a particular group always feel uncomfortable when they know that their behaviour is critically analysed by an outsider. Therefore in some cases the tribals do not allow an outsider to watch their socio-cultural activities. It is always better for a researcher to become a member of the group in order to learn much about it.

### **DATA PROCESSING**

Data processing is the conversion of data into usable and desired form. This conversion or "processing" is carried out using a predefined sequence of operations either manually or automatically. Most of the data processing is done by using computers and thus done automatically. The output or "processed" data can be obtained in different forms like image, graph, table, vector file, audio, charts or any other desired format depending on the software or method of data processing used. When done itself it is referred to as automatic

data processing. Continue reading below to understand more about what is data processing.

### **Six stages of data processing**

1. Data collection: Collecting data is the first step in data processing. Data is pulled from available sources, including data lakes and data warehouses. It is important that the data sources available are trustworthy and well-built so the data collected (and later used as information) is of the highest possible quality.

2. Data preparation: Once the data is collected, it then enters the data preparation stage. Data preparation, often referred to as “pre-processing” is the stage at which raw data is cleaned up and organized for the following stage of data processing. During preparation, raw data is diligently checked for any errors. The purpose of this step is to eliminate bad data (redundant, incomplete, or incorrect data) and begin to create high-quality data for the best business intelligence.

3. Data input: The clean data is then entered into its destination (perhaps a CRM like Salesforce or a data warehouse like Redshift), and translated into a language that it can understand. Data input is the first stage in which raw data begins to take the form of usable information.

4. Processing: During this stage, the data inputted to the computer in the previous stage is actually processed for interpretation. Processing is done using machine learning algorithms, though the process itself may vary slightly depending on the source of data being processed (data lakes, social networks, connected devices etc.) and its intended use (examining advertising patterns, medical diagnosis from connected devices, determining customer needs, etc.).

5. Data output/interpretation: The output/interpretation stage is the stage at which data is finally usable to non-data scientists. It is translated, readable, and often in the form of graphs, videos, images, plain text, etc.). Members of the company or institution can now begin to self-serve the data for their own data analytics projects.

6. Data storage: The final stage of data processing is storage. After all of the data is processed, it is then stored for future use. While some information may be put to use immediately, much of it will serve a purpose later on. Plus, properly stored data is a necessity for

compliance with data protection legislation like GDPR. When data is properly stored, it can be quickly and easily accessed by members of the organization when needed.

### **Data Transcription**

d) Transcription is an integral process in the qualitative analysis of language data and is widely employed in basic and applied research across several disciplines and in professional practice fields. Due to financial restraints in both educational institutions and for individuals, transcribing audio and video materials that would otherwise be beneficial for the research process are given a backseat or offloaded to inexperienced interns or inferior outsourcing firms. But automatic transcription also has advantages that help obtain a fine result.

### **Benefits of Data Transcription**

Transcription in qualitative research has made the overall process of interpreting data very simple for researchers. It has helped interviewers by enabling them to read, analyse and interpret information with ease, with text that is precise and concise as well as easily understandable.

1. **Easy Interpretation of Data:** Transcripts help in easy interpretation of data, as reading text related to the research/interview makes it easy to collate data and structure it better.
2. **Shared copies for future analysis:** Transcription of interviews and qualitative research ensures that copies of the document can be distributed to everyone in the team which would further help in future analysis of data. This also helps fellow researchers to have direct access to data which is extremely valuable and useful. Audio transcription has also helped enhance teamwork, as tasks are shared between co-workers.
3. **Inclusion of verbatim comments in the report:** Instead of having to listen, pause and type, having the focus group or

interview pre transcribed helps generate good quality and in-depth reports.

4. **Enables a follow up and a detailed examination of the events:** Taking notes during the event might result in the interviewer missing out on key pieces of information being mentioned. The word-for-word transcription allows one to listen and interpret what is being said more effectively.
5. **Source of reference and Data interpretation:** Provides a source of reference for the interviewer while conducting a follow up interview and allows them to be able to go through data and use it at points when he/she could reach a standstill while interpreting data. This data can also be re-used during the course of other investigations and can be used to draw new conclusions during later studies as well. This has helped the extent of which data can be used and the amount of observations that can be made from the same piece of data.
6. **Quick reporting/Browsing:** The process of transcription of qualitative data has made browsing through data a much faster process. A researcher looking for data can simply use commands like "CTRL-F" to find specific information in the transcript without having to waste time going through the whole text or trying to listen through long audio files to get certain information.

### **Presentation of Data**

Presentation of data requires skills and understanding of data. It is necessary to make use of collected data which is considered to be raw data which must be processed to put for any application.

Presenting the data includes the pictorial representation of the data by using graphs, charts, maps and other methods. These methods help in adding the visual aspect to data which makes it much more comfortable and quicker to understand. Various methods of data presentation can be used to present data and facts. Widely used format and data presentation techniques are mentioned below:

1. **As text** – Raw data with proper formatting, categorisation, indentation is most extensively used and very effective way of

presenting data. Such format is widely found in books, reports, research papers and in this article itself.

2. **In tabular form** – Tabular form is generally used to differentiate, categorise, relate different datasets. It can be a simple pros & cons table, or a data with corresponding value such as annual GDP, a bank statement, monthly expenditure etc.
3. **In graphical Form** – Data can further be presented in a simpler and even easier form by means of using graphical form. The input for such graphical data can be another type of data itself or some raw data. For example, a bar graph & pie chart takes tabular data as input. The tabular data in such case is processed data itself but provides limited use. Converting such data or raw data into graphical form directly makes it quick and easier to interpret.

### **Tabular Presentation of Data**

A table helps representation of even large amount of data in an engaging, easy to read and coordinated manner. The data is arranged in rows and columns. This is one of the most popularly used forms of presentation of data as data tables are simple to prepare and read.

The most significant benefit of tabulation is that it coordinates data for additional statistical treatment and decision making. The analysis used in tabulation is of 4 types:

1. **Qualitative Classification:** When the classification is done according to traits, such as physical status, nationality, social status, etc., it is known as qualitative classification.
2. **Quantitative Classification:** In this, the data is classified on the basis of features which are quantitative in nature. In other words, these features can be estimated quantitatively.
3. **Temporal Classification:** In this classification, time becomes the categorising variable and data are classified according to time. Time may be in years, months, weeks, days, hours, etc.,

4. **Spatial Classification:** When the categorisation is done on the basis of location, it is called spatial classification. The place may be a country, state, district, block, village/town, etc.,

**Objectives of Tabulation:**

Following are the Objectives of Tabulation:

- To Simplify the Complex Data
- To Bring Out Essential Features of the Data
- To Facilitate Comparison
- To Facilitate Statistical Analysis
- Saving of Space

