

Course Information

Course Code:	LIS 305
Course Title:	Research Methods and Statistics in Library & Information Science.
Credit Unit:	3
Course Status:	Compulsory
Semester:	1st
Required Study Hour:	6 hours per week
Edition:	First

Course Team:

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Ice Breaker

Upload your passport and introduce yourself by stating your names, what you do for a living, your hobbies, expectations in this course and the name you would prefer to be called during this course.



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Course Guide

Introduction

Welcome to **LIS 305: Research Methods and Statistics in Library & Information Science**. This is a three-credit (3-CR) unit course that is compulsory for all the undergraduate students in the department. It is designed to enable you to explore and apply the strategies for conducting research studies. This will facilitate the successful conduct and completion of your research project, which is a requirement for a wonderful and successful academic journey in the university.

Course Objectives

By the end of this course, you will be able to:

- Recognise the basic terminologies employed in research investigation.
- Identify the techniques to carry out successful research inquiry.
- Apply the strategies to conduct and complete your undergraduate project.
- Determine the ethical guidelines and challenges in carrying out research studies.
- Describe the various approaches to research such as quantitative, qualitative and mixed methods approach.
- Identify the components of a research proposal.
- Critically analyse published research studies.

Working Through this Course

To complete this course, you must participate in both the theoretical and practical parts of the course. You are also to read the study units, listen to the audios and videos, do all assessments, examine the links and read, participate in discussion forums, read the recommended books and other materials provided, prepare your portfolios, and participate in the online facilitation.

Each study unit has an introduction, intended learning outcomes, the main content, summary, conclusion, self-assessment questions and references/further readings. The introduction opens the door to each unit and gives a glimpse of the expectations in the study unit. Read and note the intended learning outcomes (ILOs), which outline what you should be able to do after each study unit. This will help you evaluate your learning at the end of each unit to ensure you have achieved the designed objectives (outcomes). To achieve the intended learning outcomes, the content of each section is presented in modules and units with videos and links to other sources to enhance your study. Click on the links as directed, but where you are reading the text offline, you may have to copy and paste the link address into a browser. You can download the audios and videos to view offline. You can also print or download the texts and save

them on your computer or external drive. The summaries provide a recapitulation of the essential points in the unit. It's an indispensable brief that garnishes your journey through the unit. The conclusion brings you to the climax of the study and what you should be taking away from it.

There are two main forms of assessments – the formative and the summative. The formative assessments will help you monitor your learning. This is presented as in-text questions, discussion forums and Self-Assessment Exercises. The university would use summative assessments to evaluate your academic performance. This will be given as a Computer-Based Test (CBT) which serves as continuous assessment and final examinations. A minimum of three computer-based tests will be given, with only one final examination at the end of the semester. You are required to take all the computer-based tests and the final examination.

Study Units

There are 20 study units in this course divided into four modules. The modules and units are presented as follows:

Module 1: Definition of Concepts

- Unit 1 Definition of Research
- Unit 2 Variables and Construct
- Unit 3 Need and Purpose of Research
- Unit 4 Methods of Acquiring Knowledge
- Unit 5 Types of Research

Module 2 The Research Process

- Unit 1 The Research Process
- Unit 2 The Research Proposal
- Unit 3 Elements of Research Proposal 1
 - Introduction – background to the study
 - The Research Problem
 - Research Questions/Assumptions/Hypothesis
 - Objectives
 - Justification of the Research
 - Significance of the Research
 - Delimitation/limitation of the Research
- Unit 4 Elements of Research Proposal 2
 - Review of Related Literature
 - Methodology
 - Organization of the Research
 - Definition of Terms

Module 3 Research Methodology

- Unit 1 Research Methods and Design
- Unit 2 Data Collection and Instrumentation
- Unit 3 Validity and Reliability of Instruments
- Unit 4 Sampling Procedure and Techniques

Module 4 Data Analysis

- Unit 1 Methods of Data Analysis
- Unit 2 Qualitative and Quantitative Data Analysis
- Unit 3 Descriptive Statistics
- Unit 4 Inferential Statistics

Module 5 The Research Report

- Unit 1 Writing Research Report
- Unit 2 Ethical Issues in Research Procedure
- Unit 3 Referencing Style and Citation Techniques

Presentation Schedule

The presentation schedule gives you the important dates for completing your computer-based tests, participation in forum discussions, and facilitation. Remember, you are to submit all your assignments at the appropriate time. You should guide against delays and plagiarisms in your work. Plagiarism is a criminal offence in academics and is liable to heavy penalty.

Assessment

There are two main forms of assessments in this course that will be scored: The Continuous Assessments and the final examination. The continuous assessment shall be in three-folds. There will be two Computer-Based Assessments. The computer-based assessments will be given in accordance with the university academic calendar. The timing must be strictly adhered to. The Computer-Based Assessments shall be scored a maximum of 10% each, while your participation in discussion forums and your portfolio presentation shall be scored a maximum of 10% if you meet 75% participation. Therefore, the maximum score for continuous assessment shall be 30% which shall form part of the final grade. The final examination for LIS 305 will be a maximum of three hours, and it takes 70 per cent of the total course grade. The examination will consist of written essay questions.

Note: You will earn a 10% score if you meet a minimum of 75% participation in the course forum discussions and your portfolios; otherwise, you will lose 10% in your total score. You will be required to upload your portfolio using Google Docs. What are you expected to do in your portfolio? Your portfolio should be notes or jottings you made on each study unit and activity. This will include the time you spent on each unit or activity.

How to Get the Most from the Course

To get the most in this course, you need a functional personal laptop and access to the Internet. This will study and learning easy, and the course materials accessible anywhere and anytime. Use the Intended Learning Outcomes (ILOs) to guide your self-study in the course. At the end of every unit, examine yourself with the ILOs and see if you have achieved the outcomes.

Carefully work through each unit and make your notes. Join the online real-time facilitation as scheduled. Where you miss a schedule for online real-time facilitation, go through the recorded facilitation session at your convenience. Each real-time facilitation session will be video recorded and posted on the platform. In addition to the real-time facilitation, watch the video and audio recorded summary in each unit. The video/audio summaries are directed to the salient points in each unit. You can access the audio and videos by clicking on the links in the text or through the course page.

Work through all self-assessment exercises. Finally, obey the rules in the class.

Facilitation

You will receive online facilitation. The facilitation is learner-centred. The mode of facilitation shall be asynchronous and synchronous. For the asynchronous facilitation, your facilitator will:

- Present the theme for the week.
- Direct and summarise forum discussions.
- Coordinate activities in the platform.
- Score and grade activities when needed.
- Upload scores into the university recommended platform.
- Support and help you to learn. In this regard, personal mails may be sent.
- Send videos, audio lectures and podcasts to you.

For the synchronous:

- There will be eight hours of real-time online contacts in the course. This will be through video conferencing in the Learning Management System. The eight hours shall be of one-hour contact for eight times.
- At the end of each one-hour video conferencing, the video will be uploaded for viewing at your pace.
- The facilitator will concentrate on the main themes that you must know in the course.
- The facilitator is to present the online real-time video facilitation timetable at the beginning of the course.
- The facilitator will take you through the course guide in the first lecture at the start date of the facilitation

Do not hesitate to contact your facilitator. Contact your facilitator if you:

- do not understand any part of the study units or the assignments.
- have difficulty with the self-assessment exercises.
- have any questions or problems with an assignment or with your tutor's comments on an assignment.

Also, use the contact provided for technical support.

Read all the comments and notes of your facilitator, especially on your assignments; participate in the forums and discussions. This allows you to socialise with others in the programme. You can discuss any problem encountered during your study. To gain the maximum benefit from course facilitation, prepare a list of questions before the discussion session. You will learn a lot from participating actively in the discussions.

Finally, respond to the questionnaire. This will help the university know your challenges and how to improve on them to review the course materials and lectures.

Contents

Module 1:	Definition of Concepts
Unit 1	Definition of Research
Unit 2	Variables and Construct
Unit 3	Need and Purpose of Research Methods of Acquiring Knowledge
Unit 4	Types of Research

Module 2	The Research Process
Unit 1	The Research Process
Unit 2	The Research Proposal
Unit 3	Elements of Research Proposal 1 Introduction – background to the study The Research Problem Research Questions/Assumptions/Hypothesis Objectives Justification of the Research Significance of the Research Delimitation/limitation of the Research
Unit 4	Elements of Research Proposal 2 Review of Related Literature Methodology Organization of the Research Definition of Terms
Module 3	Research Methodology
Unit 1	Research Methods and Design
Unit 2	Data Collection and Instrumentation
Unit 3	Validity and Reliability of Instruments
Unit 4	Sampling Procedure and Techniques
Module 4	Data Analysis
Unit 1	Methods of Data Analysis
Unit 2	Qualitative and Quantitative Data Analysis
Unit 3	Descriptive Statistics
Unit 4	Inferential Statistics
Module 5	The Research Report
Unit 1	Writing Research Report
Unit 2	Ethical Issues in Research Procedure
Unit 3	Referencing Style and Citation Techniques

RESEARCH METHODS AND STATISTICS IN LIBRARY AND INFORMATION SCIENCE

LIS 305 COURSE CONTENT

Definition of Concepts, Variables, Construct, Need and Purpose of Research; Types of Research Methodology, Methods and Design; Literature Review; Research Problem; Research Questions/Assumptions/Hypothesis; Research Process; Sampling Procedure and

Techniques; Designing a Research Proposal; Instrumentation, Establishing Validity and Reliability of Research Instruments; Data Collection and Analysis: Qualitative Data Analysis; Quantitative Data Analysis; Descriptive and Inferential Statistics; Ethical Issues in Research Process; Writing Research Report, Bibliographic/Referencing Style and Citation Techniques.

