CHAPTER ONE

1. INTRODUCTION

Man has all along tried to look back at his history for better understanding of evolutionary process leading to the present stage of mankind and have always sought to enlarge their understanding of themselves and the world around them with the purpose of improving their way of life. The search for knowledge has been motivated by man's desire to understand and control his environment. Thus, the concept of research is closely linked with human endeavor for better understanding of his evolution, environment and growth through diverse stages of human history. Research is a quest for knowledge through diligent search or investigation or experimentation aimed at the discovery and interpretation of new knowledge. Research, therefore, has been an integral part of academic pursuits in the past.

1.1. Concepts of Scientific research

Concepts of scientific research are mental images or perceptions and their meanings vary from individual to individual. But from its dictionary meaning it is stated as 'an understanding retaine d in the mind from experience, reasoning and imagination of a particular set of instances or occur rences. **R**esearch conducted for the purpose of contributing towards science by the systematic col lection, interpretation and evaluation of data and that tool, in a planned manner is called scientifi c research. So**, scientific research** is the systematic investigation of **scientific** theories and hypot heses. Scientifc method is a systematic body of procedures and techniques applied in carrying out investigation or experimentation targeted at obtaining new knowledge. **S**cientific research operates at two levels: a t**heoretical** level and an **empirical** level. The theoretical level is concerned with developing abstract concepts about a natural or social phenomenon and relationships between those concepts (i.e., build "theories"), while the empirical level is concerned with testing the theoretical concepts and relationships to see how well they reflect our observations of reality, with the goal of ultimately building better theories. Over time, a theory becomes more and more refined (i.e., fits the observed reality better), and the science gains maturity. Both theory and observations are essential components of scientific research. Creativity and critical thinking are of particular importance in scientific research. Basically, research is original investigation undertaken to gain knowledge and understand concepts in major subject areas of specialization, and includes the generation of ideas and information

leading to new or substantially improved scientific insights with relevance to the needs of society.

1.2. Purpose of studying research methods

The objective of research, particularly the applied research, is to arrive at a solution for a given problem. To do this, the **available data** and the **unknown aspects** of the problem have to be related to each other to make a solution possible. Different **research methods** have different purposes and different levels of validity. If the **research** has a higher measure of validity, the results of a study provide stronger evidence.

Purpose of studying research methods includes:

- To learn how to conduct different disciplinary researches
- Provides a foundation for topic-specific courses
- To make researcher critical consumer of information
- To develop critical and analytical thinking
- To provide information needed to critically read a research article
- For admission into most graduate programs in various fields

Difference between research techniques and research methods

Research techniques refer to the behavior and instruments we use in performing research operations such as making **observations**, **recording data**, **techniques of processing data** and the like.

Research methods refer to the behavior and instruments used in selecting and constructing research technique. For instance see their difference in follow type of research:

Type	Method	Technique
Field research	Personal interview	Interviewer uses a detailed schedule with open and closed questions.
	Focused interview	Interviewer focuses attention upon a given experience and its effects
	Group interview	Small groups of respondents are interviewed simultaneously

From what has been stated above, we can say that methods are more general. It is necessary for the researcher to know not only the research methods/techniques, but also the methodology. **Research methodology** is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. It includes various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them. Researchers not only need to know how to develop certain indices or tests, how to calculate the mean, the mode, the median or the standard deviation or chi-square, how to apply particular research techniques, but they also need to know which of these methods or techniques, are relevant and which are not, and what would they **mean** and **indicate** and **why**. Researchers also need to understand the assumptions underlying various techniques and they need to know the criteria by which they can decide that certain techniques and procedures will be applicable to certain problems and others will not. This means that it is necessary for the researcher to design his methodology for his problem. The term methodology refers to the overall approaches & perspectives to the research process as a whole and is concerned with the following main issues:

- Why you collected certain data
- What data you collected
- Where you collected it
- How you collected it
- How you analyzed it

NB: The study of research methods gives training to apply them to a problem. The study of research methodology provides us the necessary training in choosing methods, materials, scientific tools and training in techniques relevant for the problem chosen.

1.3. What is research?

The word „Research‟ combination of: Re + Search, where: ‘Re’ indicating repetitions,

‘Search’ to seek or find

That means trace again and afresh whatever material that is already present or available in order to establish our own findings/ facts or opinion.

Research described by different scholars, dictionary and companies as:

- ✓ A systematic investigation to find solution to a problem
- ✓ Investigation undertaken in order to discover new facts
- ✓ A systematized effort to gain new knowledge
- ✓ Defining and redefining problems

❖ The prime objectives of research are

1. To discover new facts (knowledge).
2. To verify and test important facts
3. To analyze an event or process or phenomenon to identify the cause and effect relationship
4. To develop new scientific tools, concepts and theories to solve and understand scientific and non scientific problems
5. To find solutions to scientific, non scientific and social problems and
6. To overcome or solve the problems occurring in our everyday life

N.B: Research is **systematic**, because it follows certain steps that are logical in order. These steps are:

- ➢ Understanding the nature of problem to be studied and identifying the related area of knowledge.
- ➢ Reviewing literature to understand how others have approached or dealt with the problem.
- ➢ Collecting data in an organized and controlled manner so as to arrive at valid decisions.
- ➢ Analyzing data appropriate to the problem.
- ➢ Drawing conclusions and making generalizations.

What Makes People do Research?

This is a fundamentally important question. No person would like to do research unless there are some motivating factors. Some of the motivations are the following:

1. To get different degree/educational promotions
2. To get a research degree and then to get a teaching position
3. To get a research position in developed countries and settle there

4. To solve the unsolved and challenging problems
5. To get joy of doing some creative work
6. To acquire respectability
7. To get recognition
8. Curiosity to find out the unknown facts of an event
9. Curiosity to find new things
10. To serve the society by solving social problem

1.4. Research and scientific methods

Scientific method refers to a standardized set of techniques for building scientific knowledge, such as how to make valid observations, how to interpret results, and how to generalize those results. The scientific method allows researchers to independently and impartially test preexisting theories and prior findings, and subject them to open debate, modifications, or enhancements. **Scientific knowledge** refers to a generalized body of **laws** and **theories** to explain a phenomenon or behavior that are acquired using the scientific method.

i. Knowledge and its sources

Knowledge is the sum of man's conception, views and propositions which have been established as correct reflections of objective reality. Knowledge consists of facts and theories that enable one to understand phenomena and solve problems. It can be obtained from direct personal **experience** or from deliberate **inquiry** as done by present day investigators. The following are sources to gain knowledge:

ii. Authority

Authority is defined as one who has special knowledge; an expert; or an authoritative opinion, decision, or precedent. Or it can be also defined as a person accepted as a source of reliable information on subject. It is knowledge that is passed down from experts or authorities (e.g scientists, expert practitioners, master teachers) in a particular field. When we accept what a respected or famous person tells us, we are gaining knowledge via authority.

iii. Tradition

It is defined as Knowledge, practices transmitted from one person to another over a period of time. The terms **traditional knowledge (indigenous knowledge** or **local /knowledge)** generally refers to knowledge systems embedded in the cultural traditions of regional, indigenous, or local communities. Traditional knowledge includes knowledge about traditional technologies (e.g. tools and techniques for hunting or agriculture), midwifery, ethnobotany and ecological knowledge, traditional medicine, celestial navigation, ethnoastronomy, climate, and others.

How do Native people define traditional knowledge?

- It is practical common sense based on teachings and experiences passed on from generation to generation.
- It is knowing the country. It covers knowledge of the environment - snow, ice, weather, resources - and the relationships between things.
- It is holistic. It cannot be compartmentalized and cannot be separated from the people who hold it. It is rooted in the spiritual health, culture and language of the people. It is a way of life.
- Traditional knowledge is an authority system. It sets out the rules governing the use of resources - respect, an obligation to share. It is dynamic, cumulative and stable. It is truth.
- Traditional knowledge is a way of life -wisdom is using traditional knowledge in good ways. It is using the heart and the head together. It comes from the spirit in order to survive.

iv. Experience

Knowledge that is gained by doing is experience knowledge. Through experience, you gain kno wledge but you also gain biases.

v. Reasoning

Reasoning might be defined as the process of using known facts to arrive at new facts. In this way Reason can help us arrive at new facts or new knowledge BUT only as long as the original facts we put into the process are correct and the process itself is reliable.

For example, if I have one dollar and you give me a dollar, then I will have two dollars. No one needed to tell me that because it is evident to me. I can look in my hands and see that I have two dollars. Another common example is: If a equals b and b is equal to c, logically, it must follow that a is equal to c. There are two types of reasoning which serve as the source of knowledge.

A. Deductive reasoning

Deductive reasoning refers to going from the general to the specific. It is the process of deriving specific expectations from general principles. The most familiar kind of reasoning, which is often taken as the model for all reasoning is 'deductive reasoning'. In a deductive argument, the conclusion logically follows from the premises, in which a conclusion is drawn from two statements known as a major premise and a minor premise. If the premises are true, the conclusion that follows must be true. It needs establishing a logical relationship between a major premise, a minor premise and a conclusion. A major premise is a self-evident assumption, previously established by thinkers or metaphysical truth or dogma, concerning a relationship; a minor premise is a particular case related to the major premise. Given the logical relationship of these premises, it leads to an inescapable conclusion. For example,

a) All men are mortal.

John is a man.

Therefore, he is mortal.

b) All cows are green.

She is a cow.

Therefore, she is green.

B. Inductive reasoning

Induction is a reasoning process that involves going from the specific to the general. It is the process of establishing general principles from specific observations. In inductive reasoning, the premises provide evidences for the conclusion but not complete evidence.

a) Crow 1 is black.

Crow 2 is black.

Crow 3 is black. (and so on for 10,000 crows or more than that)

Therefore, all crows are black.

Similarly,

b) Iron conducts heat and electricity.

Copper conducts heat and electricity.

Aluminum conducts heat and electricity.

(and so on for others).

Therefore, all metals conduct heat and electricity. Here, though 10,000 premises where crow being black are true, the conclusion is not established. It is always possible; the next crow, which we may come across, might be white. Similarly, there may be a metal, which does not conduct heat and electricity.