**Following are the main parts of Tabulation:**

Table Number	<ul style="list-style-type: none"> <li>• Table No. is the very first item mentioned on the top of each table for easy identification and further reference.</li> </ul>
Title	<ul style="list-style-type: none"> <li>• Title of the table is the second item which shown just above the table.</li> <li>• It narrates about the contents of the table so, it has to be very clear, brief and carefully worded.</li> </ul>
Headnote	<ul style="list-style-type: none"> <li>• It is the third item just above the Table &amp; shown after the title.</li> <li>• It gives information about unit of data like, "Amount in Rupees or \$", "Quantity in Tonnes" etc.</li> <li>• It is generally given in brackets.</li> </ul>
Captions or Column Headings	<ul style="list-style-type: none"> <li>• At the top of each column in a table, a column designation/head is given to explain figures of the column.</li> <li>• This is column heading is called "Caption".</li> </ul>
Stubs or Row Headings	<ul style="list-style-type: none"> <li>• The title of the horizontal rows is called "Stubs".</li> </ul>
Body of the	<ul style="list-style-type: none"> <li>• It contains the numeric information and</li> </ul>

Table	reveals the whole story of investigated facts. Columns are read vertically from top to bottom and rows are read horizontally from left to right.
Source Note	<ul style="list-style-type: none"> <li>• It is a brief statement or phrase indicating the source of data presented in the table.</li> </ul>
Footnote	<ul style="list-style-type: none"> <li>• It explains the specific feature of the table which is not self-explanatory and has not been explained earlier. For example, Points of exception if any.</li> </ul>

### **Limitations of Tabulation**

Following are the major limitations of a Table:

#### (1) Lacks Description

- The table represents only figures and not attributes.
- It ignores the qualitative aspects of facts.

#### (2) Incapable of Presenting Individual Items

- It does not present individual items.
- It presents aggregate data.

#### (3) Needs Special Knowledge

- The understanding of the table requires special knowledge.
- It cannot be easily used by the layman.

### **Graphic Presentation of Data**

Apart from diagrams, Graphic presentation is another way of the presentation of data and information. Usually, graphs are used to present time series and frequency distributions.

### **Construction of a Graph**

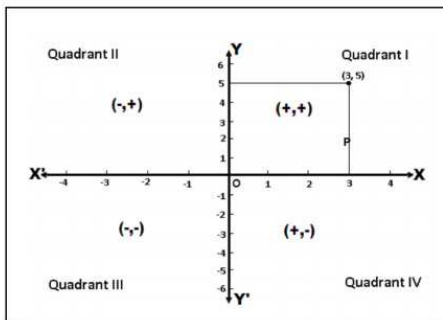
The graphic presentation of data and information offers a quick and simple way of understanding the features and drawing comparisons. Further, it is an effective analytical tool and a graph can help us in finding the mode, median, etc.



We can locate a point in a plane using two mutually perpendicular lines – the X-axis (the horizontal line) and the Y-axis (the vertical line). Their point of intersection is the Origin.

We can locate the position of a point in terms of its distance from both these axes. For example, if a point P is 3 units away from the Y-axis and 5 units away from the X-axis, then its location is as follows:

**Some points to remember:**



Graphical Plane

- We measure the distance of the point from the Y-axis along the X-axis. Similarly, we measure the distance of the point from the X-axis along the Y-axis. Therefore, to measure 3 units

from the Y-axis, we move 3 units along the X-axis and likewise for the other coordinate.

- We then draw perpendicular lines from these two points.
- The point where the perpendiculars intersect is the position of the point P.
- We denote it as follows (3,5) or (abscissa, ordinate). Together, they are the coordinates of the point P.
- The four parts of the plane are Quadrants.
- Also, we can plot different points for a different pair of values.

**Guidelines for Graphic Presentation of Data**

There are certain guidelines for an attractive and effective graphic presentation of data and information. These are as follows:

1. **Suitable Title:** Ensure that you give a suitable title to the graph which clearly indicates the subject for which you are presenting it.

2. **Unit of Measurement:** Clearly state the unit of measurement below the title.
3. **Suitable Scale:** Choose a suitable scale so that you can represent the entire data in an accurate manner.
4. **Index:** Include a brief index which explains the different colours and shades, lines and designs that you have used in the graph. Also, include a scale of interpretation for better understanding.
5. **Data Sources:** Wherever possible, include the sources of information at the bottom of the graph.
6. **Keep it Simple:** You should construct a graph which even a layman (without any exposure in the areas of statistics or mathematics) can understand.
7. **Neat:** A graph is a visual aid for the presentation of data and information. Therefore, you must keep it neat and attractive. Choose the right size, right lettering, and appropriate lines, colours, dashes, etc.

### **Merits of a Graph**

- The graph presents data in a manner which is easier to understand.
- It allows us to present statistical data in an attractive manner as compared to tables. Users can understand the main features, trends, and fluctuations of the data at a glance.
- A graph saves time.
- It allows the viewer to compare data relating to two different time-periods or regions.
- The viewer does not require prior knowledge of mathematics or statistics to understand a graph.
- We can use a graph to locate the mode, median, and mean values of the data.
- It is useful in forecasting, interpolation, and extrapolation of data.

## **Limitations of a Graph**

- A graph lacks complete accuracy of facts.
- It depicts only a few selected characteristics of the data.
- We cannot use a graph in support of a statement.
- A graph is not a substitute for tables.
- Usually, laymen find it difficult to understand and interpret a graph.
- Typically, a graph shows the unreasonable tendency of the data and the actual values are not clear.

## **Types of Graphs**

Graphs are of two types:

1. Time Series graphs
2. Frequency Distribution graphs

## **Time Series Graphs**

A time series graph or a “histogram” is a graph which depicts the value of a variable over a different point of time. In a time series graph, time is the most important factor and the variable is related to time. It helps in the understanding and analysis of the changes in the variable at a different point of time. Many statisticians and businessmen use these graphs because they are easy to understand and also because they offer complex information in a simple manner.

Further, constructing a time series graph does not require a user with technical skills. Here are some major steps in the construction of a time series graph:

- Represent time on the X-axis and the value of the variable on the Y-axis.
- Start the Y-value with zero and devise a suitable scale which helps you present the whole data in the given space.
- Plot the values of the variable and join different point with a straight line.
- You can plot multiple variables through different lines.

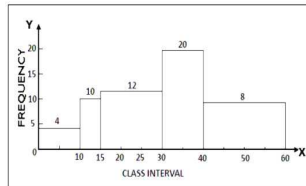
**Line Graph:** You can use a line graph to summarize how two pieces of information are related and how they vary with each other.

**Net Balance Graph:** If you have to show the net balance of income and expenditure or revenue and costs or imports and exports, etc., then you must use a net balance graph. You can use different colours or shades for positive and negative differences.

### Frequency Distribution Graphs

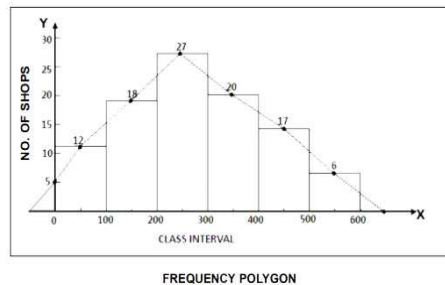
Let's look at the different types of frequency distribution graphs.