Module 1: Definition of Concepts

- Unit 1 Definition of Research
- Unit 2 Variables and Construct
- Unit 3 Need and Purpose of Research
Methods of Acquiring Knowledge
- Unit 4 Types of Research

Module 2 The Research Process

- Unit 1 The Research Process
- Unit 2 The Research Proposal
- Unit 3 **Elements of Research Proposal 1**
 - Introduction – background to the study
 - The Research Problem
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 - Justification of the Research
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 - Delimitation/limitation of the Research
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- Unit 2 Data Collection and Instrumentation
- Unit 3 Validity and Reliability of Instruments
- Unit 4 Sampling Procedure and Techniques

Module 4 Data Analysis

- Unit 1 Methods of Data Analysis
- Unit 2 Qualitative and Quantitative Data Analysis

Unit 3	Descriptive Statistics
Unit 4	Inferential Statistics
Module 5	The Research Report
Unit 1	Writing Research Report
Unit 2	Ethical Issues in Research Procedure
Unit 3	Referencing Style and Citation Techniques

Module 1: Definition of Concepts

Unit 1	Definition of Research
Unit 2	Variables and Construct
Unit 3	Need and Purpose of Research Methods of acquiring knowledge
Unit 4	Types of Research

Unit 1 DEFINITION OF RESEARCH

Contents

- Introduction
- Intended Learning Outcomes (ILOs)
- Main Content
 - Definition of Research
 - Methods of Acquiring Knowledge
- Summary
- Conclusion
- References/Further Readings

1.0 INTRODUCTION

This unit introduces you to the concept of research. It opens your eyes to the beginning of the entire research course, which will help you carry out independent investigative studies or inquiries. Therefore, the unit expounds on the basic concepts of research as a means of acquiring knowledge and discusses other means of knowledge acquisition.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, you are expected to state and discuss the whole meaning of research. Also, at the end of the lesson, you should be able to determine the various methods of acquiring knowledge and ascertain the strengths and limitations of each.

3.0 MAIN CONTENT

- **Definitions of Research**

Research is generally referred to as an inquiry into a phenomenon. Babbie (2017) defines research as a “systematic investigation to describe, explain, predict and control a phenomenon which employs inductive and deductive methods.” Research is a systematic search for new knowledge and solutions to life issues. The Cambridge Dictionaries Online defines research as a “detailed study of a subject to discover information or achieve a new understanding of it.” Wikipedia defines research as the “creative and systematic work undertaken to increase the stock of knowledge. It involves collecting, organising, and analysing information to increase understanding of a topic or issue. A research project may be an expansion of past work in the field. To test the validity of instruments, procedures, or experiments, research may replicate elements of prior projects or the project as a whole.” Shaughnessy (1976) opines that research in the library and information science is conducted to “solve professional problems, develop tools, and methods for the analysis of an organisation, services, and behaviour, to determine costs and benefits of our services, and most importantly, to establish or develop a body of theory on which to base our practice.”

The Merriam-Webster Online Dictionary, on the other hand, defines research as “studious inquiry or examination; *especially* investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws.” The Organisation for Economic Co-operation and Development (OECD) (2007) submits that research is “any systematic creative activity undertaken to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this knowledge to devise new applications.” Creswell (2008) defines research as “a process of steps used to collect and analyse information to increase our understanding of a topic or issue.” What can you deduce from all these definitions? The world cannot exist without research. Societies, to a very large extent, rise or fall based on the value they place on research.

The process of research is systematic, logical, and organised. It involves taking conscious steps to carry out investigations that lead to relevant conclusions. It is also organised, which requires structure and methods that are repeatable or replicable. Research seeks answers to intelligent questions. Research studies help to arrive at valid and reliable information. This search for valid and reliable information is referred to as research. Organisations, institutions, and corporate entities depend on research to function efficiently and effectively. The research process leads to the generation of a body of evidence. From this, you can begin to appreciate the great value of research in your personal, career or professional life. From all these definitions and explanations, we deduce that research is a means of acquiring knowledge. The question then is, are there other means of acquiring knowledge? Our discussions below answer this question.

1.2 Methods of Acquiring Knowledge

Pause for a moment! Have you at any time considered how you acquire or acquired knowledge? How did you arrive at brushing your teeth every morning and night

before bed? How did you arrive at the practice of making your bed in the morning? Think of how you could determine your friend is lying to you – because of his strange behaviour and inability to look you in the eye. How did you choose and trust the sources of knowledge you have depended on all your life? Over the years, there have been different conventional and unconventional methods of acquiring knowledge. Men of old had their ways of acquiring knowledge that worked for them. Some of the methods of acquiring knowledge include the following:

- **Traditions**

Traditions is another potent source of knowledge acquisition. Society has relied on traditions in search of solutions to their problems and accept the verdict of tradition in the face of challenges. Societies that depended on tradition also accepted the culture and practice of their forefathers in the face of dealing with issues that affected their lives and survival. Knowledge acquired through traditions is not subjected to objectivity and tests. They are practices passed from one generation to another and sustained as the accepted means of acquiring knowledge. These days, these traditions are being eroded away in the face of economic and technological advancements.

Interestingly, people who depended on traditions as a veritable source of knowledge begin to query and reject the practices once accepted as the final authority. Where do you come? What has been the role of tradition in knowledge acquisition in your locality? What has changed now?

- **Authority**

Authority is the oldest and most familiar method of acquiring knowledge. From generation to generation, humanity has appealed to authority in knowledge acquisition. Society has been accepting new ideas as accurate and reliable because authority figures have declared them so. This is resorting to authorities in various specialities or fields of knowledge. The medical doctor is relied upon as the authority in medicine, and his verdict is accepted as the final authority. For instance, his advice to abstain from smoking because it is dangerous to health has become established knowledge. The dietician prescribes healthy meals to help you keep fit, and it is accepted as the final authority. The public, therefore, gains knowledge through the specialisation of the supposed experts. Nurses, economists, teachers, parents, priests and other religious leaders, the media, professors, and the government are accepted as an authority and great sources of knowledge. Authorities should be respected, but ideas should not always be accepted hook, line and sinker. Authorities often are wrong and misleading. You should learn to evaluate the credentials of authority figures. Many professors and medical doctors have misled people and led them to disastrous consequences.

- **Experience**

Experience is another reliable and robust source of knowledge acquisition. According to Ary, Jacobs and Sorensen (2010), experience is a familiar and well-used source of acquiring knowledge. Society relies so much on experience. Our experiences and that of others are fundamental sources of knowledge from time immemorial. Generations have benefited from the resulting wisdom garnered from experience. Imagine where people or communities could not profit from the great wealth of experience; severe

stagnation and retardation would have been. People talk of the wisdom of the ages, which generally amplifies that the ability to benefit from experience is one of the hallmarks of intelligent behaviour. We learn a lot from the occurrences and events that surround our existence. Remember the general saying that “experience is the best teacher.” Is experience the best teacher?

Consider this example: a laboratory technologist was running an experiment and had a chemical he derived from the mixture of several substances. In his excitement, he decided to test the reaction of concentrated sulphuric acid when mixed with the new chemical. There was an immediate explosion. Fire gutted down the laboratory. The laboratory technologist was also killed. Is experience the best teacher? In this example, where is the student to explain the value of his experience? Experience is a good teacher. It would help if you accepted it and then rely on the certified experiences of others, especially those who are ahead of you in life, career, or profession. Remember, the main thing here is the experience you rely on must be certified. If you follow the foolish man’s experience, you will end up in the stupid man’s destination. Therefore, you should understand clearly that experience has limitations. Your personality characteristics, traits, perceptions, and general disposition to life affect the experience you acquire. Two persons in the same situation could obtain different experiences. The blind men and the elephant readily come to mind. Ary, Jacobs and Sorensen (2010) write that ‘the same forest that is a delightful sanctuary to one person may be a menacing wilderness to another. Two supervisors observing the same classroom simultaneously could truthfully compile very different reports if one focused on and reported what went right. The other focused on and reported the things that went wrong.’ And all of them are records of experience.

- **Trial and error**

Although this sub-area says trial and error, it is one of the fundamental methods of acquiring knowledge. It is a method characterized by multiple attempts until success is achieved. When you employ trial and error, it involves trying, observing, and repeating the process until success is reached. Trial and error have been professionally described as a means of “problem-solving, repair, tuning or obtaining knowledge” (Wikipedia). A means of acquiring knowledge is known as a brute force in which you generate and test or a means that enables you to guess and check. It is only efficient when the attempts are based on prior knowledge and information. In his study of the law of effect in learning, the first initiator of the trial-and-error theory was Edward Lee Thorndike. Interestingly, several professionals employ trial and error in handling technical issues, which are sometimes successful and at other times frustrating. Do you know that medical doctors sometimes eliminate causes and illnesses through trial and error? Take for instance, I went to the hospital and complained of weakness, temperature, and headache. The Doctor asked a few questions, touched my body, and prescribed certain drugs. I religiously followed the doctor’s prescription, and after six days, I had a mild relief, but the symptoms were still disturbing me. How did the doctor arrive at his initial prescription? He assumed I must be suffering from malaria and recommended the prescription to take care of it. Seven days after, the same doctor discovered that it was not malaria that was affecting me. He has isolated malaria by trial and he was not correct. This time, he recommended a laboratory test.