In inductive reasoning, truth is established based on earlier evidences for something, which is not observed. For example, the proposition like 'tomorrow the sun will rise in the east' is made based on so many years of observations of seeing sun rising in east. Though the phenomenon for next day is still not witnessed, based on the repeated observations we can say inductively that the sun will rise in the east. This conclusion has some probability on the basis of evidence presented in the premises.

vi. Scientific methods

Science may be defined as an objective, accurate, logical and systematic method of analysis of phenomenon devised to permit the accumulation of reliable knowledge. The man who classifies facts of any kind whatever, who sees their mutual relation and describes their sequences, is applying the Scientific Method and is a man of science. **Scientific method** is the pursuit of truth as determined by logical considerations. The ideal of science is to achieve a systematic interrelation of facts. Scientific method helps to achieve "this ideal by experimentation, observation, logical arguments from accepted postulates and a combination of these three in varying proportions."

1.5. History of Agricultural research in Ethiopia

The Ethiopian Institute of Agricultural Research is one of the oldest and largest agricultural institutes in Africa. EIAR was established in 1966 and was then called Institute of Agricultural Research (IAR). In 1997 it was designated the Ethiopian Agricultural Research Organization (EARO). At the moment the institute is renamed as the Ethiopian Institute of Agricultural

Research (EIAR). During its formative periods, the institute started agricultural trials on crops and livestock on few selected research centers. Accordingly, the first crop variety was released in 1969 by the National Crop Improvement Committee. The committee was comprised of senior researchers drawn from different research centers. Technology release mechanisms continued under the leadership of the committee until early 1970s. Then, the role and representation of the committee was replaced by the National Crop Improvement Conference (NCIC) which later established the National Variety Release Committee (NVRC). Later on, the scope of agricultural research expanded as its role included research on soils and water, and agricultural economics. This arrangement continued until the late 1980s; then the role of Professional Associations came to the limelight. As a result, professional societies took the role of annual conferences and begun to serve as platform for presenting findings. EIAR has made tremendous efforts to build the national capacity of conducting agricultural researches, produce and introduce improved technologies, focusing on fostering agricultural growth and development in the country. As a result, over the last four decades the release of improved technologies in crops, livestock, soils and water, forestry and agricultural mechanization has dramatically increased. To date, the contribution of improved agricultural technologies generated and introduced by EIAR and its partners has become an engine in the national agricultural productivity gains in the economy. EIAR is now doing its level best to generate and introduce agricultural technologies, contributing to the national demands of transforming Ethiopian agriculture. To this end, the institute has established 17 federal agricultural research centers throughout the country.

1.6. Types of research

Depending on purposes and methods used in research, there are the following types of research:

i. Basic vs. applied research

Basic research	**Applied /action/ research**
• It is done for the sake of general knowledge. • Research that studies some natural phenomenon, concerning human behavior etc.	• It aims at finding a solution for an immediate problem facing a society • Research done to identify social, economic or political trends that may affect a particular institution for that moment.

- The primary aim of Basic Research is to improve knowledge generally, without any particular applied purpose in mind at the outset. Applied Research is designed from the start to apply its findings to a particular situation.

ii. Quantitative vs. Qualitative research

Quantitative research

Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity. The emphasis of quantitative research is on collecting and analyzing numerical data; it concentrates on measuring the scale, range, frequency etc. of phenomena. The result of this research is essentially a number or a set of numbers. Some of the characteristics of quantitative research/method are:

- It is numerical, non-descriptive, applies statistics or mathematics and uses numbers.
- It is an iterative process whereby evidence is evaluated.
- The results are often presented in tables and graphs.
- It is conclusive.
- It investigates the what, where and when of decision making.

Qualitative research

It is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind. For instance, when we are interested in investigating the reasons for human behaviour (i.e., why people think or do certain things), we quite often talk of 'Motivation Research', an important type of qualitative research. Some of the characteristics of qualitative research/method are:

- It is non-numerical, descriptive, applies reasoning and uses words.
- Its aim is to get the meaning, feeling and describe the situation.
- Qualitative data cannot be graphed.
- It is exploratory.
- It investigates the why and how of decision making.

iii. Conceptual vs. empirical research

Conceptual research is that related to some abstract idea(s) or theory. It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones. It is defined as a **methodology** wherein research is conducted by observing and analyzing already present information on a given topic**.** Conceptual research doesn't involve conducting any practical experiments.

Empirical research relies on experience or observation alone, often without due regard for system and theory. It is data-based research, coming up with conclusions which are capable of being verified by observation or experiment. We can also call it as experimental type of research. In such a research, the researcher must first provide himself with a working hypothesis or guess as to the probable results. He then works to get enough facts (data) to prove or disprove his hypothesis.

iv. Adaptive research

Adaptive research is part of the research continuum of the development of appropriate agricultural technologies to alleviate identified farming constraints. Adaptive research is also known as on farm research, and is conducted to validate, modify or calibrate a new technology on specific soil, climate, and social economic or environmental characteristics of a given area. In this type of research farmers play a key role in the research process. Adaptive research is defined by UN Food and Agricultural Organization (FAO) as "the use of research in enhancing productivity or solving problems."

v. Descriptive research

Descriptive research identifies the characteristics of an observed phenomenon and collecting more information. This research method is designed to depict the participants in a very systematic and accurate manner. In simple words, descriptive research is all about describing the phenomenon, observing and drawing conclusions from it. It is used to describe characteristics of a population or phenomenon being studied. It does not answer questions about how/when/why the characteristics occurred. Rather it addresses the "what" question (what are the characteristics of the population or situation being studied. The researcher observes and then he describes what he has observed. A descriptive study describes and interprets what is? It involves description, recording, analyzing, and interpretation of conditions that exist. Descriptive research includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research

is description of the state of affairs as it exists at present. The methods of research utilized in descriptive research are survey methods of all kinds. Research questions in descriptive studies typically start with ‘What is…”.

CHAPTER TWO

2.0. DEFINING RESEARCH PROBLEMS

2.1. What is the research problem?

The research topic serves as a foundation for the entire effort. A proper statement of the research problem is the primary step in any research design. It is necessary to first define some kind of research problem in order to provide a reason for doing the research. At the very outset the researcher must single out the problem he wants to study, i.e., he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry. It should be evident from what you have read so far that in order to carry out research; you need to start by identifying a question which demands an answer, or a need which requires a resolution, or a riddle which seeks a solution, which can be developed into a **research problem:**

A research problem is a definite or clear expression [statement] about an area of concern, a condition to be improved upon, a difficulty to be eliminated, or a troubling question that exists in scholarly literature, in theory, or within existing practice that point to a need for meaningful understanding and deliberate investigation. A research problem does not state how to do something, offer a vague or broad proposition, or present a value question. One of the first tasks, therefore, on the way to decide on the detailed topic of research is to find a question, an unresolved controversy, gap in knowledge or an unrequited need within the chosen subject. This search requires an awareness of current issues in the subject and an inquisitive and questioning mind. Although you will find that the world is teeming with questions and unresolved problems, not every one of these is a suitable subject for research. So you should look for which lead you to a suitable research problem.

Essentially two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view. The best way of understanding the problem is to discuss it with one's own colleagues or with those having some expertise in the matter.

A research problem, in general, refers to some difficulty which a researcher experiences in the context of either a theoretical or practical situation and wants to obtain a solution. Thus, a

research problem is one which requires a researcher to find out the best solution for the given problem. The heart of every research is the problem. Research problem is paramount to the success of a research effort. There is no shortage of problems throughout the world. Problems for research are everywhere, but for a problem to be researchable it must be:

- stated clearly and concisely;
- significant i.e. not trivial or a repeat of previous work;
- delineated, in order to limit its scope to practical investigation;
- possible to obtain the information required to explore the problem;
- Possible to draw conclusions related to the problem, as the point of research is to find some answers.

The purpose of a problem statement is to:

1. **Introduce the reader to the importance of the topic being studied**. The reader is oriented to the significance of the study.

2. **Anchors the research questions, hypotheses, or assumptions to follow**. It offers a concise statement about the purpose of your paper.

3. **Place the topic into a particular context** that defines the parameters of what is to be investigated.

4. **Provide the framework for reporting the results** and indicates what is probably necessary to conduct the study and explain how the findings will present this information.

2.2. Selection of research problem

The research problem undertaken for study must be carefully selected. Help may be taken from a research guide in this connection. Nevertheless, every researcher must find out his own salvation for research problems, research problems cannot be borrowed. A problem must spring from the researcher's mind like a plant springing from its own seed. Thus, a research guide can only help a researcher to choose a subject area. The following points should be observed by a researcher in selecting a research problem:

i. **Subject which is overdone should not be normally chosen**, for it will be a difficult task to throw any new light in such a case.

ii. Controversial subject should not become the choice of an average researcher.

iii. Too narrow or too vague problems should be avoided.

iv. **The subject selected for research should be familiar and feasible** so that the related research materials or sources of research are within one's reach.

v) The importance of the subject, the qualifications and the training of a researcher, the costs involved, and the time factor are few other criteria that must also be considered in selecting a problem. In other words, before the final selection of a problem is done, a researcher must ask himself the following questions:

(a) Whether he is well equipped in terms of his background to carry out the research?

(b) Whether the study falls within the budget he can afford?

(c) Whether the necessary cooperation can be obtained from those who must participate in research as subjects?

If the answers to all these questions are in the affirmative, one may become sure so far as the practicability of the study is concerned. If the subject for research is selected properly by observing the above mentioned points, the research will not be a boring drudgery, rather it will be interesting. The subject or the problem selected must involve the researcher and must have an upper most place in his mind so that he may undertake all pains needed for the study.

2.3. Techniques in selecting a research problem

Before you start to think about your research, you need to ask yourself a few questions. When you start to think about your research project, a useful way of remembering the important questions to ask is to think of the five „Ws": What? Why? Who? Where?, & When?

What is our research?

One of the hardest parts in the early stages is to be able to define your project; so much research fails b/c the researcher has been unable to do this. A useful tip is to sum up, in one sentence your research. If you are unable to do this, your research topic will be too broad or too doubtful.

Why do you want to do the research?

If you're doing it for a university dissertation or project, does your proposed research provide the opportunity to reach the required intellectual standard?

- Will your research generate enough material to write a dissertation of the required length?
- Or will your research generate too much data that would be impossible to summarise into a report of the required length?

If you're conducting research for funding purposes,

- Have you found out whether your proposed funding body requires the information to be presented in a specific format? If so, you need to plan your research in a way which will meet that standard.

Who will be our participants/ respondents?

Who are participants?

Participants: those persons who participate and answer questions in studies (eg. interviews and focus groups. The participant generally gives much more detailed answers than respondents.

Who are respondents?