**Histogram:** A histogram is a graph of a grouped frequency distribution. In a histogram, we plot the class intervals on the X-axis and their respective frequencies on the Y-axis. Further, we create a rectangle on each class interval with its height proportional to the frequency density of the class.



### Frequency Polygon or Histogram

A frequency polygon or a Histogram is another way of representing a frequency distribution on a graph. You draw a frequency polygon by joining the midpoints of the upper widths of the adjacent rectangles of the histogram with straight lines.



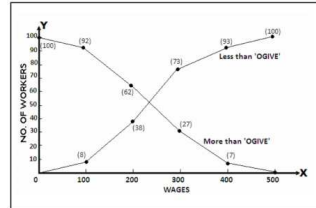
### Frequency Curve

When you join the verticals of a polygon using a smooth curve, then the resulting figure is a Frequency Curve. As the number of observations increase, we need to accommodate more classes.

Therefore, the width of each class reduces. In such a scenario, the variable tends to become continuous and the frequency polygon starts taking the shape of a frequency curve.

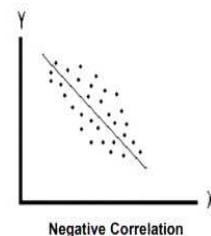
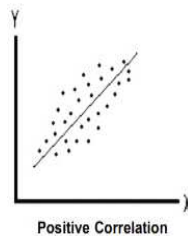
### Cumulative Frequency Curve or Ogive

A cumulative frequency curve or Ogive is the graphical representation of a cumulative frequency distribution. Since a cumulative frequency is either of a 'less than' or a 'more than' type, Ogives are of two types too – 'less than ogive' and 'more than ogive'.



### Scatter Diagram: A

scatter diagram or a dot chart enables us to find the nature of the relationship between the variables. If the plotted points are scattered a lot, then the relationship between the two variables is lesser.



### DATA ANALYSIS

Data Analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data. According to Shamoo and Resnik (2003) various analytic procedures “provide a way of drawing inductive inferences from data and distinguishing the signal (the phenomenon of interest) from the noise (statistical fluctuations) present in the data”..

While data analysis in qualitative research can include statistical procedures, many times analysis becomes an ongoing iterative process where data is continuously collected and analysed almost simultaneously. Indeed, researchers generally analyse for patterns in

observations through the entire data collection phase. The form of the analysis is determined by the specific qualitative approach taken (field study, ethnography content analysis, oral history, biography, unobtrusive research) and the form of the data (field notes, documents, audiotape and videotape).

An essential component of ensuring data integrity is the accurate and appropriate analysis of research findings. Improper statistical analyses distort scientific findings, mislead casual readers, and may negatively influence the public perception of research. Integrity issues are just as relevant to analysis of non-statistical data as well.

There are differences between qualitative data analysis and quantitative data analysis. In qualitative researches using interviews, focus groups, experiments etc. data analysis is going to involve identifying common patterns within the responses and critically analysing them in order to achieve research aims and objectives.

## **Data analysis in quantitative research**

### **Preparing data for analysis**

The first stage in research and data analysis is to make it for the analysis so that the nominal data can be converted into something meaningful. Data preparation consists of four phases

#### **Phase I: Data Validation**

Data validation is done to understand if the collected data sample is per the pre-set standards, or it is a biased data sample again divided into four different stages

- **Fraud:** To ensure an actual human being records each response to the survey or the questionnaire
- **Screening:** To ensure each participant or respondent is selected or chosen in compliance with the research criteria
- **Procedure:** To ensure ethical standards were maintained while collecting the data sample

- **Completeness:** To ensure that the respondent has answered all the questions in an online survey. Else, the interviewer had asked all the questions devised in the questionnaire.

### **Phase II: Data Editing**

More often, an extensive research data sample comes loaded with errors. Respondents sometimes fill in some fields incorrectly or sometimes skip them accidentally. Data editing is a process wherein the researchers have to confirm that the provided data is free of such errors. For that, they need to conduct necessary checks and outlier checks to edit the raw edit and make it ready for analysis.

### **Phase III: Data Coding**

Out of all three, this is the most critical phase of data preparation, which is associated with grouping and assigning values to the survey responses. Suppose a survey is completed with a 1000 sample size, then the researcher will create an age bracket to distinguish the respondents based on their age. Thus, it becomes easier to analyse small data buckets rather than to deal with the massive data pile.

### **Methods used for data analysis in quantitative research**

After the data is prepared for analysis, researchers are open to using different research and data analysis methods to derive meaningful insights. For sure, statistical techniques are most favoured to analyse the numerical data. The technique is again classified into two groups. First, 'Descriptive Statistics' used to describe data. Second, 'Inferential statistics' that helps in comparing the data.

### **Descriptive statistics**

This method is used to describe the basic features of versatile types of data in research. It presents the data in such a meaningful way that pattern in the data starts making sense. Nevertheless, the descriptive analysis does not go beyond making conclusions. The conclusions are again based on the hypothesis researchers have formulated so far. Here are a few major types of descriptive analysis methods

### **Measures of Frequency**

- Count, Percent, Frequency
- It is used to denote how often a particular event occurs
- Researchers use it when they want to showcase how often a response is given

### **Measures of Central Tendency**

- Mean, Median, Mode
- The method is widely used to demonstrate distribution by various points
- Researchers use this method when they want to showcase the most commonly or averagely indicated response

### **Measures of Dispersion or Variation**

- Range, Variance, Standard deviation
- Here the field equals to high/low points
- Variance standard deviation = difference between the observed score and mean
- It is used to identify the spread of scores by stating intervals
- Researchers use this method to showcase data spread out. It helps them identify the depth until which the data is spread out that it directly affects the mean.

### **Measures of Position**

- Percentile ranks, Quartile ranks
- It relies on standardized scores helping researchers to identify the relationship between different scores.
- It is often used when researchers want to compare scores with the average count.

For quantitative market research use of descriptive analysis often give absolute numbers, but the analysis is never sufficient to demonstrate the rationale behind those numbers. Nevertheless, it is necessary to think of the best method to be used for research and data analysis suiting your survey questionnaire and what story



researchers want to tell. For example, the mean is the best way to demonstrate the average scores of the students in schools. It is better to rely on the descriptive statistics when the researchers intend to keep the research or outcome limited to the provided sample without generalizing it to the population. For example, when you want to compare average voting done in two different cities, then differential statistics is enough.

Descriptive analysis is also called a 'univariate analysis' since it is commonly used to analyse a single variable.

### **Inferential statistics**

Inferential statistics are used to make predictions about a larger population after research and data analysis of the collected sample of the representing population. For example, at a movie theatre, you can ask some odd 100 audiences if they like the movie they are watching. Researchers then use inferential statistics on the collected sample to reason that about 80-90% of people like the movie they are watching.