- **Intuition**

This is another method of knowing. According to Price, Jhangiani, Chiang, Leighton, & Cuttler (2017), intuition relies on guts, emotions, and instincts. It does not rely on rational thought; it accepts what feels true. Have you had a course to rely on intuition, and how did it guide you in making decisions? Intuitions can be wrong because they are propelled by “cognitive and motivational biases rather than logical reasoning or scientific evidence” (Price et al., 2017). However, several people depend on intuition and accept it as superior to decisions based on analysis.

- **Reasoning**

This is another important source of acquiring knowledge. Many people arrive at decisions based on abstract thinking or associating relationships between events and variables. Reasoning enables you to collect facts, generalize and make out cause to effect or effect to cause, and derive conclusions from premises. It assembles data, analyses, findings and decides. It takes you to the door of final assessment and judgement. Reasoning is a powerful source of knowledge acquisition but can be very misleading. Your reasoning can be affected by circumstances and vicissitudes of life that may eventually cause your reasoning to be warped, corrupted and crooked. God has given you the power of reason but also allowed you to substantiate your reasoning with other available credible sources to prevent you from going into error. Several persons have dangerously erred based on a complete reliance on their limited reasoning. Reasoning is categorised into two significant areas: deductive reasoning and inductive reasoning:

Deductive Reasoning

Deductive reasoning is a process of thinking that proceeds from general to specific knowledge through logical argument. Sternberg (2009) describes it as “reasoning from one or more statements (premises) to reach a logical conclusion.” Doyle (2020) sees deductive reasoning as “logical thinking that starts with a general idea and reaches a specific conclusion.” In deductive reasoning, arguments consist of statements that stand concerning one another. It employs a tool called a syllogism. This comprises premises referred to as significant premise, minor premise, and a conclusion.

For example,

“All riverine people are swimmers” (major premise)
“Angelina is from a riverine area” (minor premise)
“Therefore, Angelina is a swimmer” (conclusion)

In deductive reasoning, if the premises are true, the conclusion will also be true. If the premise is wrong, the conclusion will necessarily be wrong.

Another example:

All Japanese live long
Akasuki is a Japanese
Therefore, Akasuki will live long

According to Ary, Jacobs and Sorensen (2010), premises are organised into “patterns that provide conclusive evidence for a conclusion’s validity with deductive reasoning.” The development of a systematic approach to acquiring knowledge is linked to the ancient Greek philosophers. Subsequently, Aristotle and his followers introduced the use of deductive reasoning. The major limitation of deductive reasoning lies in the fact that your conclusions will be misleading if your premise is faulty. Therefore, to arrive at valid conclusions, your premises must be valid. Deductive reasoning is generally based on previously existing knowledge.

Inductive Reasoning

While deductive reasoning is considered bottom-down logic, inductive reasoning is bottom-up logic. This is because it “involves widening specific premises into broader generalisations.” Inductive reasoning consists of drawing a general conclusion from a set of specific observations. In other words, inductive reasoning develops from particular instances to general principles. Put differently, inductive reasoning proceeds from specific premises to general premises or from facts to theories. For example:

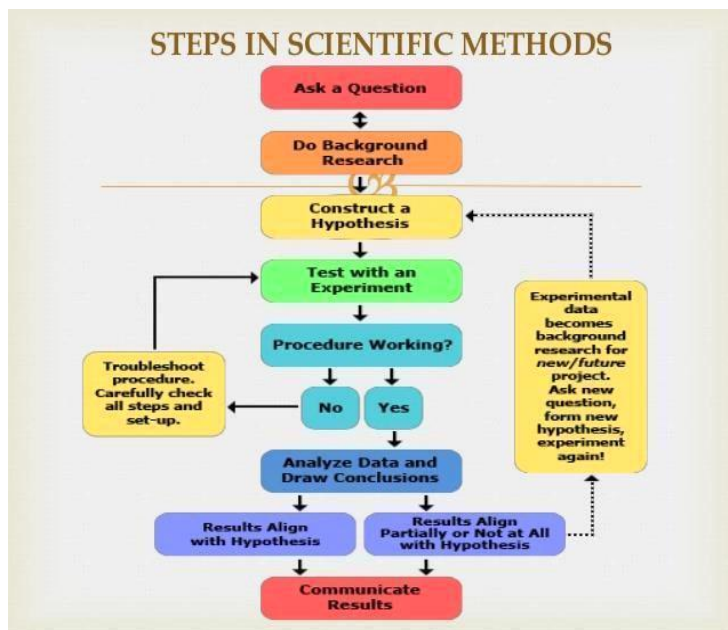
Stephen is a man
Men are mortals
All men are mortals
Men are mortals

Fig. 2: Sources of knowledge

Source: Author-generated

- **Research – the scientific method**

The most reliable and valid method of acquiring knowledge is the scientific method, also referred to as research. This involves the systematic and logical process of collecting, analysing, and evaluating data to answer questions and test hypotheses. Here, the hypothesis is regarded as an intelligent research guess. Although the scientific method is the most authentic way of knowing, intuition, authority, and experience still play significant roles. However, the scientist further employs systematic steps under controlled conditions to make careful observations to arrive at valid conclusions. The scientific method is characterised by objectivity, replicability, validity, reliability, purposiveness, precision, and accuracy. The scientific method is accurate and reliable but tedious, time-consuming, and costly. It primarily addresses empirical questions and cannot answer immediate and instantaneous questions. LIS 305 is designed to give you a thorough study on the use of the scientific method and how you can employ it in your present and further studies.



Source: Dwivedi (2017). <https://www.slideshare.net/jyotidwivedi7/ppt-methods-of-acquiring-knowledge>

4.0 CONCLUSION

There is no method of knowledge acquisition that is comprehensive. In every circle, professional engagements and transactions usually require an intelligent combination of methods of knowledge acquisition to establish a foothold in an area. Man is deemed to be gregarious and depends on one another to make progress. Therefore, whatever method you adopt to acquire your knowledge must be subjected to tests. This is where the scientific method is superior to all other means of acquiring knowledge.

5.0 SUMMARY

Our lives revolve around discoveries, developments, and changes. Research is a significant path to the discovery of new knowledge. It helps to explain, predict, and control phenomena in society. It employs inductive and deductive methods as tools. We discussed research as a method of acquiring knowledge. There are also other methods of knowledge acquisition that are common in human existence and interaction. These include authority, experience, trial and error, intuition, and reasoning. It is interesting to note that even in professional circles such as medicine, trial and error play a significant role in acquiring medical knowledge. Doctors often employ trial and error in eliminating the causes and symptoms of perceived illnesses.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

1. What are the various methods of obtaining knowledge?
2. Give your own example of each method of knowledge acquisition.

7.0 REFERENCES/FURTHER READINGS

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UNIT 2 VARIABLES AND CONSTRUCT

CONTENTS

- Introduction
- Intended Learning Outcomes (ILOs)

- Main Content
 - Definition of Variables
 - Types of Variables
 - Variables and Scales of Measurement
 - Meaning and Definition of Construct
- Summary
- Conclusion
- References/Further Readings

1.0 INTRODUCTION

One of the most challenging aspects of research is the proper definitions of operational terms. Definitions and explanations of key terms help set standards and lay a good foundation for building the research study. According to iEduNote (2021), operational definition is one of the keys to successful research. Variables and construct are part of such research terms that require proper definition and explanation of their meaning and significance. This section, therefore, brings you to the straightforward definition and description of the concept of variables and construct. It helps you understand each term's unique application, how they are directly connected, and where they overlap.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

This unit gives you a bird's eye view of the definition, description and explanation of variables and construct. At the end of the lesson, you are expected to:

- define and describe variables,
- determine the different types of variables,
- describe, and explain construct and
- determine the role of these terms in research.

3.0 MAIN CONTENT

3.1 Definition of Variables

A variable is any characteristic that assumes measurable values. The iEduNote (2021) defines a variable as “any property, a characteristic, a number, or a quantity that increases or decreases over time or can take on different values.” In research studies, variables are the various concepts the researcher studies. As the name implies, it is a characteristic, something, or quantity that varies. For instance, the various elements in the forms you fill, such as application for admission, are variables, e.g., age, sex, date of birth, eye colour, state of origin. These properties take different values from one individual to another. In research, a variable is a phenomenon that the researcher studies or measures. In other words, a variable is a measurable attribute that assumes different states. It is also referred to as a name with a value that changes. They are measurable traits in a research study that can change during experiments.

3.2 Types of Variables

There are different types or categories of variables. Various writers have categorised variables in many ways. In this course, we will be looking at the following common classification of variables:

3.2.1 Dependent variables

This is the result of manipulating the independent variable. It is described as the “effect” (dependent variable). For instance, ‘a study of the effect of reading environment on reading habits’ has ‘reading habits’ as the dependent variable. In this case, reading habits are dependent on varying the reading environments.

3.2.2 Independent variables

This is the variable which the researcher manipulates to observe the changes on the dependent variable. This variable is regarded as the cause (independent variable). In research, it is usually one independent variable that the researcher manipulates to establish the cause-effect relationship. When two variables are controlled in one study, it would be difficult to establish the exact cause of the changes from the manipulation.

3.2.3 Continuous variables

Continuous variables are phenomena or traits that assume an infinite number of values. Continuous variables take indefinite and varying values after each measurement is taken, e.g., temperature reading, height, blood pressure etc. Continuous variables can assume countless values within the range of the instrument of measurement as many times as the observations are done. However, if the measuring instrument is precise and accurate, the reading will always fall within the same range.