Respondents are those persons who have been invited to participate in a particular in the study. This definition applies to both qualitative and quantitative studies. Respondents are derived from the sample that is constructed for a qualitative study.

- ✓ You needn‟t worry too much about exactly how many participants will take part in your research. However, you should think about the type of people with whom you will need to get in touch with and whether it will be possible for you to contact them.

Where are you going to conduct your research?

Thinking in geographical terms will help you to narrow down your research topic. Think about the resources in terms of budget and time that are available to you. If you‟re a student who will not receive travel expenses or any other out of pocket expenses, choose a location close to you. Ask if there is a suitable place for such type of research to be conduct in your study area. Ask availability of such types of data in your study areas. Also think in terms of effect of location on your research result etc.

When are you going to do your research?

Thinking about this question will help you to sort out whether the research project you have proposed is possible within your time scale.

 It will also help you to think more about your participants, when you need to contact them and whether they will be available at that time

Techniques in formulating a research problem

The techniques involved in defining and formulating a research problem is a crucial part of a research study. These techniques should be defined in a systematic manner and involve the following steps:

 statement of the problem in a general way;

 understanding the nature of the problem;

 surveying the available literature

 developing the ideas through discussions; and

 rephrasing the research problem into a working proposition

Statement of the problem in a general way: First of all the problem should be stated in a broad general way, keeping in view either some practical concern or some scientific or intellectual interest. For this purpose, the researcher must immerse himself thoroughly in the subject matter concerning which he wishes to pose a problem. The problem stated in a broad general way may contain various ambiguities which must be resolved by cool thinking and rethinking over the problem. At the same time the feasibility of a particular solution has to be considered and the same should be kept in view while stating the problem.

Understanding the nature of the problem: The next step in defining the problem is to understand its origin and nature clearly. The best way of understanding the problem is to discuss it with those who first raised it in order to find out how the problem originally came about and with what objectives in view. If the researcher has stated the problem himself, he should consider once again all those points that induced him to make a general statement concerning the problem. For a better understanding of the nature of the problem involved, he can enter into discussion with those who have a good knowledge of the problem concerned or similar other problems. The

researcher should also keep in view the environment within which the problem is to be studied and understood.

Surveying the available literature: All available literatures concerning the problem at hand must necessarily be surveyed and examined before defining research problem. This means that the researcher must be well-conversant with relevant theories in the field, reports and records as also all other relevant literature. He must devote sufficient time in reviewing of research already undertaken on related problems. This is done to find out what data and other materials, if any, are available for operational purposes. "Knowing what data are available often serves to narrow the problem itself as well as the technique that might be used." This would also help a researcher to know if there are certain gaps in the theories, or whether the existing theories applicable to the problem under study are inconsistent with each other, or whether the findings of the different studies do not follow a pattern consistent with the theoretical expectations and so on. All this will enable a researcher to take new strides in the field for furtherance of knowledge i.e., he can move up starting from the existing premise. Studies on related problems are useful for indicating the type of difficulties that may be encountered in the present study as also the possible analytical shortcomings. At times such studies may also suggest useful and even new lines of approach to the present problem.

Developing the ideas through discussions: Discussion concerning a problem often produces useful information. Hence, a researcher must discuss his problem with his colleagues and others who have enough experience in the same area or in working on similar problems. This is quite often known as an experience survey. People with rich experience are in a position to enlighten the researcher on different aspects of his proposed study and their advice and comments are usually invaluable to the researcher. They help him sharpen his focus of attention on specific aspects within the field. Discussions with such persons should not only be confined to the formulation of the specific problem at hand, but should also be concerned with the general approach to the given problem, techniques that might be used, possible solutions, etc.

Rephrasing the research problem: Finally, the researcher must sit to rephrase the research problem into a working proposition. Once the nature of the problem has been clearly understood, the environment (within which the problem has got to be studied) has been defined, discussions over the problem have taken place and the available literature has been surveyed and examined, rephrasing the problem into analytical or operational terms is not a difficult task. Through

rephrasing, the researcher puts the research problem in as specific terms as possible so that it may become operationally viable and may help in the development of working hypotheses.

CHAPTER THREE

3. DEVELOPING A RESEARCH PROPOSAL

A research proposal is a relatively brief document that contains an outline plan for a research project. It is produced at the beginning of the research process in advance of any data collection. A well-constructed research proposal offers a blueprint for the research that shows what the parts look like and how they will fit together. It describes what will be done, explains how it will be done, and justifies why the research should be undertaken. A research proposal is an important part of the research process because the success of any project depends on forward planning and organization.

A good proposal is based on careful thought about how the project will be conducted and involves the kind of advance planning that is required if a project is to run smoothly. There is a useful analogy here with house building. No-one would seriously consider starting work on a house without first having drawn up plans for the building. Without such plans it would be virtually impossible to work out exactly what materials will be required, when they are to be delivered, and how they will fit together. The same applies with a research project. Before embarking on a research project, the researcher needs to prepare the groundwork and give careful thought to the practical issues involved at the implementation stage of the research.

3.1. The purpose of proposals

There are many reasons for writing a research proposal. Perhaps most important is that a research proposal is a necessary document to convince funding sources that a project is worthy of their attention and their money! It also forces a researcher to organize his efforts with regard to the **time** and **resources** necessary to complete a research project. Good research must carefully be planned and systematically carried out.

In short the purpose of the proposal is:

a. To allow the writer to clarify what it is he/she wants to do, why and how he/she wants to do it,

b) To persuades the committee that what she/he wants to do can be done in the manner and timeframe proposed, and

c) To provides written contract between the student/researcher and the committee.

3.2. Structure of a research proposal

A typical research proposal should contain many of the features which features will, or should be, included may vary from faculty to faculty.

I. A cover page

This is essential – it contains:

- your research area via a tentative or **proposed title**
- your name, contact details, and qualifications
- the institutional or university name, as well as the specific department
- Advisor's and co-advisor's names
- the degree level being attempted

II. Proposal title

- Should be specific, clear and concise and is relevant to the intended contents of the proposal
- It should tell what the proposal is all about.
- Usually should not exceed 17 words.
- It must include the **subject matter** (animal, disease, feed, etc.) **the line of investigation** (breading for disease resistance, evaluation of nutritive value of , selecting for adaptability, and **location** (place of study)
- Usually be typed using all capital letters
- Abbreviations formulas, jargon (terminological), and unnecessary words should be avoided in the title

III Table of contents

A table of contents should:

- ✓ list the research proposal sections in a hierarchical way, using titles and subtitles
- ✓ list all of the elements of the proposal, with accompanying page numbers.
- ✓ these elements generally include the following items: title page, acknowledgements, acronyms and abbreviations, table of contents, introduction, literature review, methodology, reference list, and appendices.

1 Introduction

Following a general-to-specific writing pattern this part provides background information that orientates the reader to the research‟s general socio-political, historical, scientific, and educational contexts (whichever is most relevant). Perhaps include a theoretical, personal, or

policy-based motivation for the research as a starting point. Often it should have the following common sections:

- ✓ Background
- ✓ Statement of the problem
- ✓ Significance of study
- ✓ Objectives of the study

Background: This explains to the reader the background from which the research problem emerges and proposes that give rise to the need for undertaking the research activity. Review of previous work to reveal what is known of subject (gaps in knowledge and current trends). Virtually every subject has been researched previously, so a critical account of what has been achieved so far *to address the problem is required in order to identify the gaps in knowledge or contentious issues.* The research should fill one of these gaps or try to resolve the contention. It should explain the major factors which surround your problem, and of any significant literature which relates to it. Some of the factors which make up the context might be of a physical nature, such as location, materials, organizations, processes etc, while others might be more conceptual, such as the economy, legislation, development policy etc. Even more abstract are theoretical concepts such as power, poverty and Marxism. The research problem should emerge from this context.

Research problem: The research problem provides the focus of the research project. It is the end of the background work and the initiator of the specific research tasks. It must be very clearly defined to explain the nature of the problem and why it is significant. The problem may be expressed in abstract terms initially, but through the statement of sub-problems, you should indicate how it can be investigated practically. The purpose is to further increase the understanding of the significance of the proposed research. This section is the most critical task in writing research proposal (i.e., the central point in any research). It the most important section of proposal; because it shows why the researcher has selected the concerned variables in the expected research and the extent (how far or deep) to which the research problem is going to be addressed.

Significance of the study: This section addresses the likely contribution of the research (knowledge, applications, solutions, etc). The researcher describes the value of specific

applications of knowledge to be gained and the potential importance of these applications. He/she also describes the gaps that the proposed research is intended to fill.

Objectives of the Study: Should specify the measurable outcomes of the research, i.e., end products. Objectives must be SMART (S= specific; M=measureable; A= achievable; R=reliable; T=time bounded). The objectives must neatly fit into the statement of the problem. Objective emphasizes what will be done, whereas a method will explain how it will be done

Two types of objectives:

General objective: provides a short statement of the scientific goal being pursued by the research.

Specific objectives are operational in nature.

Do not confuse objectives with goals. The goals are conceptual, ultimate and more abstract. Objectives are specific and immediate.

2. Literature review

Review means see again, examine, or study again examine critically or deliberately, to give critical evaluations. A literature review is an account of what has been published on a topic by accredited scholars and researchers. It is not necessary to review all the literature in the field particularly if you are dealing with a specific research topic. What you need are materials that have direct relevance to the study. It must provide a historical background of the subject to be studied (clear background). It must adequately present any and all relevant materials that are available. In the context of literature review: it means locating literature in a variety of sources, reading it carefully and thoroughly, evaluating the content, breaking down and reorganize it into theme (topics) along the line of investigation.

Purpose

- To **convey to your reader what knowledge and ideas** have been established on a topic, and what their strengths and weaknesses are.
- To expand the introductory chapter and to address the questions raised
- To provide the **theoretical basis** for the research question
- To help the researcher in the **interpretation of results or findings**.
- To help the researcher to outline the **implications** of his study

- To **further define** the research problem

3. Materials and methods

This section shows how the research objectives/hypotheses will be answered / tested in the most rigorous way. It describes in detail the specific methods and the materials needed to accomplish the research. It explains the procedures to be followed. It provides clear and complete descriptions for all experimental, analytical, and statistical procedures. The section should include enough information so that another researcher can repeat the procedures and expect to get similar results.

- In writing this section it is very useful to consider questions such as:

 Where: Important to describe where the study will explicitly takes place.

 How: provide a detailed description of what will occur from the time the project starts until it ends, i.e., how you will do the research

 When: present the methods in a logical sequence of activities in a time frame.