Here are two significant areas of inferential statistics

- Estimating parameters: it takes statistics from the sample research data and uses it to demonstrate something about the population parameter.
- Hypothesis test: it's about sampling research data to answer the survey research questions. For example, researchers might be interested to understand if the new shade of lipstick recently launched is good or not, or if the multivitamin capsules help children to perform better at games.

These are sophisticated analysis methods used to showcase the relationship between different variables instead of describing a single variable. It is often used when researchers want something beyond absolute numbers to understand the relationship between variables.

Here are some of the commonly used methods for data analysis in research

- **Correlation:** When researchers are not conducting experimental research wherein the researchers are interested to understand the relationship between two or more variables, they opt for correlational research methods.
- **Cross-tabulation:** Also called as contingency tables, cross-tabulation is a method used to analyse the relationship between multiple variables. Suppose a provided data has age and gender categories presented in rows and columns, then a two-dimensional cross-tabulation helps for seamless data analysis and research by showing the number of males and the number of females in each age category.
- **Regression analysis:** For understanding the strong relationship between two variables, researchers do not look beyond the primary and commonly used regression analysis method, which is also a type of predictive analysis used. In this method, you have an essential factor called the dependent variable, and you also have multiple independent variables in regression analysis, you undertake efforts to find out the impact of independent variables on the dependent variable. The values of both independent and dependent variables are assumed as being ascertained in an error-free random manner.
- **Frequency tables:** The statistical procedure is used for testing the degree to which two or more vary or differ in an experiment. A considerable degree of variation means research findings were significant. In many contexts, ANOVA testing and variance analysis are similar.
- **Analysis of variance:** The statistical procedure is used for testing the degree to which two or more vary or differ in an experiment. A considerable degree of variation means research findings were significant. In many contexts, ANOVA testing and variance analysis are similar.

## Univariate Analysis

Univariate analysis is the easiest methods of quantitative data analysis. As the name suggests, “Uni,” meaning “one,” in univariate analysis, there is only one dependable variable. It is used to test the hypothesis and draw inferences. The objective is to derive data, describe and summarize it, and analyse the pattern in it.

Height in (cms.)	169	170	174	177	178	180	182
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In a set of data, the univariate analysis explores each variable separately. It analyses the range and central tendency of the values, describes the pattern of responses towards the variable.

A variable is a condition or a category that the data falls under. For instance, the analysis may be looking into the variable of “age” or “weight” of demography. It takes one variable into concern at a time, i.e., either “age” or “weight.”

The univariate method is commonly used in analysing data for cases where there is a single variable for each element in a data sample or when there are multiple variables on each data set.

The patterns that are identified from the univariate analysis can be described in the following ways:

- Central tendency – (mean, mode and median)
- Dispersion – (range, variance)
- Procuring an adequate budget
- Quartiles (interquartile range)
- Standard deviation

Univariate data can be described through graphs:

- **Bar Charts:** Bar graph is very useful while making comparisons between categories of data or different groups of data. It helps to track changes over time.

- **Pie Charts:** A pie chart gives an overview of the group of data broken into smaller pieces that reflects in each slice of the pie. The whole pie represents 100 percent, and the slices represent the relative size of that group or category.
- **Histograms:** Similar to bar-charts, histograms display the same categorical variables against the category of data. The height of the bars signifies the number of components in that category. The bin indicates the number of data points in a range.
- **Frequency Distribution Tables:** As the name suggests, the frequency distribution reflects the frequency of an occurrence in the data.
- **Frequency Polygons:** Akin to the histogram, a frequency polygon is used to compare data sets or reflects the cumulative frequency distribution.

### **Bivariate Analysis**

In Bivariate Analysis, there are two variables wherein the analysis is related to cause and the relationship between the two variables. For example, points scored by the winning team in the Super Bowl from 1960 to 2010.

Multivariate analytical techniques represent a variety of mathematical models used to measure and quantify outcomes, taking into account the important factors that can influence this relationship. There are several multivariate analytical techniques that one can use to examine the relationship among variables. The most popular is multiple regression analysis, which helps one understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed.

Temperature (in Celsius)	Ice Cream Sales
20	2000
25	2500
35	5000
43	7800

Suppose the temperature and ice cream sales are the two variables of a bivariate data. Here, the relationship is visible from the table that temperature and sales are directly proportional to each other and thus related because as the temperature increases, the sales also increase. Thus bivariate data analysis involves comparisons, relationships, causes and explanations. These variables are often plotted on X and Y axis on the graph for better understanding of data and one of these variables is independent while the other is dependent.

### Types of Bivariate Analysis

- **Scatter Plots:** It shows the measure of the influence of one variable on the other.
- **Regression Analysis:** It is used to analyse how the data is related to each other.
- **Correlation Coefficients:** It analyses if the variables are related. "0" suggests that the variables are not related to each other, and "1" reveals a positive or a negative correlation.

### Multivariate Analysis

Multivariate data involves three or more variables. For example, when a web developer wants to examine the click and conversion rates of four different web pages among men and women, the relationship between the variables can be measured through multivariate variables. In a pharmaceutical experiment on drugs, the multivariate analysis is used to analyse the multiple responses of a patient on a drug.

Any company that wants to succeed in this global marketplace will focus on obtaining and analysing market research surveys using the statistical methods of bivariate and multivariate analysis to gain a competitive advantage over its peers.

**Few ways to perform the analysis are:**

- **Regression Analysis:** It is used to find out the pattern in a set of data.
- **MANOVA** is ANOVA for the various dependent variables. It is done to check if the response variable changes when the independent variable is manipulated.
- **Factor Analysis:** It is a way to shrink large sets of data into a manageable one. It brings out the hidden patterns and how they overlap and traits in multiple patterns.
- **Path Analysis:** It is used to examine the causal models by determining the relationships between the dependable variable and multiple independent variables.

**Data Interpretation**

Data interpretation is part of daily life for most people. Interpretation is the process of making sense of numerical data that has been collected, analysed, and presented. A common method of assessing numerical data is known as statistical analysis, and the activity of analysing and interpreting data in order to make predictions is known as inferential statistics.

After collecting and analysing the data, the researcher has to accomplish the task of drawing inferences followed by report writing. Only through interpretation that the researcher can expose relations and processes that underlie his findings. All this analytical information and consequential inference(s) may well be communicated, preferably through research report, to the consult of research results that may be either an individual or a group of individuals or some public private organization.

Interpretation refers to the task of drawing inferences from the collected facts after an analytical and or experimental study. In fact, it is a search for broader meaning of research findings. The task of interpretation has two major aspects viz., the effort to establish continuity in research through linking the results of a given study with those of another and the establishment of some explanatory concepts. "In one sense, interpretation is concerned with relationships within the collected data, partially overlapping analysis. Interpretation also extends beyond the data of the study to include the results of other research, theory and hypotheses."