3.2.4 Discrete variables

These are variables that take definite values, which most times consist of whole numbers such as number of items in a cartoon, number of children in the family, etc. number of books in the library, the total number of clientele in the study centre library.

However, please, note that some texts include other types of variables (iEduNote, 2021), such as:

- Qualitative variables
- Quantitative variables
- Background variable
- Moderating variable
- Extraneous variable
- Intervening variable
- Suppressor variable

3.3 Variables and Scales of Measurement

The American Heritage Dictionary (2018) defines scale as “a progressive classification, as of size, amount, importance, or rank; a relative level or degree.” These are measures for organizing data to facilitate analysis and interpretation. They are instruments used to represent the range of values or scores for variables. There are four measurement scales commonly applied in research studies. This includes nominal, ordinal, interval, and ratio scales.

3.3.1 Nominal Variables

This is also referred to as a categorical variable. This is because it classifies individuals, objects, or responses into two or more categories. “For instance, a survey of academic library users could employ a nominal scale to categorize users by subject major. The nominal scale that takes only two values, e.g., male-female and yes-no, is the simplest. Other examples of nominal variables include marital status (e.g., married, divorced, single, separated), employment status (e.g., full time, part-time, unemployed). Although nominal scales are qualitative, categories may be represented by numbers, e.g., ‘male’ may take the number 1 and ‘female’ by the name 2. These numbers are labels for the categories and do not represent the ranking of any sort.

3.3.2 Ordinal Variable

The Ordinal variable defines the relative position of objects by ranking them. It assigns values as ranks in order from highest to lowest. It is also known as a rank order. The Likert-type scale is an example of an ordinal variable. Researchers use ordinal variables to define the order of performance of students, employees etc., in terms of high or low, better, or worse. However, this ranking does not indicate the distance between positions. For example, when you rank patrons’ responses as: “Very dissatisfied, Dissatisfied, Neutral, Satisfied and Very dissatisfied,” it does not specify that the rank has equal scale intervals.

3.3.3 Interval Variables

The internal variable provides a ranking that has equal intervals of measurement. An interval variable has all the characteristics of nominal and ordinal variables. In interval variables, the difference between a score of 30 and a score of 40 is assumed to be the same as the difference between a 50 and a score of 60. An interval scale implies that 1 is as far from 2 as 2 is from 3, and so forth through the whole scale. With such variables, you can perform some basic arithmetic operations, addition, and subtraction, thus supporting various data analysis methods (Wildermuth, 2017).

3.3.4 Ratio Variables

The ratio variable has similar characteristics to all the other variables discussed earlier but has an accurate zero-point measurement scale. With ratio variables, ratios can be calculated. Ratio variables support the broadest possible range of data analysis methods.

3.4 Meaning and Definition of Construct

Every research study starts with identifying a specific problem and choosing a topic. This, in turn, leads to identifying the concepts that encapsulate the phenomenon for

investigation. Constructs, therefore, are themes or ideas that represent the subject of investigation. When the constructs are identified in any research, they are theoretically defined. Lavrakas (2008) writes that construct is the abstract idea, underlying theme, or subject matter that you wish to measure using survey questions. These abstract ideas or constructs are operationalized by defining the concepts abstractly in theoretical terms. This operationalisation process moves the researcher from the abstract to the empirical level, where variables rather than concepts or constructs are the focus (Lewis-Beck, Bryman & Liao, 2004). Operationalization results in the measurement of the concepts to assume labels of identification or characteristics. It is the characteristics or variables that research studies empirically and makes definite statements about the interaction or relationship of the variables studied. In this context, the variables may be descriptive, relational or causal.

Virtually every scientific research involves data collection. The data are gathered in line with the topic of investigation, the problem statement, hypothesis and objectives of the study. As a researcher, you must determine the kind of data you require before collection. This means that you must establish the interactions that exist between constructs and variables. Consequently, Gay, Mills and Airasian (2012) define “construct as an abstraction that cannot be observed directly; it is a concept invented to explain behaviour.” The authors further note that constructs must be operationally defined to be measurable. This definition is in terms of processes or operations that can be observed and measured. For a construct to be measurable, you need to identify the scores or values it can assume. “For example, the construct “personality” can be made measurable by defining two personality types, introverts, and extroverts, as measured by scores on a 30-item questionnaire, with a high score indicating a more introverted personality and a low score indicating a more extroverted personality. When constructs are operationally defined, they become variable.”

4.0 CONCLUSION

The success of your research begins from operational definition of terms. Every research study involves some form of variables and construct which must be defined properly. This remains the bedrock of every viable and successful research study. This is in tandem with the general saying that every effort to set standards must begin with definitions.

5.0 SUMMARY

A summary of our discussion in this unit shows us that variables and construct are important attributes in research. A variable is a characteristic that assumes measurable values and can take different values. It depicts elements whose characteristics varies. Examples of variables include age, sex, date of birth etc. some of the common classification of variables include dependent, independent, continuous, and discrete variables. Likewise, variables can be measured in scales that are described as nominal, ordinal, interval, and ratio.

As a researcher, you also deal with constructs which are described as themes or ideas that represent the subject of investigation. They are abstract idea, underlying theme, or subject matter that you wish to measure using survey questions.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. What is the major difference between ordinal and interval variables?
- ii. Discuss the independent and dependent variables. Choose a topic and state which of the variables is dependent and independent
- iii. Differentiate between a variable and a construct

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UNIT 3 NEED AND PURPOSE OF RESEARCH CONTENTS

- Introduction
- Intended Learning Outcomes (ILOs)
- Main Content
 - Purpose of Research
 - Research in Library and Information Science
- Summary
- Conclusion
- References/Further Readings

1.0 INTRODUCTION

The perspective of this unit is the rationale for conducting research in library and information science. It presents the basic idea of the value of research in various areas of life. It also brings to focus the power and significance of research in advancing the theory and practice of librarianship. While this section is not a cookbook for researching in the library and information science, it introduces you to the discipline's bedrock of carrying out research.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This unit concerns itself with the rationale for conducting research studies. Therefore, it is expected that at the end of the unit, you should be able to:

- Identify the various purposes why research studies are carried out;
- Acquire the skill to conduct research and
- Determine the value of research in the practice of librarianship.

- **MAIN CONTENT**

- **Purpose of Research**

The general understanding of the purpose of research is to ask questions and find answers to them through systematic or scientific procedures. Research helps to discover hidden truths about issues or phenomena. It helps create new knowledge for promoting progress and establishing the best foundation for the growth and development of librarianship. In this regard, Connaway, Lynn Silipigni and Powell (2010), write that the greater impetus to the advancement of the profession “is the need for the field to test the various myths, assumptions, rules-of-thumb, and other conventions by which it has operated for so long a time, to link concepts which have been proven through testing to be valid, and thereby establish theories indigenous to the field itself.”In addition, the profession needs to advance beyond its heavy dependence on descriptive data and establish principles and theories on which libraries and information systems and services can be based.

The study of research would enable you to gain the knowledge and ability to conduct research. It exposes you to the rudiments of developing ideas and testing them; how to collect, measure, analyse and interpret data. The study of research is a necessity that you require all through the journey of your life. Every aspect of life and the professions require every practitioner to be thoroughly informed about principles of scientific thinking and carrying out research studies. According to Sage (2018), research takes us closer to reality. Research helps us to become educated customers.

Generally, research facilitates the:

- i. revelation of new insights in specific areas of investigation. It is a logical means of gaining new knowledge. This is commonly applied to exploratory studies.
- ii. provision of the platform to identify the peculiarities or characteristics of groups, subjects, or situations as applicable in descriptive research.
- iii. determination of the causes, frequency, and effects of certain developments such as an earthquake.
- iv. determination of the relationship that exists between variables using the test of hypothesis

Scalia (2021) writes that the purpose of research is to inform. This is achieved through systematic data collection and analysis. Research is essential and valuable in every discipline and area of life. Undoubtedly, research in library and information science will help improve and advance library management and the practice of librarianship. The American Library Association (2001), in underscoring the need for research to advance the profession, advocated the need for the dissemination of research findings

for support of professional practice and published “recommendations related to the effective dissemination of research.” According to Connaway & Radford (2017), “increased research activity will lead to additional expansion and refinement of the profession’s theoretical underpinnings. Kumasi, Charbonneau, and Walster (2013) agree that library and information science research enhances theoretical application and development in the profession.

Basically, research is a major key that helps you to understand and critically evaluate other research reports. In the words of Swisher (1986), “the reader who understands the process of research will question much more about the literature in general, and correctly identify the working limitations of the literature.” In the practice of the profession, you will be confronted with the need to assess or screen research reports that affect the library, services, or patrons.

Research also helps scholars in librarianship to achieve a greater understanding of the needs of professionals and how to cater for them. Engle (1987) noted that a “thorough and continuing personal grounding in the experience of learning and research in an academic setting prepares us to join students and faculty in the creative act which bibliographic research can be.” Clark (1997), also added that “an understanding of research can help improve how librarians support researches and encourages the use of small-scale research projects to support their work.”