 Why: justify the chosen methods, especially if they are new or unique.

The major components are:

Description of the study area

Describing the biophysical environment of the study area is very important. mainly by giving emphasis to the following information depending upon the nature of the study:

- Location and topography
- Climate
- Geology and soils
- Production systems and population

Data collection methods

The proposal should include a description of the instruments and procedures to be used for collecting the data including who will collect the data when it will be collected and how. If observers, interviewers or enumerators are to be used, specify the criteria that will be used in their selection.

Data analysis procedures

Data analysis involves the ordering and reduction of the data so that they can be related directly to the research problem. All statistical procedures to be used in analyzing the data should be described. One way of organizing the data is to state each hypothesis and to follow it with a description of the statistical tests to be used.

4. Expected output

You need to state the output expected after accomplishing the proposed research. Expected outcomes commonly developed from specific objectives.

5. Work plan

You need to present timetable/work plan/schedule for each activity to be implemented. It shows how you plan to deal with constraints such as time, transport and accommodation. There are three steps in formulation of work plan

- Analysis of tasks
- Time estimates of each tasks
- Synthesis of the plan

6. Budget

It shows how you are going to organize the research in logistic terms (research equipment, transport, accommodation, etc) and deal with language problems (use of interpreters). The steps in presentation of budget should proceed in the following manner

- Study the sequence of research activities or work plan
- Estimate the cost of each activity
- Group similar expenditure items together
- Present a detailed periodic budget; and
- Present a budget summary covering all years of the project

7. References

In-text references (citations)

References are citations of other works such as books, journal articles, or private communications. There may be different systems of citing references in the text. But the most common one is writing

the author and the year in the text and the full reference is then found in alphabetic order in the bibliography or reference section.

A. One author

1. When placed at the end of a sentence (more common)

…….. (Allard, 1999).

2. When placed somewhat in the middle (less preferable)

…… (Allard, 1999)…….

3. When placed towards the beginning of a sentence

Allard (1999) estimated that ……

According to Alard (1999),

B. Two authors

The same as in section ''A'' except that the two authors are connected with'' and".

……(Ayana and Bekele, 2000).

……... (Ayana and Bekele, 2000)….

Ayana and Bekele (2000)…….

According to Ayana and Bekele (2000),…

C. Three or more authors

If you are referring to literature written by three or more authors, write the name of the first author followed by et al.

…… (Ayana et al., 2000)

. …… (Ayana et. al, 2000)…

Ayana et al. (2000) pointed out…

According to Ayana et al. (2000),…..

D. Referring to the same author or group of authors in the same year

Place a, b, etc. immediately after the year, and it does not matter if single, double or multiple authors. Placement is also up to you.

Ayana et al. (2000a, 2000b)

E. Referring to many authors at the same time

Arrange them chronologically (i.e., Year ascending) and if of the same year arrange the authors alphabetically and separate them using semi-colon). Placement is up to you, though highly preferable to put at the end in this condition.

Example:

…….(Gebrekidan, 1987; Kebede, 1991; Debelo et al., 1995; Ayana, 2001).

Reference lists: written in an alphabetical or numerical list with complete source of relevant information about a given subject. Any publication or other source that is referred in the text, tables or figure must be listed in the list of references. Inversely all references in the list shall be referred in the text. The reference shall be made in the accepted style of the university

 Most reference entries have three components:

(ii) Authors: Authors are listed in the same order as specified in the source, using surnames and initials. Commas separate all authors. When there are seven or more authors, list the first six and then use "et al." for remaining authors. If no author is identified, the title of the document begins the reference. The first author always starts with its surname followed by initials

(ii) ***Year of Publication***: In parentheses following authors, or without parenthesis following authors. If no publication date is identified, use "n.d." in parentheses or without parenthesis following the authors.

(iii) ***Source Reference***: **Includes title**, journal, volume, pages (for journal article) or title, edition, city of publication, publisher (for book). [**Note:** Italicize name of journal, and periodical volume numbers.]

Abbreviating within a reference

Here are approved abbreviations for use in a reference list:

- chap. for chapter
- ed. for edition
- rev. ed. for revised edition
- 2nd ed. for second edition
- Ed. for Edited by
- (Eds.) for multiple editors

- Trans. for Translated by
- p. for page number, with a space after the period
- pp. for page numbers in encyclopedia entries, multi-page newspaper articles, chapters or articles in edited books, but not in journal or magazine article citations, where numbers alone should be used (see examples of reference formats).
- Vol. for Volume
- vols. for volumes
- No. for Number
- Pt. for Part
- Suppl. for Supplement,
- Tech. Rep. for Technical Report
- **Books = Author (s) name (s). Date. Title. Publisher, place.** Suzuki, D.T., Griffiths, A.J., Jeffrey, H.M. & Lewontin, R. 1999. An introduction to genetic analysis, 4th ed. Freeman: New York.
- **Chapter in a book = Author's name. Date. Title of chapter. In: Name (s) of ed (s). Title of book. Publisher, city.pp**

Example: Jagdish Prasad (2004). Goat production and Management. In: Goat, Sheep and Pig production and management. Kalyani Publishers,451 pp.

- **Reports**

FAO (Food and Agricultural Organization). 2010. Draft guidelines for Molecular Characterization of Animal Genetic Resources for Food and Agriculture. Rome, Italy.

- **Journal articles = Author (s) name (s). Date. Title. Journal name in full, volume number: beginning and ending page numbers.**

Getachew Tadesse, Aynalem Haile, MarkosTibbo, A.K. Sharma, J. Solkner and M. Wurzinger 2010. Herd management and breeding practices of sheep owners in a mixed crop livestock and a pastoral system. *African journal of agricultural research*. 5(8):685-91.

- **Entire proceedings= Name (s) of ed (s) (sponsoring institution, if there is no editor). Date of publication. Title of proceedings, date of conference, place of conference. Publisher, total pages.**

ICRISAT (International Crops Research Institute for the Semi-Arid Tropics). 1975. Proceedings of the international workshop on grain legumes, ICRISAT, 18 Jan 1974, Hyderabad, India. ICRISAT Patancheru, A.P., India.

- **Papers in proceedings= Author of paper. Date of publication. Title of paper. Pages. In: Proceedings (name of workshop), name of editor (s), if any, sponsor, date of workshop, place held, publisher's address.**

Solomon Abegaz, Gemeda Duguma, Takele Kumsa, Birhanu Soboka, Dereje Bacha,Bizunesh Mideksa, Fayo Dubiso, Ulfina Galmessa and BirhanFeleke. 2005.On-farm verification of sheep finishing technology in Eastern Wollega Zone. In: Participatory Innovation and Research: Lessons for Livestock Development. *Proceedings of the 12thAnnual conference of the ESAP*, Ethiopia, held in Addis Ababa, Ethiopia, August 12-14, 2004, Addis Ababa.

- **Thesis or dissertation**

Sisay Asmare, 2010. Characterization of Sheep Production System and Fattening Practices in Bahir Dar Zuria Woreda .An M.Sc. Thesis presented to the School of Graduate Studies of Bahir Dar Universit y.

Solomon Gizaw. 2008. Sheep resources of Ethiopia: genetic diversity and breeding strategy PhD thesis, Wageningen University, The Netherland.

3.3. Reasons why research proposals fail

A research proposal can be rejected as unsuitable or poorly designed and on the basis of this a pieces of research can be rejected. The proposal is, therefore an important document; one that is worth spending one time on to get right. Another reason to get proposal right is that this can save you time in the long run. If the proposal well designed, it can form an outline of the research to follow and ideally can be mapped onto various part of the final write up. Therefore it is worth to consider the important characteristics of a good proposal not to be failed.

Why research proposal fail?

Some of the main reasons for the omission of the required action of many proposal applications are noted below:

- If objectives are unclear or vague
- If the description of the nature of the research and of its significance leaves the proposal nebulous and diffuse and without a clear research aim
- If there is mismatch between the approach being adopted and the issue to be addressed
- If the overall plan is too ambitious and difficult to achieve in the timescale
- If the research as proposed is overly involved , with too many elements under simultaneous investigation
- If the researcher does not seem to have conducted enough in depth background research.
- If failure to accurately present the theoretical and empirical contributions by other researches
- If the investigator appears to be unfamiliar with recent pertinent literature or methods
- If the investigator needs more liaison with colleagues in this field or in collateral fields
- If problem is of insufficient importance
- the topic has been done too many times before
- failure to stay focused on the research question
- failure to develop a coherent and persuasive argument for the proposed research
- If information about the data collection and data analysis methods is insufficiently detailed.
- If timescale is inappropriate or unrealistic
- If it appears that other responsibilities , for example, would prevent devotion of sufficient time and attention to this research
- If assets and budget have not been carefully thought out i.e. the requirements for equipment or personnel are unrealistic
- If fail to delimit the boundary conditions for the research

CHAPTER FOUR
METHODS OF RESEARCH

Once the researcher formulates his research he can go on to think about how he is going to do his research. The first thing he needs to do is to think about his research methodology. This is the philosophy or the general principle which will guide our research. It is the overall approach to studying our topic and includes issues we need to think about such as the constraints, dilemmas and ethical choices within our research. Research methodology, in simpler terms is the manner or the approach the investigator adopts in answering his/her research question. "Methodology is the rationale and philosophical assumptions underlying a particular study."

Research methods are the means, the instruments or the tools a particular investigator chooses to accumulate the information required to answering research questions. We all need to use at least one or more of these tools for our research projects. These tools for example include questionnaires, interviews, records, measurements, or audiovisual materials. These several methods with their merits and limitations, are available for the purpose and the researcher may use one or more of the methods. 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 behavior.

It is always desirable to pretest 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. Data to be collected are also divided into two other categories, referring to their characteristics; basically whether they can be reduced to numbers (quantitative research) or presented only in words (qualitative research). This affects the way that they are collected, recorded and analyzed.
A quantitative method examines numerical data and often requires the use of statistical tools to analyze data collected.

4.1. Descriptive types of research

Descriptive research can be used to identify and classify the elements or characteristics of the subject. The major purpose of descriptive research is description of the state of affairs as it exists

at present (finding out **what is)**. It cannot draw conclusions from that data about which way the relationship goes Does A cause B, or does B cause A. Quantitative techniques are most often used to collect, analyze and summarize data. Descriptive research includes surveys and fact-finding enquiries of different kinds. The distinctive feature of this approach is that its primary concern is with description rather than with testing of hypothesis as there is in experimental research. It often uses visual aids such as graphs and charts to aid the reader in understanding the data distribution. ***It is important to emphasize that descriptive research methods can only describe a set of observations or the data collected***

There are three main types of descriptive methods: observational methods, case-study methods and survey methods**.** So survey and observational methods are frequently used to collect descriptive data.