### **Importance of Interpretation**

It is through interpretation that the researcher can well understand the abstract principle that works beneath his findings. Interpretation leads to the establishment of explanatory concepts that can serve as a guide for future research studies; it opens new avenues of intellectual adventure and stimulates the quest for more knowledge. Researcher can better appreciate only through interpretation why his findings are what they are and can make others to understand the real significance of his research findings.

### **Steps in Interpretation:**

Interpretation often involves the following steps:

1. Researcher must give reasonable explanations of the relations which he has found and he must interpret the lines of relationship in terms of the underlying processes and must try to find out the thread of uniformity that lies under the surface layer of his diversified research findings.
2. Extraneous information, if collected during the study, must be considered while interpreting the final results of research study, for it may prove to be a key factor in understanding the problem under consideration.
3. Consultation will result in correct interpretation and, thus, will enhance the utility of research results.

4. Researcher must accomplish the task of interpretation only after considering all relevant factors affecting the problem to avoid false generalization.

### **Purpose of interpretation of data**

The purpose of collection and interpretation of data is to acquire useful and usable information and to make the most informed decisions possible. From businesses, to newlyweds researching their first home, data collection and interpretation provides limitless benefits for a wide range of institutions and individuals.

### **Characteristics of interpretation of data**

Data analysis and interpretation, regardless of method and qualitative/quantitative status, may include the following characteristics:

- Data identification and explanation
- Comparing and contrasting of data
- Identification of data outliers
- Future predictions

### **Techniques of interpretation of data**

**Qualitative Data Interpretation:** Qualitative data analysis can be summed up in one word – categorical. With qualitative analysis, data is not described through numerical values or patterns, but through the use of descriptive context (i.e., text). Typically, narrative data is gathered by employing a wide variety of person-to-person techniques. These techniques include:

- **Observations:** detailing behavioural patterns that occur within an observation group. These patterns could be the amount of time spent in an activity, the type of activity and the method of communication employed.
- **Documents:** much like how patterns of behaviour can be observed, different types of documentation resources can be coded and divided based on the type of material they contain.
- **Interviews:** one of the best collection methods for narrative data. Enquiry responses can be grouped by theme, topic or



category. The interview approach allows for highly-focused data segmentation.

A key difference between qualitative and quantitative analysis is clearly noticeable in the interpretation stage. Qualitative data, as it is widely open to interpretation, must be “coded” so as to facilitate the grouping and labelling of data into identifiable themes. As person-to-person data collection techniques can often result in disputes pertaining to proper analysis, qualitative data analysis is often summarized through three basic principles: notice things, collect things, think about things.

**Quantitative Data Interpretation:** If quantitative data interpretation could be summed up in one word (and it really can't) that word would be “numerical.” There are few certainties when it comes to data analysis, but you can be sure that if the research you are engaging in has no numbers involved, it is not quantitative research. Quantitative analysis refers to a set of processes by which numerical data is analysed. More often than not, it involves the use of statistical modelling such as standard deviation, mean and median. Let's quickly review the most common statistical terms:

- **Mean:** a mean represents a numerical average for a set of responses. When dealing with a data set (or multiple data sets), a mean will represent a central value of a specific set of numbers. It is the sum of the values divided by the number of values within the data set. Other terms that can be used to describe the concept are arithmetic mean, average and mathematical expectation.
- **Standard deviation:** this is another statistical term commonly appearing in quantitative analysis. Standard deviation reveals the distribution of the responses around the mean. It describes the degree of consistency within the responses; together with the mean, it provides insight into data sets.
- **Frequency distribution:** this is a measurement gauging the rate of a response appearance within a data set. When using a survey, for example, frequency distribution has the capability of

determining the number of times a specific ordinal scale response appears (i.e., agree, strongly agree, disagree, etc.). Frequency distribution is extremely keen in determining the degree of consensus among data points.

Typically, quantitative data is measured by visually presenting correlation tests between two or more variables of significance. Different processes can be used together or separately, and comparisons can be made to ultimately arrive at a conclusion. Other signature interpretation processes of quantitative data include:

- Regression analysis
- Cohort analysis
- Predictive and prescriptive analysis

Now that we have seen how to interpret data, let's move on and ask ourselves some questions: what are some data interpretation benefits? Why do all industries engage in data research and analysis? These are basic questions, but that often don't receive adequate attention.

## **REPORT WRITING**

Mostly, research work is presented in a written form. The practical utility of research study depends heavily on the way it is presented to those who are expected to act on the basis of research findings. Research report is a written document containing key aspects of research project.

Research report is a medium to communicate research work with relevant people. It is also a good source of preservation of research work for the future reference. Many times, research findings are not followed because of improper presentation. Preparation of research report is not an easy task. It is an art. It requires a good deal of knowledge, imagination, experience, and expertise. It demands a considerable time and money.

Research report involves relevant information on the research work carried out. It may be in form of hand-written, typed, or computerized.

## **CONTENTS OF A RESEARCH REPORT**

A research report ordinarily includes the following sections:

**Abstract:** The abstract is often required to be no more than a given maximum number of words, usually between 100 and 150. It should describe the most important aspects of the study, including the problem investigated, the type of subjects (sample) and data collection method involved, the analytical procedures used, and the major results and conclusions.

**Introduction:** This section includes discussions concerning the practical and/or theoretical importance of the topic as well as a description of the research problem. It often starts by introducing the reader to the topic and making a case for the practical significance of the issues being investigated and/or the contribution that the study could make to our understanding of the phenomenon. The statement of research problem(s) is intended to indicate what the general purpose of the study is. This is often done through broadly stated questions or statements regarding whether and how the research variables are (or are expected to be) related to (or affected by) one another. Finally, the introduction section should include the working definitions of those terms used in the study that do not have a commonly known meaning or for which several meanings may be used.

**Review of the Literature and the Research Model:** Some authors present the material included here as a separate section under its own heading, while others present it as part of a longer introduction section. In either case, the review of the related literature describes and analyses the published studies that are directly related to, and/or have some relevance to, the topic and research questions at hand. Related literature should be integrated with, and weaved into,

the material in this section and not be simply catalogued. The review could conclude with a brief summary of the literature and its implications.

The study's theoretical / conceptual model and its hypotheses are developed based on the researcher's logical reasoning as well as the implications of his/her literature review. Note that the study's hypotheses should be stated in a language consistent with its proposed conceptual framework and the literature review; they should not be stated in the null and alternate hypotheses forms. Also, a well-developed hypothesis is testable; that is, it can be confirmed or disconfirmed through the collection and analysis of data.

**Methodology:** The methodology section includes a description of the research sample (subjects), data collection method, measurement instruments and data analysis procedures. The description of sample / subjects includes not only the sample size and statistics regarding the subjects but also a definition and description of the population from which the sample was selected. This section also describes the method used in selecting the sample or samples. In the case of questionnaire surveys, information on response rates also should be provided.

The description of instruments should identify and briefly describe all instruments used to collect data pertinent to the study, be they tests, questionnaires, interview or observation forms, or unobtrusive data such as absenteeism reports or productivity figures. When possible, information on validity and reliability of the measures used should be reported. Also, sources should be cited for measurement instruments / procedures (e.g., scales) developed by other researchers. The method section is usually concluded with a few statements about the analysis procedures utilized to test the study's hypotheses.