- **Research in Library and Information Science**

Research in library and information science is basically pure and its purpose is to create new knowledge. Library science research goes beyond experience and common sense to advance knowledge, promote progress, and help us to relate more effectively with the profession. Kunge as cited by Busha (1980) writes “learning to master theoretically and in practical application, the ground rules of research create the best foundation for continuing growth in a profession.” Research in library and information science provides the platform to test the assumptions and conventions and develop valid and tested concepts and establish theories that are indigenous to the profession of librarianship (Grotzinger, 1981). This implies that librarianship depends on research to establish principles and theories that create the foundation for libraries and information systems and services. According to Poole (2000), “one of the hallmarks of a profession is the ability of its members to advice its clients based on a body of generalized and systematic knowledge that comprises its theoretical foundation.” The development of such a body of theoretical knowledge would constitute a major hallmark of the library and information science profession. And Shaughnessy (1976) adds that theoretical knowledge is discovered through the process of research and the LIS should develop a strong research tradition. The development and recognition of librarianship as science is predicated on scholars and research workers applying the scientific method regularly to analyse problems in the profession. In other words, librarianship must engender and engage in productive research. In fact, research would help to discover the profession, invent the future, and firmly root itself in professional practice. This implies that scholars, researchers, and librarians in general should work together to define library and information science research and build strong foundation for evidence-based practice. Therefore, library educators and library

and information science students should devote and increase the attention given to research in the teaching and learning process.

The practice and training of library and information science need generalized truths that scientific research helps to achieve. Research in the discipline is a vehicle for developing theories and exposes the value and use of research. In this context, several library professional associations have recognised the importance of research in advancing the discipline. The American Library Association (ALA), for example, has a powerful and veritable research component that features profitably in every annual meeting – this is the ALA’s Committee on Research and Statistics. The Association of College and Research Libraries (ACRL) has a flourishing Research Mentoring Programme, which assists members with issues relating to research. In its research advocacy programme, the Special Library Association argues that the selection, acquisition, organization, and management of information resources should be based on research findings.

Similarly, the Association for Information Science & Technology (ASIS&T) provides for creating and disseminating research as central to its vision statement. The relevant aspect of its vision states, “...advancing knowledge about information, its creation, properties, and use; providing analysis of ideas, practices, and technologies; valuing theory, research, applications, and service; nurturing new perspectives, interests, and ideas; and increasing public awareness of the information sciences and technologies and their benefits to society.”

4.0 CONCLUSION

Research is essential in library and information science practice and study and remains an avenue to study the many problems facing librarianship. Therefore, students must analyse and understand the contribution of research and disregard “research as esoteric, remote or impractical” (Muller, 1967). In conclusion, evidence abounds that library services' future directions, librarianship and library science education depend on research.

5.0 SUMMARY

Research helps to generate measurable data that facilitates the accumulation of knowledge. Through research, scientists can ask questions and employ observation to understand and evaluate phenomena around them; establish the causes and relationships between the causes and effects. This also helps to predict events and occurrences.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

Please provide at least three questions

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UNIT 4 TYPES OF RESEARCH

CONTENTS

- Introduction
- Intended Learning Outcomes (ILOs)
- Main Content
 - Types of Research
 - Historical Research
 - Survey Research
 - 3.31 Steps in Conducting Survey Research
 - Experimental Research
 - Evaluation Research
 - Case Study Research
 - 3.61 Categories of Case Study Research
 - 3.62 Reasons for Case Study Method
 - Content Analysis
 - Bibliometrics
 - Delphi Method
- Summary
- Conclusion
- References/Further Readings

1.0 INTRODUCTION

Researchers and scholars have classified research in various ways. The classifications are often premised on the length and depth of the study, the purpose of the study and the method of data analysis. Some of the classifications are based on theoretical or practical principles. However, whatever categorisation of the types of research, the end product remains the same, i.e., to discover new knowledge or advance existing knowledge and theories. Some of the broad types of research include among others basic research, applied research, experimental research, historical research etc. These classifications are examined in detail in the following discussions below.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

At the end of this unit, you should be able to:

- Identify the various types of research
- Determine which type of research to apply in any problem of study
- Analyse the strengths and weaknesses of each type of research

- Ascertain which type of research is most applicable to librarianship

- **MAIN CONTENT**

- **Types of Research**

Research, which is also referred to as the scientific method, can be categorised into various types:

- **Pure or Basic Research:** This is research that helps to explain a phenomenon theoretically under investigation to contribute to existing knowledge. This kind of more descriptive research provides explanations to issues, formulating and testing generalizable theoretical constructs and propositions. It is research carried out for the sake of knowledge accumulation.
 - **Applied Research:** This kind of research pursues practical solutions to human, industrial or organizational, and societal problems. A study of the remote and immediate causes of an earthquake to avert future occurrence is applied research. Applied research is a study of why young persons are not using the library even for their academic works. Applied research is generally prescriptive, which aims at helping the understanding of problems and effective control of the environment. Applied research is for immediate practical application.

- **Historical Research:**



Best and Kahn (2006) write that history is “a meaningful record of human achievement; a truthful integrated account of the relationships between persons, events, times, and places.” Our society builds on the developments of the past, which help to understand the present and predict the future. In this vein, the development of libraries and librarianship hinges and builds its foundation on past events and developments. History is compelling, which also help societies navigate towards avoiding ‘reinventing the wheel.’ Therefore, historical analysis flows down from the events of the past and the developments that have shaped individuals, institutions, movements, professions, or societies. Therefore, historical research study engages historical sources (primary sources, e.g. First-hand data, diaries, letters, photographs, etc. and secondary sources are second-hand information, e.g., books, articles, etc.) in

the study of the events, personalities, or occurrences of the past. Historical research involves compiling, presenting, and interpreting information. Historical research depends on primary sources, which may be more challenging to find but are generally more reliable, accurate, and used by historical researchers. The focus of historical studies is the interpretation of documents or historical data. Historical data is usually subjected to the thorough examination to determine authenticity, truthfulness, bias, omissions, or consistency of facts. Historical research help to understand phenomena thoroughly, which facilitate solving contemporary problems. It provides a platform to learn from past failures and successes and improve the development of all fabrics of society. Historical research also helps in handling the present and predicting the future reliably. It facilitates the understanding of the ‘how’ and ‘why’ of the theories and practices that government operations of institutions or professions. Conducting historical research involves several logical steps, which are outlined in the diagram below:

Figure 1: Steps in historical study

Source: Author-generated

Historical research is valuable in providing rich sources of information. It allows historical researchers to study topics and subjects that are most suitable for historical analysis. However, historical research is prone to researcher bias in interpreting sources. Locating and extracting primary sources may be tedious, time-consuming, and costly.

3.3. Survey Research

Survey research is defined as a quantitative method of conducting research that employs surveys to collect data from identified respondents. It is one of the most effective methods of conducting scientific research studies. Surveys have been used repeatedly by organizations or institutions to obtain reliable and accurate data. Survey research is an “important type of study that involves a clearly defined problem and

definite objectives. It requires expert and imaginative planning, careful analysis and interpretation of the data gathered, and logical and skilful reporting of the findings” (Best & Kahn, 2006). Survey research is a trustworthy and tested method of gathering quantitative data from a large sample of respondents. Survey research relies heavily on the use of questionnaires. Surveys and questionnaires are used extensively in library and information science as efficient means of collecting extensive data. The questionnaires remain the most veritable instrument to handle large samples and efficiently produce quantitative data, readily amenable to statistical analysis. Surveys that produce valid and reliable data must involve a representative sample of the target population. This will help the researcher to generalize the research results from the study to the target population.

Survey research can be conducted online or through electronic mail, telephone, face-to-face, or regular mail. Each avenue has its pros and cons. Online or email surveys are cheaper to conduct, even though they may be subject to manipulation. Surveys through the telephone are liable to the high cost of phone calls and are time-consuming. Face-to-face surveys are more reliable and have a high respondent response rate but are very expensive to conduct. Regular mail is one of the most ordinary methods of administering surveys to large respondents. It is very convenient, unobtrusive, and non-threatening. Respondents are allowed to respond confidently, anonymously, and confidentially. The mail survey is relatively simple and easy, although it may involve a lot of stationaries, which may be costly to print and time-consuming to disseminate or post.

Survey research is generally divided into two categories: Longitudinal survey research and cross-sectional survey research.

Longitudinal survey research: This kind of survey research conducts the study over a very long period, sometimes spanning years and decades. The subjects are continuously observed to gather comprehensive data on the actual reasons for change, attitudes, preferences or behaviour of library clientele. A study of the reading habits of undergraduate students in the National Open University of Nigeria may span years of close study, observation and data gathering to ensure valid and reliable data is gathered and analysed.

Cross-sectional survey research: This is closely related to longitudinal survey research. In this case, data is collected over a time interval. A study of the use of journal resources for research by one hundred level students of University of Lagos may require gathering the data over a time interval of one year which covers the period the respondents operate as one hundred students. Cross-sectional survey research does not last as long as longitudinal survey research. It is quick, brief, and fast. The analysis of cross-sectional survey research data can be descriptive or qualitative or analytical or quantitative.

3.3.1 Steps in Conducting Survey Research

Surveys are usually directed at the target population. It is important to determine the population that constitutes the focus of your survey study. This is followed by the process of drawing a representative sample of the population for the target audience. The process of determining a target audience follows a systematic or logical method

that gives the population an equal representation of being selected for the study. The representative sample must be comprehensive such that the results can be generalized to the entire population.

Determine the survey questions. Successful survey studies involve putting together valid questions that are grammatically and logically constructed. The questions must reflect the objectives of the study and lead to the answers to the research questions guiding the research. The questions can be designed as multiple-choice, open-ended, or closed ended. The Likert Scale is most often adopted in designing questions.