Case- study method

A research involves an in-depth study of an individual or group of individuals, case studies should not be used to determine cause and effect, and they have limited use for making accurate predictions. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. They are largely descriptive examinations, usually of a small number of sites (small towns, hospitals, schools). Case studies can provide very engaging, rich explorations of a project or application as it develops in a real-world setting.

Observation studies

As their name implies, observation studies involve observing and recording of behavior or trait or attribute as it occurs in its natural settings. Observation study has the following important features:

- The first and most fundamental principle is that of non-interference.
- Second, observation study involves the observation and detection of patterns or phenomena that exist in the real world.
- Third, observation study is particularly useful when we know little or nothing about a certain subject.

Survey

A **survey** is a method of collecting data in a consistent way. This is used to obtain data about practices, situation views at one point in time through questionnaire or interviews. **Survey** research is useful for documenting existing community conditions, characteristics of a population, and community opinion according to the data attained by asking individuals questions either in person, on paper, by phone or online. Conducting surveys is one form of primary research, which is the gathering data first-hand from its source. The information collected may also be accessed subsequently by other parties in secondary research. Surveys involve selecting a representative and unbiased sample of subjects drawn from the group you wish to study. Surveys gather data at a particular point in time with the intention of describing the nature of existing conditions, or determining the relationships that exist between specific events. Typically survey method is used to scan a wide field of issues, populations, programs etc. in order to measure or describe any generalized features. Survey is useful in that it usually:

- gathers data on a one-shot basis and hence is economical and efficient;
- represents a wide target population;
- generates numerical data;
- provides descriptive, inferential and explanatory information;
- manipulates key factors and variables to derive frequencies.

Exploratory (Informal) survey

Exploratory research is undertaken when few or no previous studies exist. Exploratory research studies are also termed as formulative research studies. The main purpose of such studies is that of formulating a problem for more precise investigation or of developing the working hypotheses or ideas that can be tested from an operational point of view and will form the basis for further research. Exploratory research is the way of getting more information on a topic and can make an important contribution to the design of the more expensive and time consuming formal surveys. Exploratory research helps to:

- determine the best research design,
- develop hypotheses,

- develop questions to be answered,
- understand how to measure a variable,
- determine data collection method, and
- determine selection of subjects.

It can be said that exploratory research is generally a precursor to a more formal study. Informal interviews are used to confirm or complement the information obtained from secondary data sources and to get insight from producers and community members who are directly involved. Informal Interviews fall in to three main categories as follow:

A. Individual Interviews

- In which a small (non-random) sample of producers within each targets group are selected for questioning.
- Are relatively informal, the questions being specific for each respondent.
- Several members of multidisciplinary team will be involved in an interview.

B**. Group Interview**

- used to broaden perspectives about the farming system.
- used to obtain insights about the farm /pastoral community
- are informal and respondents are encouraged to participate in debates on particular issues concerning the members of the community

  e.g. Government policies

  Land tenure issues

C. Key Informant Interview

It is directed towards individual knowledgeable about particular subjects (e.g. the socio economic characteristics of the target group, the activities of extensions staffs, etc.)

- Individuals chosen for this type of interview may be:
  - Farmer
  - Extension staff
  - District administrators
  - Traditional leaders

It can provide high quality information on a wide range of topics in a relatively short time. The information obtained should always be cross- checked by interviewing more than one informant

on the same subject or by comparing informants' responses with information from other sources (eg. Secondary data).

Principles

For each type of interview, it is necessary to make sure that:

- The right people are selected for the interview.
- The right language is used.
- The right questions are asked so that the right information is obtained.
- The farmers/ pastoralists selected for an interview should be representative of the target group.

Diagnostic (Formal) survey

Diagnostic is formal, structured, conducted with randomly selected sample of farmers or pastoralists. It involving the use of questionnaires provides a systematic, ordered way of obtaining information from respondents and enables precise and statistically analyzable data to be obtained. They can be conducted when the need for further research indicated during the exploratory stage. Enumerators are normally used to conduct interviews and collect data on particular aspects. It lays the foundation for experimental research. It deals with some of the most practical issues applicable to diagnostic survey including selection of samples, Training of enumerators, designing, Questionnaires, etc.

Diagnostic surveys can also be used to:

- ✓ redefined target group
- ✓ identify further relationships /linkage and
- ✓ Identify priorities for research.

Redefinition of target groups: when recommendation domains are identified during the exploratory stage target groups can be classified into groups based on one or two characteristics. Because Diagnostics survey used random sample methods, variability in these characteristics within a target group can be re-examined and quantified and the initial groupings can be refined or modified.

Identifications of other relationships: often, relationships/linkages not specifically recognized during the exploratory stage are found coring diagnosis. For example, a diagnostics survey of cattle herd size and household size in a certain area at a particular year indicated that household size increased with increasing herd size. Relationship like this can have a major effect on production and should be carefully examined and tested for statistical significance.

Identifications of research priorities: it is not always easy to identify research priorities with any confidence during the exploratory phase of livestock research. The prescreening of the technologies is only tentative and quantitative data are required to continue the process of priority selection/identification. The option for further research can be narrowed and priorities can be more clearly defined through diagnostic surveys. .

Methods of data collection in survey work

Data collection techniques allow us to systematically collect information about our objects of study (people, objects, phenomena) and about the settings in which they occur. In the collection of data we have to be systematic. If data are collected haphazardly/unplanned, it will be difficult to answer our research questions in a conclusive way. The task of data collection begins after a research problem has been defined and research design/ plan checked out. While deciding about the method of data collection to be used for the study, the researcher should keep in mind two types of data (primary and secondary). The primary data are those which are collected afresh and for the first time, and thus happen to be original in character. The secondary data, on the other hand, are those which have already been collected by someone else and which have already been passed through the statistical process. The methods involved in survey data collection are any of a number of ways in which data can be collected for a statistical survey. These are methods that are used to collect information from a sample of individuals in a systematic way. Various data collection techniques/methods include:

Questionnaires

A questionnaire is a data collection tool in which written questions are presented that are to be answered by the respondents in written form. A questionnaire is a type of survey where **respondents write answers to questions** posed by the researcher on a question form. A number

of respondents are asked identical questions, in order to gain information that can be analyzed, patterns found & comparisons made. Questionnaires are extremely flexible & can be used to gather information on almost any topic involving large or small numbers of people, either at quantitative or qualitative angle.

- ❖ It can be ***group administered*** (if the respondents are illiterate , the researcher can ask the questions directly from the respondents and records their answers) and it can be ***self-administered*** (when the respondents themselves answer the questions)

  - The questions can be either open-ended or closed.

a) Closed ended questionnaire

The commonest type of questionnaire involves closed choice or fixed questions where the respondent is required to answer by choosing an option from a number of given answers, usually by ticking a box or circling an answer. These types of questionnaires only gather straightforward, uncomplicated information & only simple questions can be asked.

b) Open ended questionnaire

The open ended questionnaire differs in that it allows the respondent to formulate and record their answers in their own words. These are more qualitative & can produce detailed answers to complex problems.

Interviewing

An **interview** is a data-collection technique that involves oral questioning of respondents, either individually or as a group (in the form of formal conversation). The interviewer, asks a person being interviewed, the respondent, questions designed to obtain answers pertinent to the purposes of the research problem. Answers to the questions posed during an interview can be recorded by writing them down (either during the interview itself or immediately after the interview) or by tape-recording the responses, or by a combination of both. It is initiated by the researcher & is focused on specific content. Interviews can be approached from **either a quantitative or qualitative angle.** Interview can be structured, unstructured and semi structured.

Structure interviews: involve the use of a set of predetermined questions and of highly standardized techniques of recording and conducted with tight control over the questions and

answers. This is the use of standardized interview schedules that have been carefully prepared in advance to obtain information pertinent to the research problem. The questions, their sequence and their wording are fixed. Thus the interviewer in a structured interview follows a rigid procedure laid down, asking questions in a form and order prescribed. The interviewee may be permitted some liberty in asking questions but very little.

Unstructured interviews do not follow a system of pre-determined questions and standardized techniques of recording information and characterized by a flexibility of approach to questioning. In a non-structured interview, the interviewer is allowed much greater freedom to ask, in case of need, supplementary questions or at times he may omit certain questions if the situation so requires. He may even change the sequence of questions. He has relatively greater freedom while recording the responses to include some aspects and exclude others. But this sort of flexibility results in lack of comparability of one interview with another and the analysis of unstructured responses becomes much more difficult and time-consuming than that of the structured responses obtained in case of structured interviews. Unstructured interviews also demand deep knowledge and greater skill on the part of the interviewer. Unstructured interview, however, happens to be the central technique of collecting information in case of exploratory or formulative research studies. But in case of descriptive studies, we quite often use the technique of structured interview because of its being more economical, providing a safe basis for generalization and requiring relatively lesser skill on the part of the interviewer.

- Interview can be one to one, group or focus group interview.
  - ✓ A one to one interview is an interview conducted through meeting one researcher and one respondent.
  - ✓ Group interviews, on the other hand, takes place between meeting of one researcher and more than one respondent.
  - ✓ In focus group interview a number of people are asked to come together in a group to discuss a certain issue. The discussion is led by a moderator or facilitator who introduces the topic, asks specific questions, controls digressions and stops break-away conversations.

  Interview can be conducted face to face or through telephonic or other electronic source, e-mail, etc.

Observation

The observation method is the most commonly used method especially in studies relating to behavioral sciences **observation** is a technique that involves systematically selecting, watching and recording behavior and characteristics of living beings, objects or phenomena. Observation relies on what the researcher has witnessed rather than on what people say or think about issues. There are different types of observation.

i. Participant observation: If the observer observes by making himself, more or less, a member of the group he is observing so that he can experience what the members of the group experience.

ii. Non-participant observation: When the observer observes as a detached emissary without any attempt on his part to experience through participation what others feel.

iii. Controlled and uncontrolled observation: If the observation takes place in the natural setting, it may be termed as uncontrolled observation, but when observation takes place according to definite pre-arranged plans, involving experimental procedure then termed controlled observation.

Using available information

Usually there is a large amount of data that has already been collected by others, although it may not necessarily have been analyzed or published. Locating these sources and retrieving the information is a good starting point in any data collection effort.