**Results & Discussion:** Some authors use a single section to both present and discuss the data analysis results. Others deal with the two issues in two separate sections. In either case, the statistical techniques that were applied to the data must be mentioned and the results of each analysis summarized, tabulated, and then discussed. For each research hypothesis, the statistical test of significance selected and applied to the data is briefly described, followed by a statement indicating whether the hypothesis was supported or not supported. Tables and figures are used to present analyses results in summary and/or graph form and to add clarity to the presentation. Good tables and figures are uncluttered, self-explanatory, and non-redundant.

In addition to simply presenting the results in a straightforward manner, the author also has to provide the readers with his/her interpretation of the results, implications of the findings, conclusions and recommendations. Each result is discussed in terms of the original hypothesis to which it relates and in terms of its agreement or disagreement with results obtained by other researchers in similar/related studies. If the results are consistent with the theoretical model, researcher's expectations, and/or findings of other researchers, explanations must be provided as to what the results mean and what their theoretical and practical implications are. When the results do not support the hypotheses and/or contradict previous findings, not only their meaning, but also possible reasons for the discrepancies must be discussed.

Often during a study apparent and/or interesting relationships will be noticed that were not hypothesized by the researcher. These unforeseen results should be acknowledged and discussed. Such results often form the basis for future studies specifically designed to examine the issue more carefully.

Finally, the researcher should address the study's limitations and make recommendations for future research. It is notable that in the discussion portion of this section the researcher is often permitted

more freedom to express opinions and reasonable speculations/assertions that may be rather indirectly and implicitly based on data analysis results.

**Summary and Conclusions:** This section is very similar to the abstract section except that it appears at the end of the report (preceding the reference section). It summarizes the study's findings in an easy to understand manner. It also explains the practical implications of those findings, and points to recommended directions for future research in that area.

**References:** The references section, or bibliography, lists all the sources, alphabetically by authors' last names that were directly used in writing the report. Every source cited in the paper must be included in the references, and every entry listed in the references must appear in the paper. Style manuals, such as the APA (American Psychological Association) manual, will give you the correct procedure for all in-text and reference citations. This form is usually different for books, journal articles, and magazine articles. It is recommended that you use the APA style. It is important that whatever form is used be followed consistently.

**Appendixes:** Appendixes include information and data pertinent to the study that either are not important enough to be included in the main body of the report or are too lengthy. Appendixes contain such entries as materials especially developed for the study (e.g., tests, questionnaires, and cover letters), coding scheme, print out of raw data, and the computer print-out of statistical analyses.

### **Report Format**

There is no one best format for all reports. Format depends on several relevant variables. One must employ a suitable format to create desirable impression with clarity. Report must be attractive. It should be written systematically and bound carefully. A report must use the format (often called structure) that best fit the needs and wants of its readers. Normally, following format is suggested as a

basic outline, which has sufficient flexibility to meet the most situations.

**Research report is divided into three parts as:**

**I. First Part (Formality Part):**

1. Cover page
2. Title page
3. Certificate or statement
4. Index (brief contents)
5. Table of contents (detailed index)
6. Acknowledgement
7. List of tables and figures used
8. Preface/forwarding/introduction
9. Summary report

**II. Main Report (Central Part of Report):**

1. Statement of objectives
2. Methodology and research design
3. Types of data and its sources
4. Sampling decisions
5. Data collection methods
6. Data collection tools
7. Fieldwork
8. Analysis and interpretation (including tables, charts, figures, etc.)
9. Findings
10. Limitations
11. Conclusions and recommendations
12. Any other relevant detail

**III. Appendix (Additional Details):**

1. Copies of forms used
2. Tables not included in findings
3. A copy of questionnaire
4. Detail of sampling and rate of response
5. Statement of expenses

6. Bibliography – list of books, magazines, journals, and other reports
7. Any other relevant information

**Key Considerations/Factors:**

**While preparing research report, following issues must be considered:**

1. Objectives
2. Type of problem/subject
3. Nature and type of research
4. Audience or users of research work
5. Size of report
6. Form of writing – handwritten, typed, or computerized.
7. Time and cost
8. Language
9. Contents of report
10. Order of contents
11. Number of copies
12. Format – type and size of paper; lengths width, and depth of report; and pattern of writing including paragraph, indent, numbering, font size and type, colouring, etc.
13. Binding (for soft, and, particularly, for hard copy) – type, quality of material, colour, etc., related issues.

**Main Contents of the Research Report**

The lay out of the report must be appropriate. A comprehensive report will include.

- The Preliminary Pages
- The Main Text
- The End Matter

**(A)The Preliminary Pages**

These should include

- **The title page:** The title page should carry the title of the research study, the organization for which the research is being carried out and the name of the researcher.



- **Acknowledgement:** The research should acknowledge those people or organizations/ institutions who have significantly contributed in completing the research.
- **Any certification required:** If any certificate/s regarding the research are necessary this may be attached at this point.
- **Preface:** The preface should be a brief general introduction to the topic of research answering why the researcher took up the research.
- **Table of Contents / Index:** The table of contents or index is a vital part of this report and must include the page number of each of the contents.
- **List of Table and Illustrations and list of graphs and or charts:** These may be given on the following pages as ready reference.

## **(B) Main Text**

**Introduction:** This should introduce the research to the reader. The language of the introduction should be so simple that a lay man whom having little knowledge about the study area could also be able to understand the purpose and objectives of the research.

**Nature and scope of the study:** It explains about why the study was undertaken and what geographical area and time frame it occupies.

**Research Methodology:** The methodology involves in the study, the research design, data collection techniques, analysis techniques and method of interpretation should be mentioned.

**Hypothesis:** If the study involves testing of hypothesis. These should be clearly stated.

**Supporting theoretical background:** Any secondary research or theories that may be relevant for our studies should be discussed.

**Results for the study:** A detailed presentation of the findings of the study with reporting data in the form of tables and charts should be given.

**Analysis of data:** The analysis of the data which has been statistically treated should be made and noted.

**Interpretation of results:** After analysing the data the researcher should note down his interpretations of results derived from the analysis of data.

**Recommendations, suggestions, and conclusions:** This step is the most important part of the research report because any decision taken on the basis of research will be based upon the recommendations, suggestions and conclusions.

**Summary:** The summary helps to present the research briefly and presents the information about research in a capsule form.

### **(C) End Matter**

**Appendices:** All technical data such as questionnaire, sample information, mathematical derivation etc. should form a part of the appendix. It should be numbered alphabetically or numerically.

**Bibliography and references:** The source consulted must be given. Bibliography forms all the relevant subject matter studied by the researcher for conducting the research while references is specific or particular subject matter or text that not only researcher studied but used for his investigation.

**Glossary:** This includes a list of special terms used in the research along with their definitions. **Subject Index:** Sometimes a subject index given alphabetically works as a guide to the reader for the contents of the report.