Choose the medium to administer the surveys. To collect the data, the researcher distributes the surveys to the target audience. The respondents in turn respond to the questions and return the feedback to the researcher. This is a crucial aspect of any survey research. The administration of the survey instrument could be any of the earlier outlined mediums. The more feedback received, the more authentic, valid and reliable the result would be.

Analyse the data. When the respondents return the feedback, the researcher collates the data for analysis. The analysis may involve the use of descriptive and inferential statistics to arrive at valid results and reliable conclusions which will provide solutions to the problem studied.

3.4 Experimental Research

This is the kind of research that is truly the scientific method. It is one of the most rigorous research designs. It involves the manipulation of the independent variables by the researcher in a controlled environment to ascertain its effect on the dependent variables. It usually comprises a hypothesis to be tested and variables that can be measured or controlled. Experimental research employs quantitative research design in its approach. It is most suitable for the physical sciences. It has very high internal validity because it enables the researcher to manipulate the treatment while controlling other variables.

3.5 Evaluation Research

This is divided into summative and formative evaluations. Evaluation research focuses on processes and outcomes which aim at solving identified problems. It helps determine the effectiveness of activities, programs, policies, or products measured against established, tested, and accepted yardsticks or standards.

Research can also be classified as longitudinal when the study is extended over a long period. There are authors who classify research as laboratory or simulation, clinical or diagnostic, and exploratory research. Research may be classified as laboratory or simulation when the description is based on the environment in which the study is carried out. Clinical or diagnostic research describes studies that follow in-depth case-study methods or approaches to establish causal effects. Diagnostic research involves thoroughly establishing the cause and effect of events, circumstances, or subjects using very small samples.

On the other hand, exploratory research is studies aimed at developing hypotheses against testing hypotheses. This kind of study is carried out to better understand existing problems without reaching conclusive results. It identifies areas of focus for

further research. Exploratory research is also referred to as the grounded theory approach or interpretive research (Questionpro, 2021).

3.6. Case Study Research

Authors have defined case study research in different ways. Leedy and Ormrod define case study research as qualitative research that gathers in-depth data on a single individual, program, or event that provides adequate information about an unknown or poorly defined situation. According to Yin (2014), a case study research deals with an empirical inquiry investigating a contemporary phenomenon in its real-life context. Case studies involve intensive analysis of a small number of participants rather than collecting data from a large sample. It is an in-depth investigation into a single case phenomenon to gather an adequate understanding of the case.

In summary, the characteristics of case studies include:

- It is limited to a few subjects that focus on an in-depth analysis of a single phenomenon.
- It is a methodology that also is common in the social and behavioural sciences
- It is an empirical investigation of an event in its real-life context.
- It is a descriptive and exploratory analysis of a phenomenon, person or event.
- Case studies can carry out holistically through one or more methods.
- Case studies can include quantitative evidence using multiple sources.
- Case study research findings are not generalizable to populations. The common question is: how can you generalize from a single case?

3.6.1 Categories of Case Study Research

Case studies can be divided into three categories: descriptive, exploratory, and explanatory.

Descriptive Case Study

This type of case study focuses on analysing the sequence of certain events that may have happened over a period. The case study that belongs to this category identifies the key phenomena and describes the cultural setting of the case.

Exploratory Case Study

Exploratory case studies try to discover answers to the questions of “what” or “who”. Exploratory case studies employ multiple sources of data collection.

Explanatory Case Study

Explanatory case studies focus on answering the questions of “how” or “why” without interfering with the occurrence of events. This type of case study examines phenomena within the contexts of real-life situations.

3.6.2 Reasons for Case Study Method

The case study research is used in many disciplines and situations to contribute to the universe of knowledge of social, political, individual, organisational or group phenomena. It is a common research method in library science, social work, education, sociology etc. No matter the discipline that employs the case study method, the focus is for a deeper understanding of the area or subject of investigation. According to Yin (2014), it “allows researchers to focus on a case and retain a holistic and real-world perspective.”

According to Dudovskiy (2018), the strength of the case method includes data collection and analysis within the context of phenomenon, integration of qualitative and quantitative data in data analysis, and the ability to capture complexities of real-life situations so that the phenomenon can be studied in greater levels of depth.” However, case studies lack rigour; data analysis is challenging and limited generalizability of findings and conclusions.

3.7 Content Analysis

Content analysis is a research approach which common in several disciplines, particularly the media. It is also applicable in the field of library and information science. It is a valuable tool that helps researchers answer many questions in librarianship. Wimmer and Dominick (2013) trace the history of modern content analysis to World War II when Allied intelligence units monitored and compared the music played on German stations with other European stations.

The first example of content analysis was probably an examination of 90 hymns published in Sweden in 1743 (Dovring, 1954). Modern content analysis can be traced back to World War II, when Allied intelligence units painstakingly monitored the number and types of popular songs played on European radio stations. By comparing the music played on German stations with that on other stations in occupied Europe, the Allies were able to measure the changes in troop concentration on the continent with some degree of certainty. In the Pacific theatre, communications between Japan and various island bases were carefully tabulated; an increase in message volume to and from a particular base usually indicated some new operation involving that base.

At about the same time, content analysis was used to verify the authorship of historical documents. These studies were concerned primarily with counting words in questionable authenticity papers and comparing their frequencies with the same words in documents whose authors were known (Yule, 1944). More recently, this technique was used to attribute the authorship of 12 disputed “Federalist Papers” to James Madison (Martindale & McKenzie, 1995). These literary detective cases demonstrated the usefulness of quantification in content analysis. After the war, researchers used content analysis to study propaganda in newspapers and radio. In 1952, Bernard Berelson published *Content Analysis in Communication*.

3.8 Bibliometrics

This is another method of research in library and information science. It is the use of statistical methods to analyse books, articles, and other publications. Bibliometric is a technique used in information management. It is also referred to as quantitative

research in LIS. It has gone through developments giving birth to other terms such as scientometrics and informetrics (Dongardive, 2013). Scientometrics deals with the analysis of scientific publications. Ranganathan referred to bibliometric as Librametry, while others called it Statistical Bibliography. The development of bibliometrics began in 1917 and has gained significance among library and information managers. In LIS, bibliometrics is a quantitative analysis of practical applications in the evaluation of library operations through statistical techniques. LIS researchers have found it significant in the study and measurement of publication patterns of different forms of literature. There are two main divisions of bibliometrics: evaluative bibliometric (statistical count of the use of literature) and the descriptive bibliometric (productivity count). Bibliometrics has also been extensively applied to information management, sociological studies of science, history of science, study of science and scientists, etc.

According to Dongardive (2013), bibliometrics has been widely applied in the study of research trends and growth of knowledge; the estimation of comprehensiveness of secondary periodicals, identification of users of different subjects, identification of authorship trends in documents on various subjects, the measurement of the usefulness of retrospective and current awareness services, the identification of past, and present publishing trends as wells as forecast of future trends, and the development of experimental models. It is also used together with the Bradford's law of scattering and citation analysis to identify core periodicals in different disciplines, formulate stacking and weeding policies, initiate effective multilevel network systems, formulate collection development/management policies, study obsolescence and dispersion of scientific literature, study productivity of institutions, individuals and disciplines; design automated language processing for auto indexing, auto classification and auto abstracting, and develop norm for standardization. There are five steps or stages in bibliometric analysis of books, articles, and other publications.

Stage 1: Develop search criteria using keywords

Stage 2: Consult the Web of science database – an authoritative database of research publications and citations.

Stage 3: Refine your search

Stage 4: Export the final data

Stage 5: Analysis and discussion of findings

3.9 Delphi Method

The Delphi method is a technique of arriving at consensus from experts' opinion on a given problem. It is a framework of forecasting process on the results of multiple rounds of questionnaires sent to a panel of experts. The questionnaire is developed which translates the aims and objectives of the research. The defined problem is passed on to the panel of experts in several rounds till a consensus agreement is achieved. According to Dongardive (2013), the basic theory in the use of the Delphi technique is that consensus opinions from majority of the expert opinions produces greater credibility and authority than the conclusions of only the most articulate

persons in a group of participating respondents. The Delphi method is very significant in the formulation of library legislation, policies making for libraries, curriculum design, method of teaching and education, process of decision making and in manpower planning.

4.0 CONCLUSION

Researchers are faced with different types of research when they want to carry out investigations into phenomenon. The topic and area of study determine the type of research to adopt. Historical studies and content analysis focus on the evaluative examination of documents and the analysis of contents. Experimental studies are most prevalent in the physical sciences.

5.0 SUMMARY

In this section, we examined the types of research. Generally, research is classified into pure or basic research, applied research. Other categories include historical, survey, experimental, evaluation, case study research studies and content analysis. The most common form of research in library and information science is survey. It is a very efficient method of collecting extensive data using the questionnaire. Surveys produce valid and reliable data using a representative sample. Results from surveys are generalisable to the wider population.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. Define the case study research method. What are the major reasons for the use of case studies in research?
- ii. Discuss the survey research method and outline its strengths and versatility in the social sciences
- iii. What method of research would you recommend to study and analyse the contents of a newspaper and why?
- iv. What are the major advantages of historical research?