4.2. Experimental research

An experiment is an orderly procedure carried out with the goal of verifying, refuting or establishing the validity of a hypothesis. It is the cornerstone of science and is primarily concerned with cause and effect. Experiments provide insight in cause and effect by demonstrating what outcome occurs when a particular factors is manipulated. Experiments vary greatly in their goal and scale, but always rely on repeatable procedure and logical analysis of the results. It is an attempt by the researcher to maintain control over all factors that may affect the result of an experiment. Its purpose is to investigate the relationship between two variables (independent and dependent) to test the hypothesis.

Independent variable is the factor that the experimenter controls and manipulates throughout the experiment. **The dependent variable**, on the other hand, is the variable that is influenced and affected by the independent variable. The researcher seeks to determine the effect of changes in the independent variables on the dependent variable. E.g. feed and experimental animals.

4.2.1. Types experiments

There are two types of experiments in conducting experimental type of research and they are:

A) Laboratory / Controlled Experiments

This type of experiment is conducted in a well-controlled environment where accurate measurements are possible. The researcher decides where the experiment will take place, at what time, with which participants, in what circumstances and using a standardized procedure. Participants are randomly allocated to each independent variable group. Controlled experiments have two groups of subjects. One group is the **experimental group** and it is exposed to the test. The other group is the **control group**, which is not exposed to the test. There are several methods of conducting controlled experiment, but a *simple controlled experiment* is the most common. The simple controlled experiment has just the two groups: one exposed to the experimental condition and one not-exposed to it.

B) Field Experiments.

An experiment carried out in a 'natural' setting; that is, unlike in the case of laboratory experiments, the setting is not created by the researcher. Field experiments are done in the everyday (i.e. real life) environment of the participants. A field experiment still follows all of the steps of the scientific process, addressing research problems and generating hypotheses. For geologists, social scientists and environmental biologists, amongst others, field experiments are an integral part of the discipline. Less artificial than laboratory experiments, fewer variables are controlled, so inferences are often difficult.

CHAPTER FIVE

5. SAMPLING TECHNIQUES

A sampling technique is the name or other identification of the specific process by which the entities of the sample have been selected. As you continue planning your research project you need to think about how you are going to choose your participants. By now you should decide what type of people you need to contact.

5.1. Census and sample survey

One goal of scientific research is to describe the nature of a population, that is, a group or class of subjects or phenomena. In some cases this is achieved through the investigation of entire class or groups. The process of examining every member of such a population is called census. A ***census*** is the procedure of systematically acquiring and recording information about the members of a given population. It can be presumed that in such an inquiry, when all items are covered, no element of chance is left and highest accuracy is obtained. Complete enumeration of all items in the 'population is known as a **census inquiry.** But in practice this may not be true. In many situations, however, the chance of investigating an entire population is impossible. Besides, this type of inquiry involves a great deal of time, money and energy. Therefore, when the field of inquiry is large, this method becomes difficult to adopt because of the resources involved. When field studies are undertaken in practical life, considerations of time and cost almost invariably lead to ***a selection of respondents*** i.e., selection of only a few items. The respondents selected should be as representative of the total population as possible in order to produce a miniature cross-section. The selected respondents constitute what is technically called a 'sample'. A sample is a subset of the population that is taken to be representative of the entire population. The process of examining (selecting) a portion of the population is said to be sampling. The survey so conducted is known as '**sample survey**.

5.2. The need for sampling

Sampling can save time and money. A sample study is usually less expensive than a census study and produces results at a relatively faster speed. One reason is economy of effort and manpower. Sampling remains the only way when population contains infinitely many members. It enables

the researcher to get more detailed information about a particular subject. Another consideration may be that, for a small sample, the persons responsible for making measurements and observation can be of higher competence than if the whole population were to be recorded.

5.4. Step in Sampling Techniques

Designing the sample calls for three decisions

- Who will be surveyed? Identifying population and sampling frame.
- How should the sample chosen? Sampling methods.
- How many units/subjects will be sampled? Sample size.

5.4.1. Identifying the population of interest

The researcher must determine what type of information is needed and who is most likely to have it. Hence, before gathering your sample, it is important to find out as much as possible about your population. The term population in a scientific methodology refers to the material of the study whether it is human subjects, animals or inanimate objects. It is also important of specify the sampling frame. Frame refers to the list of units (e.g. persons, households, cattle etc) in the target population. Since the frame provides the means of accessing the population to obtain a sample, considerations should therefore be given to the quality of the frame. A good frame is up to date, does not have any missing units, contains only relevant units, does not include duplicates, is accessible to frame user and contains sufficient information to uniquely identify and contact each unit.

5.4.2. Determining sampling methods

Two basic approaches to sampling are followed: **probability and non-probability.**

Probability sampling

A probability method of sampling is one in which every sampling unit in the population has an equal and independent chance of being included or selected for the sample (each population element has a known (non-zero) chance of being chosen for the sample). Probability sampling provides an efficient method for selecting a sample that should adequately reflect the variation in the population or these methods make it possible to draw inferences about the population which can be statistically evaluated. Hence, it is used if the researcher wishes to explain predict or

generalize to the whole research population. **Random** selection is the key to the process of probability sampling.

Kinds of probability sampling

I. Simple random sampling

A simple random sample is one in which each member (person, animal, material, etc) in the total population has an equal chance of being picked for the sample. It should be used with a homogenous population that is one composed of members who all possess the same attribute you are interested in measuring. In identifying the population to be sampled, homogeneity can be determined by asking the question, what is (are) the common characteristics that are of interest? These may include such characteristics as age, sex, income, breed, species, etc.- whatever you are interested in measuring. There are many ways to obtain a simple random sample. One way would be the lottery method. Each of the N population members is assigned a unique number. The numbers are placed a bowel and thoroughly mixed. Then, a blind-folded researcher selects n numbers. Population member having the selected numbers are included in the sample. A less rigorous procedure for determining randomness is to write the name of each member of the population on a separate card and with continuous mixing, draw out cards until the sample size is reached.

II. Systematic Random Sampling

This sampling method follows the same procedure as simple random sampling with one exception. In this case the population is ordered in some systematic manner (example in alphabetical order). If the list contains 10,000 elements and the researcher desires a sample size of 1000, he will select every tenth element for his sample. To ensure against any possible human bias in using this method, the researcher selects the first element at random. Thus in the above example, the researcher would begin by selecting a random number between 1 and 10. The element having that number would be included in the sample plus every tenth element following it. In considering a systematic sample from a list, the researcher should examine the nature of that list. If the elements are arranged in any particular order, he should be certain if that order will bias the sample to be selected and should take steps to counter act any possible bias. If the list is ordered, say be some size, the sampling should ensure a good distribution on this

characteristic. Here it should have the standard distance between elements selected in the sample which is called **sample interval**.

III. Stratified random sampling

If the sampling population is heterogeneous it is necessary to subdivide the population into smaller homogeneous groups in order to get more accurate representation. This process is called **stratification**. A Stratified random sample is defined as a probability sampling technique wherein the researcher divides the entire population into different subgroups or strata, which is the process of grouping the members of a population into relatively homogeneous strata prior to sampling, then randomly, selects the final objects from different strata. The number of groups to be considered is determined by the characteristics of the population. The number of units to be selected may be uniform in all the strata or may vary from stratum to stratum. If the number of units to be selected is uniform in all strata it is known as *equal allocation of samples*. If the number of unit to be selected from stratum is proportional to the size of the stratum, it is known as *proportional allocation of samples.* As far as possible the units within the strata should be similar and the strata should differ as much as possible from each other in order that full advantage of the gains due to stratification is taken. Stratification uses the researcher knowledge of the population in order to increase the representativeness of a sample. The stratification process should maximize variation between groups and minimize variation within groups. We may stratify by the size of farm, geography (east, west, north and south), agro-climatic regions, age, sex and any other characteristics we like. In some cases it may be difficult to set up strata. Generally, when planning a stratified sample, a number of practical considerations should be kept in mind:

- The strata should be designed so that they collectively included all members of the target population.
- Each member must appear in only one stratum, i.e. strata should be non-overlapping: and the definition of boundaries of the strata should be precise and unambiguous.

IV. Cluster sampling

In cluster sampling, the population is divided into sub population known as clusters. A specified number of clusters are selected at random, and the observations are made on all the units in the sample clusters practical considerations. Here:

- the cluster should be designed so that they collectively included all members of the target population:
- Each member must appear in one and only one cluster; and
- The definition and boundaries of the clusters should be precise and unambiguous; in the case of geographical cluster natural and man-made boundaries such as rivers and roads are often used to delimit the cluster boundaries.

Note: The difference between stratified and cluster sampling is, with stratified sampling the sample includes elements from each stratum; while with cluster sampling, in contrast the sample includes elements only from sampled clusters.

Non-probability sampling

This involves selection of a sample based on some judgment and knowledge. It is highly biased but can achieve same purpose. With non-probability sampling methods, it is not possible to specify the possibility of one subject being included in the sample. Hence when discussing the result of a non-probability sample, the researcher must limit his/her finding to the subjects sampled. Non-probability sampling is well suited for exploratory research (in selecting respondents for an informal survey) intended to generate new ideas that will be systematically tested later. Non-probability samples do not allow statistical inferences. In other words, this is done when precise representativeness is not necessary or sought. It is often less expensive easier to run and does not require a frame. There are three types of non-probability samples.

I. Quota sampling

In quota sampling, one determines those cases to be included in the sample by choosing them on the basis of some common set of characteristics such as age (30 to 50 years), and sex (male, female). In quota sampling, you select subject non-randomly until a specific number of units (quotas) for various subpopulations have been selected. In other words, it is a means for satisfying sample size objectives for subpopulations. There are two types of quota sampling namely **proportional** and **non-proportional**. In proportional quota sampling you want to represent the major characteristics of the population by sampling a proportional amount of each. For instance, if you know the population has 40% female and 60% male and that you want a total sample size 100, you will continue sampling until you get those percentage and then you will

stop. So, if you have already got the 40 females for your sample but not the 60 males, you will continue to sample male but even if legitimate females come along, you will not sample them because you have already met your quota. In non-proportional quota sampling method, you specify the minimum number of sampled units you want in each category. Here, you are not concerned with having numbers that much the proportion in the populations. Instead, you simply want to have enough to assure that you will be able to talk about even a small group in the populations.