**Points to remember while writing a research report:**

- The report should be lengthy enough to cover all the points but short and crisp enough to hold the interests of the reader.
- The report should provide relevant and important information leaving out undesirable, extra information.
- Technical terms used in the report should be explained in the glossary.
- Charts, graphs, statistical table and figures should be used for readability, interest and quick grasp of the research.
- The layout of the report should be as per the format discussed earlier or as per the outline of the institution.
- The report should be free of grammatical mistake and should contain sound sentence construction. Use of quotation, footnotes, etc. should be done in the correct manner and context.
- The research report should be on original work.
- The analysis of data must be done in a logical manner.
- Appendices must be numbered and attached if needed.
- The index should be clear and the pagination should be done correctly.
- A detailed bibliography and references must be given.
- The report must be neat and attractive in appearance.
- The summary must be given in the end.
- The objective of the study, nature and scope of the study must be mentioned in the beginning of the study and the conclusions, suggestions and recommendations must justify it in the end.

**REFERENCING**

Referencing shows the breadth of your research and provides details of the sources that you have used to support your arguments and conclusions. By acknowledging the sources used in the preparation of your work, you will also avoid plagiarism.

There are multiple referencing systems and styles used across the university so please check your module handbook or speak to your tutor to clarify which you should use. When you have identified the appropriate referencing system you should consistently follow it.

### **Methods of Referencing**

Listed below are some of the main referencing methods used within the university:

- **American Psychological Association (APA)** 6<sup>th</sup> edition website has examples and common questions on the APA Style. The library also has a print copy of the publication manual for the sixth edition.
- **Chicago-Style Citation Quick Guide** provides examples of citations using the Chicago-Style (16<sup>th</sup> edition) for both notes and bibliography format and author-date format.
- **Our Harvard Referencing Guide** provides comprehensive guidance and examples for the key types of scholarly and digital information sources you are likely to cite. Our guide is based on the current British Standard (BS ISO 690:2010) and will be maintained in accordance with any updates.
- **IEEE style referencing** is a numeric style commonly used in Computing and Electronics. References are numbered in the order they appear in your document and retain the number given to them if used again in the same piece of work. You can find the IEEE style in RefWorks under the output style menu.
- **OSCOLA (Oxford Standard for the Citation of Legal Authorities)** 4<sup>th</sup> edition website has the full guide which outlines the principles of the standard and provides comprehensive guidance on citing materials, a quick reference guide which gives examples of how to cite key legal materials and a guide to citing international law.

## Difference between Referencing and Bibliography

Reference and Bibliography is an important part of any project under study because it helps in acknowledging other's work and also help the readers in finding the original sources of information. It not only prevents plagiarism but also indicates that the writer has done good research on the subject by using a variety of sources to gain information.

Difference	Reference	Bibliography
Meaning	Reference implies the list of sources, which has been referred in the research work.	Bibliography is about listing out all the materials which has been consulted during the research work.
Based on	Primary Sources	Both Primary and Secondary Sources
Arrangement	Alphabetically and numerically	Numerically
Includes	Only in-text citations, which have been used in the assignment or project.	Both in-text citations and other sources, which are used to generate the idea.
Supporting argument	A reference can be used to support an argument.	A bibliography cannot be used to support an argument.
Used for	Thesis and Dissertation	Journal Papers and Research work

## Types of Bibliography

- **Bibliography of works cited:** It contains the name of those books whose content has been cited in the text of the research report.
- **Selected Bibliography:** As it is evident from the name itself, selected bibliography covers only those works which the author assumes that are of major interest to the reader.

- **Annotated Bibliography:** In this type of bibliography, a small description of the items covered is given by the author to ensure readability and also improve the usefulness of the book.

To sum up, references and bibliography are almost same, but there are only subtle differences between the two, which lies in the items which are included in them. The primary use of references is to get recognition and authentication of the research work, whereas bibliography is appended with the aim of giving the reader the information on the sources relating to the topic.

### **Research Report Preparation**

This session provides guidelines for writing a formal research paper in the social sciences. Although it is a type of research paper, the process is not the same as writing a research paper for an English or history class. In fact, a formal research paper is much more similar to a formal lab report for a chemistry or biology class. The “research” in the title refers to conducted scientific research rather than the gathering of information. For psychology classes, one will typically write about a behaviour observation, a survey, or an experiment. Sociology (and occasionally social work / psychology) includes interviews as well. The usual format for a social science research paper is APA; however, always follow the instructor’s guidelines on formatting.

### **General Tips**

**Be concise.** Scientific writing often requires a lot of information, and it is important to relay this information in a detailed but straightforward manner. The research should be presented as clearly as possible, without excess wordiness or repetition. Always stay focused and on-point.

**Write in the third person.** Avoid using the first person, such as “I” or “we,” when discussing research procedure. For example, rather than writing, “I surveyed 35 participants,” it is better to write, “The survey

was administered to 35 participants.” The focus should stay on the research, and using the first person can make it appear more like a personal narrative. This type of writing may seem awkward at first, so try to pay close attention to the wording throughout the paper.

**Use correct verb tenses.** Students are often unsure of whether to use the past or present verb tense when writing about research.

**Write accurately about the research.** Write about what actually happened instead of what “should have” happened. Research results do not always turn out the way one hopes, but that is to be expected. Instructors do not grade based on whether or not a student achieves the expected results but rather how well the student conducted and understood the study. If the results are not favourable, explain possible causes or errors and what could be improved in future research.

**Use APA Format.** For a social science research paper, APA format is typically expected. APA format was developed for the social sciences, so it is followed fairly strictly in these types of papers in both formatting the paper and citing sources. When in doubt, follow APA guidelines.

**Use peer-reviewed sources for research.** If background research is needed for the paper, only credible sources should be used. Online psychology or sociology journals are good resources; however, any website that is not peer-reviewed should be avoided. Credible, peer reviewed sources can be found using the GCC Library Databases. In addition, textbooks and reference books may be helpful for theoretical discussion.

**Cite sources.** Always use parenthetical, in-text citations to reference all of the source material used. All ideas or research that is from an outside source must be cited. As previously mentioned, APA formatting is expected when writing research papers for the social sciences.

## **Format**

There are four main sections included in most formal social science research papers: introduction, method, results, and discussion. As APA formatting requires, subheadings are centered and bolded. Font size does not change for subheadings. Each section is not necessarily its own page, so do not feel the need to begin a new page for each subheading. The remainder of this hand-out details the content expected for each of the most commonly included sections in a formal research paper.

**Note.** Instructors often give their students basic formatting guidelines when they assign a formal research paper. All of the sections presented in this hand-out may not be included in every instructor's guidelines, but the content of the paper as a whole should be similar. It is always best to ask instructors for their format preference; however, they are typically more concerned with content than formatting, so following general APA guidelines is likely fine. Be sure to follow the instructor's guidelines for content, including no more or less than what is required for each section.