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MODULE 2 THE RESEARCH PROCESS

- Unit 1 The Research Process
- Unit 2 The Research Proposal
- Unit 3 Elements of Research Proposal 1
 - Introduction – background to the study
 - The Research Problem
 - Research Questions/Assumptions/Hypothesis
 - Objectives
 - Justification of the research
 - Significance of the research
 - Delimitation/limitation of the research
- Unit 4 Elements of Research Proposal 2
 - Review of Related Literature
 - Methodology
 - Organization of the research

UNIT 1 THE RESEARCH PROCESS

CONTENTS

- Introduction

- Intended Learning Outcomes (ILOs)
- Main Content
 - The Research Process
 - The steps of the Research Process
- Summary
- Conclusion
- References/Further Readings

1.0 INTRODUCTION

Carrying out a research study, especially to undergraduate students, is not easy. It is most often difficult to ascertain where and how to start. However, it is essential to remember that there are clear steps you can follow that would lead you to a successful research investigation. These steps or the research process usually begins when you develop a broad idea for a topic of the inquiry. This then leads you to a preliminary examination of basic texts to enlarge your understanding of the topic and narrow it to a specific area and develop a problem statement. This section lays out the basic steps of the research process to help you establish a solid foundation to build your research study.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This unit aims to expose you to the steps you require to help you successfully conduct your research inquiry. Therefore, it is expected that at the end of the lesson, you would:

- Identify the various steps necessary in conducting research studies.
- Determine the processes involved in the research process.
- Develop the research process for your research project.

- **MAIN CONTENT**

3.1 The Research Process

Research is a series of activities that are linked together which progress systematically from a beginning to an end. It is a process that has a definite beginning and a projected end. The research process is a pathway of interdependent related stages that lead to the completion of research studies. The research process denotes that research follows specific routes which must be marked out, captured, and described for the audience to understand, follow and replicate if necessary. The research process could be described as cyclical, spiral or helical. This means a process that follows logical developmental steps. It originates with a question: for example: Do professors still go to university libraries to study? What do undergraduate students read most on campus? Why is there a poor reading habit among students? These questions become the crux of the research problem. The formulation of questions leads to the design of a specific plan.

Research does not grope in the dark to find a solution. It is a planned discovery with outlined steps for tackling identified problems. It implies a design of study specific to get relevant data needed. The formulation of the problem generates a plan and method of gathering data. This is followed by systematically gathering the data. This data is then processed, leading to the possible discovery of new knowledge. The research examines if the hypothesis is supported or not. Thus, the research process is followed till logical findings and conclusions are reached.

3.2 The steps of the Research Process

- **Identify your topic**

Every research begins with the identification and development of a topic which culminates in the statement of a problem. This stage starts with a very broad idea for a topic you would need to study about. The first step is to develop some ideas which may start out very broad. This requires some preliminary study to develop a clear and specific topic. An initial literature review is mandatory at this stage to be able to develop a viable direction. “As you read, take notes and try to identify problems, questions, debates, contradictions and gaps. Your aim is to narrow down from a broad area of interest to a specific niche” (Scribber, 2021).

This lays the foundation of your research. If your topic is not defined and specific, it may not be researchable and, therefore, a waste of time, effort and resources going further. It means you must read widely to develop background knowledge and gradually narrow down your ideas.

Be practical, truthful and real “to consider the practicalities: the requirements of your programme, the amount of time you have to complete the research, and how difficult it will be to access sources and data on the topic.” Usually, supervisors are assigned to researchers who guide them through the journey of the research study. Therefore, you must always discuss with your supervisor before moving to the next stage.

- **Review the literature in the area**

When you have identified and defined your research problem, you move on to review the literature and existing research related to your subject of investigation. This helps to broaden your understanding of the topic and acquaint yourself with what other researchers have done in your area of investigation. The researcher must learn more about the topic under investigation. To do this, the researcher must review the literature related to the research problem. The review of literature provides a strong and reliable foundation upon which you can build your research study. This is the most important step in starting a new research study according to Connaway and Radford (2016). A thorough review of literature helps the researcher to understand the scope of his research problem and presents the opportunity to identify the gap that exists and the rationale for the present study. The review of literature also educates the researcher about what studies have been conducted in the past, how these studies were conducted, and the conclusions in the problem area. To achieve a favourable review of literature in your research area, it is essential to examine and locate relevant background information, search catalogues to locate relevant books and other resources, examine databases for journal articles, search for relevant resources on the Internet and evaluate and filter your sources.

- **Design your research questions, objectives, and hypotheses**

The identification and formulation of a problem statement progress to the design of research questions, objectives and hypotheses. After you have settled your topic and it has been approved by your supervisor or departmental research board, you proceed to determine what exactly your research will investigate and why it matters; that means you identify a clear problem that will constitute your project focus and purpose. The problem might be a practical issue – why do undergraduate students have poor reading habits? Or why reading is utilitarian in Africa? Or why there is poor publishing culture in Nigeria. Your research problem might be theoretical. When you have charted a clear problem, you develop a problem statement. This fixes the problem in focus and helps to set your objectives.

The problem might be a practical issue—for example, a process or practice that isn't working well, an area of concern in an organization's performance, or a difficulty faced by a specific group of people in society. You need a clearly defined problem to formulate your research questions, objectives and hypothesis. These three works in symmetry and in tandem with the problem of focus. This is followed with explicit and clear research questions looking for solution. These questions are converted into measurable objectives. The objectives are regarded as the foundation of your research, and they guide your entire research process. A well stated research objectives should be characterised by:

- **Measurability:** This means that your objectives must be stated in measurable terms such that it can be determined if the objectives have been achieved or not at the end the study.
- **Clarity:** Your objectives must be stated in very clear terms to avoid ambiguity or overlaps.
- **Comprehensiveness:** Your objectives should cover every required aspect of the research study. It should be stated comprehensively to ensure that every essential component of the study is not outside the purview of the objectives.

Similarly, the research questions and objectives lead to the formulation of your hypothesis which must be stated intelligently and clearly. The hypothesis also provides a guide to the direction of the research study. Clearly formulated hypothesis is stated in null or directional form. The hypothesis must be testable and should display the relationship between two or more variables.

- **Determine your research design**

To answer the questions raised at the beginning of the research process, there must be a choice of methods that should develop from the questions, i.e., there must be the choice of method that can best answer the research questions. The method should be applicable to testing the hypothesis. This means that the questions must be clear and specific, and the methods chosen must be equitable to address the questions. The research design, therefore, relates to how data collection is organized. The research design should be appropriate to achieving the stated objectives. It is also important to identify and select your sample. The choice of a representative sample is a very important component of your general research design.

- **Organise for data collection**

Data collection is a very essential step in the research process. As a researcher, you systematically plan and organize your data collection from the identified sample. This may require the use of one or a combination of instruments for data collection such as questionnaires, interviews and documents analysis. Your data collection must relate to your problem and should be able to answer your research questions and satisfy the objectives of the study.

- **Collate, process and analyse your data**

When you have collected your data, you must proceed to arrange the data logically so that interpretation and structuring can be achieved. This helps to create meaning and usefulness of the data gathered. At this stage, the researcher should be able to determine if the data resolves the research problem, answers the research questions and supports or disproves the hypothesis.

- **Write your research report**

The final stage of the research process is generating the research report. Remember that the research report is a carefully prepared document that covers the various processes, data collection and analysis and findings of a research study. A writer defines research report as “A research report is a well-crafted document that outlines the processes, data, and findings of a systematic investigation.” It is the comprehensive account and the final document of the entire research process. It is generally viewed as an objective and accurate relay of what the researcher has undertaken and the outcome. Therefore, your research report should detail all the various steps of your research investigation and should highlight the findings, recommendations and other essential information. Your research report should include the following essential elements: title, preliminaries, table of contents, abstract, introduction and background to the study, review of related literature, methods adopted, data analysis, discussion of result, findings, conclusions and recommendations.

Figure 2: Steps in presenting research report

Source: Author-generated *Fig. 2: The research process*

- **Develop your research proposal**

Before you begin the actual research, it is important to develop and write your research proposal. The research proposal is designed to persuade your supervisor and the department that you have a firm understanding of the research topic you want to pursue. Your proposal should depict the what, the why and the how of your research. This means that your research proposal should describe what your study will examine, determine why it is important to carry it out, and state how it will be carried out. The proposal should include a cursory review of related literature on your research area. This should reveal how your research study will fit into existing studies on the topic. Your research proposal should be a guide to the actual research study.

4.0 CONCLUSION

A well conducted research investigation does happen by accident. It must be carefully planned and logically executed. This means the entire research process must follow the systematic steps towards a successful research study. Similarly, the climax of every research investigation is a well-crafted document referred to as the research report. Your research is incomplete without a comprehensive and accurate report of the investigation that includes the findings and recommendations

5.0 SUMMARY

Our discussion in this unit has revealed the basic steps of the research process as (i) identification of topic of investigation, (ii) review of related literature, (iii) identification of your research problem, (iv) formulation of your research questions, objectives and hypotheses, (v) determination of research design, (vi) identification of the population and selection of sample, (vii) arrangement for data collection, (viii) processing and analysis of data and (ix) writing the research report. The stages or steps are intertwined, i.e., one step leads to the other and culminates to the generation of research result. Each step requires careful analysis to ensure

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. What is a research process?
- ii. Discuss three basic steps necessary for the research process
- iii. Discuss the significance of the population and sample in the research process

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UNIT 2 THE RESEARCH PROPOSAL

CONTENTS

- Introduction
- Intended Learning Outcomes (ILOs)
- Main Content
 - The Research Proposal
 - Components of a Good Research Proposal
 - Some of the pitfalls to avoid in the research proposal
- Summary

- Conclusion
- References/Further Readings

1.0 INTRODUCTION

Every standard and qualitative research must begin with a plan or proposal. This provides navigation or a map to the researcher. Proposals are indispensable before the commencement of the study. It helps you to present and justify the need to carry out the intended investigation. This is important because you need to convince your supervisors or assessors that the problem you want to study is worth researching. An acceptable proposal must be persuasive evidence specifying that the research is worth exploring. It also presents the practical steps outlined to conduct the study. These practical steps or methodology for conducting the research study must be valid, reliable, and consistent with the requirements for conducting such studies. This unit is, therefore, a bird's eye view of the rubrics of the research proposal.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This section is intended to help you to explain the concept and meaning of the research proposal. Therefore, at the end of the unit, you should be able to

- Define and explain research proposal;
- Describe the essential reasons for writing a research proposal,
- Determine and describe the structure of a research proposal and
- Design the proposal for your research study.