II. Convenience or incidental sampling

When a sample adopted for a study just because the sample happens to be available at the appropriate time and place, then the study is said to have used convenient sampling method. Sampling made by selecting those who are met accidentally. In other words, the researcher selects the easiest population members from which to obtain information. For example, stopping people at a street corner and asking questions or taking the most convenient group one can find.

III. Purposive sampling:

As the name, implies purposive sampling involves selecting members from the population to comprise a sample because they specifically meet some prescribed purpose or possess specific attributes of interest that address the purpose of a particular research problem under investigation. The purpose of the research governs the selection of the sample and thus excludes members of the population who do not contribute to that purpose. In this case a sample is elected according to some characteristics of interest. The process involves deliberately selecting a sample to answer a set of questions. This is done on the basis of own knowledge of the population, its elements and general characteristics. Occasionally, it may be necessary for a researcher to select his sample on the basis of his own knowledge of the population, its elements and the nature of his research aims.

5.4.3. Determining sample size

One of the pivotal aspects of planning a research study is the calculation of the sample size. The statistical concept behind calculation of the desired sample size is simple. When we study a representative sample, we aim to generalize from the sample finding to the population from

which the sample was drawn. Sample size obviously depends on the type of research. For large scale quantitative surveys you will need to contact many more subjects than you would for a small, quantitative piece of research. If we include very few subjects in a study, the result cannot be generalized to the population as this sample will represent the size of the target population. It tends to be a general rule in quantitative research that the larger the sample the more accurate your results. But it is not necessarily true that the larger the sample size, the better the study. Beyond a certain point an increase in sample size will not improve the study. In fact, it may do the opposite, if the quality of the measurement or data collection is adversely affected by the large size of the study. Hence, an optimum sample size should be determined to strike the accuracy in estimation.

Chapter 6: Methodologies in Livestock Production Research

Good production from animals is a function of health, nutrition and breeding. Efforts to improve production in livestock production should follow a holistic approach which embrace the above 3 Animal production research in the Animal Science focuses on improving livestock production systems, management practices, animal health and welfare, and food quality and safety. Animal production research in the Animal Science focuses on, improving livestock production systems, management practices, genetic/breeding improvement, animal health and welfare and food quality and safety

Scope for improvement in animal production

Proposed improvements to livestock production should be technically feasible, economically attractive to the target group and culturally acceptable.

Technical feasibility

This means that proposed improvements are compatible with the managerial, institutional, infrastructural and environmental resources which exist in target area.

Economic attractiveness

Often, potential increase in output may not be sufficient to induce the target group to adopt the improved technology. There for, each costs and market prices facing producers, as well as the opportunity costs of making the change, must also be taken in to account. Moreover, distinction must be made between out puts achieved on-station and on-farm and those achieved under traditional management, because they differed considerably.

Cultural acceptability

This common-sense requirement is often ignored in the design and promotion of new technology. For instance, a particular land tenure system might be considered a major causal factor limiting livestock production, yet changing it may not be politically or culturally acceptable. In such case, considerable improvement could be achieved by introducing innovations into the existing system rather than exchanging it for a completely new one.

6.1. Animal breeding research

Global concern about loss of biodiversity applies to domestic as well as wild populations. Animal breeding research is important for conservation our valuable livestock genetic resources. It can evaluate the potential of our livestock species and discard the inferiors and keep the superior. Improvement is obtained by selective breeding, culling the inferior and by crossing. The need for research ranges from genetic manipulation at the molecular level to the crossing of high-yielding "exotic" breeds with well-adapted indigenous genetic resources. Under the harsh production conditions of many developing regions, genetic adaptations to disease and climatic stresses are particularly important. The identification, characterization and development of indigenous genetic material should take priority in the allocation of the scarce resources available for genetic research. Before carrying out and breeding research, the available genetic resources must be characterized and preserved and their diversity will used to improve livestock productivity.

- Breeding work requires relatively high number of animals, highly skilled manpower, special evaluation technique, which makes the whole venture very expensive. E.g. Take the Ogden cattle research: we need at last a population of 500 animals to determine the populations mean, variance, etc. of the breed.
- Developing appropriate recording system is very important. Records should be informative and easy to understand (simple and precise). Every record should be available from birth including ID, sex, birth date, birth wt., daily wt. gain, age at 1^{st} estrus, mating and calving etc., keep also health records vacation for certain disease. Well-planned experimental design is required.

6.2 Feeds and feeding research

The primary constraint to livestock production in sub-Saharan Africa is the fluctuating quantity and quality of the year-round feed supply. Ruminants will continue to depend primarily on forages and crop residues. However, energy and protein concentrates are required for the expansion of poultry and pig production while concentrate feeds will also be needed to

supplement the diets of high-yielding dairy cattle. In the drier regions, seasonal shortages of forage are common while, in wetter regions, the nutritive value of forages varies seasonally and the failure to preserve surpluses therefore limits year-round carrying capacities.

The series of studies or researches on feed resource status should be conducted to identify

- major feed resources and their contribution,
- farmers practice on feeding management,
- challenges and opportunities towards production
- and utilization of quality feed

Why do we need feed evaluation research?

Because we need information about the feed to get the required product for our animals, how much to feed, to evaluate the potential of the feed, to establish feeding system for our farm and to formulate our own feed for our livestock. Why do we need research on feeds while having established feed standard table for each feed is, since there are limitations of the established feed standard tables (conventional feed standard) such as:

- Its relevance in the tropical developing countries is questionable.
- Technical feasibility: because of the difference in environment values of the European feed is higher than the tropical feed.
- Socioeconomic point of view: due to the high economic level. The Europeans can feed their animals with expensive feed which expensive feed which would compete with human.
- The conventional feed standard table is misleading.
- Level of production achieved in developing countries using the available feeds is usually less than the predicted values found on the feed standard table, which leads to rejection of many feeds.
- Tend to reject a lot of energy values because the conventional system gives higher values.
- It also encourages researchers to copy feeding systems used in temperate areas that are unachievable.

Livestock nutrition research includes the study of nutrient intake and utilization, feed efficiency, energy requirements, forage digestibility, alternative feeds, and diet formulation.

- Some research topics of Animal Science with expertise in livestock nutrition include:
  - Determination of nutrient requirements for livestock and poultry
  - Influence of nutrition and feeding management on reproduction and milk production
  - Regulation of nutrient use by food producing animals with a focus on lactation
  - Relationships between host and rumen microbes to maximize the nutrient supply for productive functions in the ruminant
  - Evaluation of feed additives and growth promotants and their effects on growth, feed conversion, meat quality and economics
  - Energy and protein nutrition of sows
  - The value and use of distillers grains by-products in livestock and poultry feeds

6.3 Animal health aspects of research

There are various purposes of animal health research among which:

- epidemiological survey (disease prevalence),
- diagnostic survey (identification of the cause)
- And irradiation (combating) and controlling disease.

Identifying and ranking the prevalent diseases in the target area

At this point, the first task will be to identify the main disease prevalent in the target area. The disease identified as being present in the area can then be ranked using one or more of the following criteria.

- Proportional morbidity rate
- Proportional mortality rate, and
- Assumed productivity effects

Proportional morbidity rate is the number of observed cases of a specific disease in a specific population during a specified time period (t), divided by the total number of observed cases of all diseases in that population during the time period(t)

This rate provides a numerical measure of the relative importance of disease in a target area, but it does not indicate whether the disease itself is significant in terms of its effects on livestock

Example: Suppose that an outbreak of contagious bovine pleuropheumonia (CBPP) occurs in a herd of cattle. During a 6 month period there are 45 cases of different diseases, including 18 cases of CBPP, The proportional morbidity rate for contagious pleuropneumonia in that herd for the six months would then be 18/45=0.4 or 40%

Proportional mortality rate is the total number of deaths resulting from disease A in a specific population during a specified time period (t), divided by the total number of deaths in that population during that time period. The proportional mortality rate is used for ranking purpose when mortality rates for specific diseases are down. If this mortality is significant, the ratio can provide a useful basis especially for initial rankings. The implicit assumption, of course, if course, is that mortality is the criterion by which the effects of a disease on animal should be judged. Other parameters (e.g. reproductive rate, weight gain) are not considered although many may also be directly affected by disease. For instance, a disease with a low mortality rate (i.e. one of those caused by intestinal parasites) may have a considerable effect on weight gain. It may also contribute indirectly to mortality by predisposing the animals to other sources of infection. Thus, ranks assigned on the basis of the proportional mortality rate may fail to reflect the rate of importance of a disease in the target area.

Assumed productivity effects when specific information on mortality is not available, the effects of disease on animal productivity can be approximated by veterinarians. Diseases can then be subjectively ranked according to predetermined criteria, such as reproductive performance, mortality rates, output levels etc. Alternatively, producers in the area can be asked to identify and rank diseases according to the criteria they consider to be important. Such preliminary ranking can then be used to determine future courses of action in diagnostic systems research. Diseases ranked high on the list may, for instance, be given priority in studies directed towards identifying the critical constrains to production.

CHAPTER SEVEN

7. SCIENTIFIC REPORT WRITING

Research report is considered a major component of the research study for the research task remains incomplete till the report has been presented and/or written. As a matter of fact even the most brilliant hypothesis, highly well designed and conducted research study, and the most striking generalizations and findings are of little value unless they are effectively communicated to others. Research has little value if it is not put together into some form of report. So it has said that research represents a scientific method of establishing knowledge that is cumulative. Therefore, scientific findings must be properly documented and reported through appropriate media. Effective communication of research findings, both to scientist and to the general audiences, is a very important component of the research process. Any researcher who hopes to do an effective report should have some idea of his probable readers or audience. Hence understanding of the needs, interests and capability will help him decide which points to stress in his presentation. The various points to be included should be given careful thought before actual writing is started.

Effective writing is a tool that helps:

- To insure understanding and use of the results of the study.
- To have an outline to work with in preparing a research report.
- To assure order in the finished work and
- To hold down repetition and guard against omissions.

7.1. Need of scientific paper

A scientific experiment/research is not complete until the results have been published and understood. In order to publish the purpose of research and the findings are made known to others. Research results must invariably enter the general store of knowledge. The general opinion is in favour of treating the presentation of research results or the writing of report as part and parcel of the research project. Writing of report is the last step in a research study and requires a set of skills. This task should be accomplished by the researcher with utmost care; he may seek the assistance and guidance of experts for the purpose. A scientific paper is needed to:

- Enable peers assess observations
- Enable peers repeat experiments
- Enable peers evaluate intellectual processes
- To make it available to scientific community without restriction
- Helping advance knowledge in a particular field

7.2. Scientific report writing/ article to published

Scientific writing: is a technical form of writing that is designed to communicate scientific information to other scientists Or it is a way of communicating scientific knowledge to wider readers. The purpose of scientific writing is to communicate new scientific findings. Thus it has to be clear, simple and well-ordered communication to transmit new scientific findings.