## **Title Page**

This is the first page of the paper and follows APA format guidelines, as shown in the illustration below. Include the following information:

- Title of the paper
- Name
- Name of institution (e.g. DMI-St. Eugene University)

**Note.** An instructor may ask for additional or different information to be included on the title page, in which case it is always best to follow the instructor's guidelines.

## **Abstract**

The abstract is the second page of the paper and provides a brief summary of the research. Only report the information; do not try to interpret or give any new information in this section. The paragraph



should be 150-250 words and include one or two sentences about each main section of the paper.

Focus on the following points:

- Purpose and hypothesis
- Method: participants, design, measures, and procedure
- Results
- Discussion/interpretation of results

**Note.** It is best to complete the other sections of the report before writing the abstract, since this section is meant to be an overview of the entire research paper.

### **Introduction**

The introduction begins on the third page and does not need a subheading; it is understood that the introduction is the first section of the paper. In general, the information provided in this section sets up the study. The main components of this section are the following:

- **Purpose of the study.** Identify the problem being explored by the current study and why it is important. After discussing what the problem is and why it warrants further research, formally express the purpose of the current research study clearly and concisely.
- **Background literature.** The main purpose of including background literature is to set up the current study, showing the progression of research in the topic area and how the hypothesis was reached, why the design was chosen, and so on. Background literature can be previous research and/or theories that are relevant to the current study. Only include information that a reader would need to know in order to understand the purpose, hypothesis, and method of the research; remember to be concise. Do not forget to cite any and all resources used.
- **Hypothesis.** The hypothesis details what is expected to happen in the study based on background literature. Typically the hypothesis is only one sentence. As an example, a hypothesis for a study on behaviour patterns in children could

be, “It was predicted that older children will show greater behavioural inhibition than younger children.”

## **Method**

The method section describes the way in which the study was conducted. It should be thorough enough that someone could replicate the study based on the description given in the paper, but there should be no excess information. There are generally four main subsections: participants, design, measures, and procedure. The headings and division of the subsections may slightly vary, but the content should remain similar.

- **Participants.** This subsection should include demographic information that pertains to the current study. Information could be about participants’ age, gender, ethnicity, year in school, marital status, etc. If required, give data such as percentages, mean, and standard deviation.
- **Design.** In this subsection, the design of the current study is detailed. Was the study an experiment, a survey, an interview, or a behavior observation? If it was an observation, was it naturalistic or structured? Why was this particular design chosen? It is important to answer these types of questions so that the reader can fully understand and evaluate the research.
- **Measures.** Information about the measures used to record observations and responses is discussed in this subsection. Examples of measures could be checklists used for behaviour observation, interview or survey questions, or experimental materials. For more detail, give examples of the items in the measure, such as a sample question from a questionnaire or a couple of items from a checklist.
- **Procedure.** This subsection describes the process of the study exactly as it occurred. The information should be detailed enough for someone to replicate the study, but it should also be concise. Usually it is best to give the information in sequence. For example, first give the sampling procedure (how participants were selected), then how the measure was administered, and so forth. Results should never be discussed

in this subsection; the next section will be entirely dedicated to providing the results of the study. Only give information regarding how the study was carried out here.

## **Results**

This section contains the results of the study. The information can be organized into tables or figures if necessary. Be sure to reference and briefly explain any tables or figures in the text, but the actual graphics will go at the end of the paper after the References page. It is important to remember to only give the data or results of the study in this section; do not interpret or attempt to analyse why the results turned out a certain way and what that might mean. The next section (Discussion) deals with exploring and analysing the results in detail.

## **Discussion**

In the discussion section, the results are explained and interpreted, allowing the student to show that he or she has a thorough understanding of the concept and results of the study. This section typically begins with an assessment of whether or not the results support the hypothesis and why. The main question to answer in this section is, "What is the significance of the results?" The following are several possible focus questions for this section:

1. Was the hypothesis supported by the results? The results may or may not support the hypothesis. Either way, state whether or not the prediction was accurate. It is perfectly acceptable for the results to turn out differently than expected.
2. Why might the results have turned out that way? Link the results of the current study to the background literature. In addition, think about the sampling strategy, design, and procedures of the current study and how they could have affected the results.
3. How could the study be improved? Think about what could have been done differently. Perhaps more participants could have been recruited, the design could have been better, or a different measure could have been used. There is a degree

of error in every study, so it is important to mention potential problems with the research. Be as specific as possible about potential errors, such as participants not being truthful with responses or questions being leading. For example, when measuring level of aggression after viewing a video clip, ask a question such as, "How do you feel after watching that video clip?" rather than, "Do you feel more aggressive after watching that video clip?" Do not suggest a desired answer to the participants.

4. What is the future direction for research on this topic? After discussing the current study, analysing the results, and determining ways to improve the research, try to assess what the next step could be.
5. What are the practical applications of the research? Discuss what the research suggests for the problem being examined. Does it offer any solutions or courses of action? In other words, why do the results matter?
6. What can be concluded from this research? The answer to this question should form the conclusion of the paper. It should relate directly to the problem being explored and the hypothesis. The conclusion reiterates whether or not the results support the hypothesis and how confident the author is in these assessments. A couple of sentences are all that is necessary to summarize the definitive conclusions drawn from the results.

## **Conclusion**

As discussed in this session, the prime objective of any research report is to communicate in an effective manner, the results of the research, so the Supervisor can take informed decisions. Research report provides the communication bridge between the researcher and the manager and that is why it is an important aspect of the overall research process.

It is very important for the researcher to remember that the report is being prepared for the supervisor and therefore researcher must

empathize with the supervisor in the writing process. The report must be logically structured and easy to follow. The objectivity of the research is also a supreme concern and researcher should oppose inclusion of any judgement beliefs which cannot be supported. The researcher should make sure that the report is well written and looks professional.

The research project follows a format which includes title page, table of contents, executive summary, introduction, research design, data analysis and findings, conclusion and recommendations, limitations and future directions, and appendices. Each component of the report has its own importance and should therefore be carefully prepared.

Researcher must make sure that they do not over or under emphasize the relevant issues. It is easy to get carried away when developing research project report. The researcher must focus on supervisor' needs and should make sure that the report consistently adheres to it. The same rules apply when preparing report presentation which also has become an integral part of any research project.

## **References**

If outside sources have been cited, a separate reference page is necessary. As mentioned previously, instructors will typically tell students their preference for formatting references; however, if an instructor does not specify, use APA formatting guidelines.

## **Tables and Figures**

It is not necessary to include tables and figures, but if they are included, place each one on a separate page following the References page. Every figure and table should be labelled. For tables, write "Table 1" (change number for any subsequent tables) at the top left of the page and name the table in italics below that. Underneath each table should be a "Note." that indicates what is displayed in the table and, if relevant, what measure(s) was used to obtain the results depicted. For figures, write "Figure 1." (change

number for any subsequent figures) below the figure and describe what is shown. Instructors probably will not ask for tables and figures, but for reference, formatting follows typical APA style.