It is unusual for one to produce ready-made text right away. Assess your results before starting to write. In the process of writing, the researcher learns from his mistakes and comments/advices he gets from peers, reviewers, or supervisor. These are very essential during the writing process. Nevertheless, the writer must assume responsibility and keep his confidence in his own experience and knowledge about the problem he studied. No one else can know better than himself about the work he did accomplish.

The key to scientific writing is clarity. Good scientific writing should be in considering the following characters

- Scientists are required to write in clear and simple terms. Scientific writing must use proper English which gives the sense in the fewest short words.
- Ideas should be explained in simple language and short, coherent sentences.
- The personal pronouns I, we, you, my, our and us are avoided by the use of such expressions as the researcher or the investigator.
- Minimize the use of jargons and imprecise words.
- Does not contain plagiarized information /Contains original results
- Concepts and definitions must be sufficiently described depending upon the type and capability of the target audience.
- The past tense should be used in describing research procedures that have been

completed.

- when possible use the active rather than passive voice… e.g. *The researcher found that* is .. is preferred than it was found by the researcher.

7.3. Parts of scientific report/ publication

Essential Parts of a scientific paper includes

Title; on the title page- Describe concisely the core contents of the paper

Acknowledgments; Give credit to those who helped you

Table of Contents

Abstract; Summarize the major elements of the paper

Chapter 1. Introduction; provide context and rationale for the study

Chapter 2. Review of the Literature

Chapter 3. Materials and Methods; Describe the experimental design so it is reproducible and describe the experimental procedures

Chapter 4. Results and Discussion; Summarize the findings without interpretation and Interpret the findings of the study

Chapter 5. Conclusion and Recommendation; Summarize the findings

Chapter 6. References; List all scientific papers, books and websites that you cited.

Appendices/Annexes.

A. Preliminary section

1. Title page: Some basic considerations

The title page usually includes:

- The name of the topic
- The name of the author
- The relationship of the report to a course or degree requirement
- The name of the institution where the report is submitted
- The date (The date when the paper was submitted.) and place of the presentation

The title should catch the readers' attention while informing them about the main thesis of the study. First impressions are strong and can attract attention.

The title should be

- Concise and should give a precise indication of what is to come.
- It should not claim more than what the study actually delivers.
- The title should be typed in capital letters, single spaced and
- Centered between the right and left margins of the page.

2. Acknowledgement (if any)

An acknowledgement page is included if the writer has received unusual assistance in the conduct of the study. The author gives credit for external support received during the conduct of the study. Acknowledgement also expresses gratitude for the use of copyrighted or otherwise restricted materials. A doctoral candidate may choose to dedicate the dissertation to a person(s) who has had significant impact on his work.

3. Table of contents:

- A good table of contents serves as an important purpose in providing an outline of the content of the report. it should list in order of appearance all components of the research report, including all headings and subheadings, with the correct corresponding page numbers.
- The table of contents should be double-spaced between entries; entries longer than one line should be single-spaced.
- The page numbers for materials preceding Chapter I (Introduction) should be in **lower-case roman numerals**, while all subsequent materials should be listed with **standard Arabic numerals**.
- The relationship between principal and minor divisions is indicated by capitalization of chapter numbers and titles, with subheadings in small letters and with capitalized principal letters.

Abstract

It should provide a brief summary of each of the main sections of the paper:

- ✓ Background /context of the study (Why?)
- The research question/gap to be addressed

- State the principal objective
- ✓ Describe the methods used (How?)
- ✓ Summarize the results (What?)
- ✓ State the principal conclusions (So what?)
- ✓ Show future perspective (what next?)

It is easier to write the abstract after completion of the paper

Criteria of the Abstract

- ♦ It should not exceed 250 words
- ♦ It should be written in one paragraph.
- ♦ It should be written in the past tense as it refers to work done.
- ♦ Long words should be followed by its abbreviation which would be used throughout the abstract and paper.
- ♦ It should not cite any references (except in rare cases)
- ♦ It should never give any information or conclusion that is not stated in the paper
- ♦ Must be accurate with respect to figures quoted in the main text.

B. Main body of the report

1. Introduction

- As in the proposal, the introduction presents the problem addressed by the research.
- Gives sufficient background information to allow readers to understand the results of the study.
- It is written in such a way that readers will know the current status of research conclusions on the topic,
- A brief review of previous research (relevant literature) to give a background - paraphrase relevant facts from the scientific literature, citing the sources to support each statement. /the theoretical implications associated with the results of previous research on the subject.
- As in the proposal, the introduction should describe the nature and purpose of the study (Reason/s why the research was undertaken).

- Present the guiding research questions, and explain the significance of and justification for conducting the study.
- Statement of the hypothesis (an idea or concept /issues to be tested by the research described) if there is one.
- An explanation of the different techniques and why they are used.
- A statement of the objective/s - what you hope to achieve.

It usually uses a *funnel style*, starting broadly and then narrowing

2. Review of Related literature

A literature review must be organized in relation to research topic you are developing. In the process you should synthesize results into a summary of what is and is not known; identify areas of controversy in the literature; formulate questions that need further research.

3. Materials and Methods (Methodology)

- The methodology section is used to describe what the researcher did and how the study was conducted.
- One important purpose is to enable others repeat the experiment and verify the .results if they wish to. In doing so, you should summarize the procedures in the execution of each of the stage of your work.
- This section should build on the description of methods outlined in the proposal. You should label subsections similar to those in the proposal.
- It may include subsections describe participants or subjects, another describing testing or measurement procedures undertaken with the participants, and a section describing limitations of the methodology.
- These are all done in the past tense or past perfect tense.
- Describe biological material(breed/varieties, sexes, ages etc), analytical procedures and statistical methods
- Explain clearly, accurately and logically how the experiment was designed, conducted and analyzed

This section should present the following:

a. Procedures used and kind of design

b. Sources of data

c. Methods of gathering data

d. Description of data gathering instruments used

4. Analysis of data/Results

- This section summarizes the data collected and details the statistical treatment of that data.
- Present your results in a logical sequence using only observations relevant to your stated objectives.
- After a brief statement of the main results or findings of the study, the data are reported in sufficient detail to justify the conclusions.
- Tables and illustrations may be used to report data when these methods are seen to present the data more clearly and economically.
- Do not replicate observations in your tables. Give only means and measures of variability.
- Use tables to present exact values and figures to show trends and relationships.
- All tables and illustrations should be mentioned in the text, with appropriate titles or captions and enough explanations to make them readily identifiable.
- Avoid repetition of numerical data from the tables and figures in the text.
- The Results section should be written in the past tense and passive voice, avoiding the use of "I" and "we".

5. Discussion

This section should reflect the implications of the study. Here the researcher evaluates the data and interprets the findings in the context of the research questions or hypothesis. He is guided by questions like the following.

- What do my results mean and what are their implications?
- State your interpretation of your findings, perhaps comparing or contrasting them with the literature. Reflect on your actual data and observations.
- Explain or rationalise errant data or describe possible sources of error and how they may have affected the outcome.
- The Discussion must answer the question "What do the results mean?" It is an argument based on the results.
- Should interpret your results clearly, concisely and logically. For each objective, describe how your results relate to meeting the objectives.
- Here, the major results are picked or summarized, evaluate, and interpreted with respect to the original research questions and hypotheses and related with previous works.
- Theoretical and practical consequences of the results and the validity of conclusions may appropriately be discussed in this section.
- The limitations of the study and suggestions for future work may also be included.
- Emphasize on new results and suggest new lines of work or further research.

6. Conclusions and Recommendations

In this section you should describe briefly what you did, the main results and recommendations for further research or applicability. Implications what the findings of the research imply (consider suggestions).

References

- The reference list at the end of the paper should list all works cited in the paper, and all items listed as references must have been cited in the text.
- Special attention should be given to ensure appropriate citations of less common sources, such as unpublished manuscripts.
- Again, the APA Manual can provide guidance for ensuring accuracy in these details.

APPENDICES (ANNEXES)

- Materials that document important components of the research process that would be too lengthy, awkward, or distracting to include within the text should be included as appendices in the final document.
- These materials may include pertinent raw data, materials, consent forms, letters of introduction to subjects, questionnaires, survey forms, and the like.
- The appendix section should begin with its own cover page.
- Each appendix may have its own cover page.
- The word "APPENDIX" should appear in all capital letters.

7.4. Content of Seminar paper

A seminar paper is a work of original research that presents a specific thesis and is presented to a group of interested peers, usually in an academic setting. The scientific nature of a seminar paper is closely connected to the use of literature that has been published in the relevant field.

For example, it might serve as your cumulative assignment in a university course.

Although seminar papers have specific purposes and guidelines in some places, such as law school, the general process and format is the same.

Structure and Elements of a Seminar Paper

General Approach

Any seminar paper has to include title, a seminar paper should start with a title page and a table of contents there are at least three basic elements in a seminar paper:

Furthermore, there are at least three basic elements in a seminar paper:

- ✓ Introduction,
- ✓ The body of the research, and
- ✓ Result and Discussion of the findings.

Introduction

The first section of the seminar paper is the introduction. General motivation, goal of the paper, overview of the following contents /

- You should start with some general motivation of the topic, leading to a short, pregnant formulation of the goal of the paper, i.e. which topic is presented – and why is this topic interesting and/or important.
- The introductory section should establish the importance of the topic, define a meaningful research gap, and explain how the present paper attempts to fill the gap. The introduction should also explicitly outline the contributions of the paper. An introduction ends with explaining the organization of the rest of the paper. The key purpose of the introduction is to motivate the reader to read the rest of the paper.

Body of the Research

In theory, the purpose of this part is simple. It describes how the research question was answered (how this topic was answered in different literatures). In seminar papers, the common approach is to write a literature review. Empirical studies are also welcome but not required. For papers focusing on literature review, there are many alternatives for structuring the body part.

Discussion of the Findings and Conclusions

The last chapter has to be a concluding chapter. Here, the core statements or findings of the seminar paper have to be shortly summarized. This section discusses the findings and their implications. The author should derive own conclusions based on the body of the research and not only repeat conclusions found in other papers. Also limitations and suggestions for future research can be discussed.