3.0 MAIN CONTENT

3.1 The Research Proposal

A research proposal or plan is a detailed description of the proposed investigation of a research problem. It outlines the essential aspects of research. A research proposal is a valuable and promising document that guides the researcher on the intended research study. It is usually the starting point of your study or the first step to obtaining the approval to complete your thesis, which determines whether the research succeeds or fails. It is an essential working document that culminates in your final thesis.

The University of Southern California (2021) outlined some of the reasons for a research proposal to include:

- Develop your skills in initiating and designing a comprehensive research study.
- Ascertain how to conduct a comprehensive review of the literature to determine that a research problem has not been adequately addressed or has been answered ineffectively and, in so doing, become better at locating pertinent scholarship related to your topic.
- Improve your general research and writing skills.

- Practice identifying the logical steps that must be taken to accomplish one's research goals.
- Critically review, examine, and consider different methods for gathering and analysing data related to the research problem.
- Nurture a sense of inquisitiveness within yourself and to help see yourself as an active participant in the process of doing scholarly research.

The purpose of a research proposal is to ensure a workable research design that, when implemented, will result in an interpretable empirical finding of significant scientific merit.

Generally, your research proposal should address these key questions:

- **What problem do you want to solve?** Your research proposal must address a specific problem of focus. This means that research questions must be stated in clear, precise and well-defined terms. Most often, strong research questions are the most crucial component of a research proposal. It is also the most challenging aspect of the proposal. It is considered the foundation of the proposal. The statement of your problem or research questions should be original, innovative and should not duplicate any previous studies. A research proposal fails when the problem is vague, and the study's steps are not clearly stated. The object of the research must be clearly stated, and the research must be feasible.
- **How knowledgeable are you about the topic?** The first of a successful research proposal is to demonstrate that you are familiar with the proposed topic. This means that you're a firm grasp of the literature on the research topic. This will call for a state-of-the-art review of literature in your proposed area. A thorough and critical review of existing and related literature on your topic is imperative in being able to master your specific area of research. The literature will also provide you with a good understanding of the methodological approach best applied to your study. It will also help you in formulating your research questions.
- **What steps would you follow to conduct your study?** Your proposal must clearly outline the steps or methods to follow to accomplish your objectives. Your approach must be valid and repeatable.

3.2 Components of a Good Research Proposal

A good research proposal should be concise and include all essential elements.

Generally, research proposals are in categories. There are proposals that are required for sponsored activities or research grants. There are also proposals or research plans for your thesis or dissertation. Whatever kind of proposal, there is usually similarity in the format with slight variations depending on the type. A research proposal includes the following essential components:

Title Page

Your proposal begins with a title and title page, which follows the format specified by the institution. This means that the title page cannot be arbitrarily prepared without

following the approved procedure. Your title must be brief, specific, descriptive, and comprehensive to reflect the research plan's nature truly. The title is the frame of reference for continuous reflection. The title may not remain static as you immerse yourself in the context of your work and become better informed of the key issues surrounding your research. This may reveal new information that was not known before starting the research, which invariably may lead to modifying or changing the title of the study to reflect the new information accurately. Moreover, according to Schram (2003), “the title serves as a conceptual point of reference for the readers.” Your title must also be functional, which reflects the relationship between the independent and dependent variables. An effective and functional title “pricks the readers’ interest and predisposes them favourably towards the proposal.”

- **Abstract**

The abstract is essential and compulsory in your proposal. It helps your supervisor and the readers to make preliminary decisions on your research plan. It is a summary of the important content of your work. It should include “research questions, the rationale for the study, hypothesis, the methodology and the main findings.” “Therefore, an effective summary states the problem your proposal addressed, identifies the solution, and specifies the objectives and methods of the project” (Illinois Library, 2021). An abstract is usually approximately 300 words.

- **Table of Contents**

This is the list of the contents of your research plan. It contains all contents, including lists of illustrations (or figures) and tables. The table of contents also follows the approved format. Each page of the table of contents is usually numbered in Roman numerals.

- **Introduction**

The introduction to your proposal provides the necessary context to your research problem. It should be brief but comprehensive to help your readers place your research problem in context and give a telescopic view of how the solution will advance the field. “The quality of your introduction depends on your creativity, ability to think, the depth of your understanding of the problem, and the extent of your literature search.” “After reading the introduction, your readers should clearly understand the direction of your research. Likewise, they should be able to appreciate your enthusiasm for the topic and to be engaged in the potential results of the study (Jackowski & Leggett, 2015).

- **The Research Problem**

Every meaningful research begins with the conceptualization of a problem. A problem must exist for research to be carried out. This means that a research problem is a knotty issue or situation to which the researcher wants to provide a solution. Therefore, “the identification and formulation of a research problem is the first step of the research process” (Sudarsana, 2014). The need for solutions to problems calls for research studies. The need to fill a gap in knowledge calls for basic research. Research studies succeed or fail depending on the clarity of the definition of the problem or its absence. The frequent shortcomings of research proposals are often the lack of clear problem statements to guide the investigation. Therefore, a clearly defined and

succinctly written problem statement forms the bedrock for the success of the research inquiry. Bwisa (2008) defines a research problem as “an incongruence; a discrepancy between what is and what ought to be. It may also be described as the gap in knowledge that needs to be filled.”

A problem statement is the precise description of the existing incongruence or discrepancy which requires a solution. The problem statement usually provides the context for the investigation; it provides the questions to which the research seeks answers. It is the focal point and the bedrock of any research study without which the research will be a fatal failure. The problem statement is the articulation of the arguments that present the problem as worth investigating. When your problem statement is well articulated, you would have established the foundation for your research. Other sections of your research proposal will not be neatly fitted together without a well-developed problem statement. A clearly stated problem opens the door to research questions, hypotheses, aims and objectives of the study. A faulty problem statement will invariably produce invalid research questions and objectives. This is akin to building a house without foundation. No structure can be set on bare ground. It cannot stand.



Figure

3: Sources of research problem

Source: <https://www.slideshare.net/drjayeshpatidar/research-problem-20719286>

- **Research Questions and Aims**

Once you have determined the direction of your study, the next step is to frame the research questions that will constitute the pivot on which your study will rest. After this, the following follows the composition of your research objectives. At this stage, you should be concerned with what you want your audience to know when they read your proposal. This means that the objectives should be appropriately framed, if possible, in a single sentence. According to Krathwohl & Smith (2005), your research objective will help you stay focused

and prevent you from drifting off on tangents. Some of the questions your proposal should consider include:

- What do you plan to achieve?
- Why do you want to conduct the research?
- How are you going to conduct the research?
- **Delimitation/limitation of the research**

Every research study has boundaries. There is no research that is limitless. A good research proposal will specify the extent of coverage under the scope. This indicates the where, when and who the subjects are. It sets out the extent the study is designed to cover. It also sets boundaries within the delimitation and indicates some constraints in the form of limitations. The limitations relate to aspects, circumstances, or issues that may surround the investigation, which may adversely affect the research result beyond the investigator's control. The limitations may also incorporate perceived weaknesses of the study, which necessarily should be "identified, discussed and reported." When your proposal fails to indicate the study's limitations, it creates loopholes and gaps and invites severe criticism against the study.

- **Literature Review**

The literature review is a significant component of every research proposal. This preliminary literature review reveals how you have:

- examined the relevant work of prominent authors in your research area. This is in tandem with the general understanding that you stand on the shoulders of others to have a detailed view of the universe of knowledge;
- understood the specific themes and sub-themes relevant to your research area;
- ensured that you are duplicating existing research studies, not "reinventing the wheel."
- Given credits to those who have trodden through a similar path and have laid the groundwork for your research.

At the advanced level, the literature review demonstrates your understanding of the theoretical and research issues related to your questions. This is a further step to convince your supervisors or readers that your proposed study will significantly contribute to the literature. A thorough review of the literature will help you develop sharper, insightful and focused research questions on your subject of study. Therefore, your literature review should lead to and justify your research objectives and questions.

Some of the common shortcomings of literature review that students suffer from include:

- Lack of focus and coherence
- Missing out landmark literature

- Dwelling on old and outdated literature
- Lack of structure and logical organization of topics
- Referring to literature without critical evaluation

The literature review will display your competence and scholarship. Your review should be meaningful, stimulating and engaging. It should not be boring reading your literature review. It should logically and systematically connect ideas and themes orderly and coherently.

- **Research Methodology**

This depicts the steps you intend to employ to carry out the study. The methodology section of your proposal discusses the various methods you have designed to achieve your research objectives and address your problem statement. Your chosen methods should be valid, reliable, replicable repeatable. It is also vital to justify the appropriateness of the methods you have chosen firmly. The methods must be adequate and suitable to address your research question.

- **Some of the pitfalls to avoid in the research proposal**

- Failure to be focused on the research problem. A research proposal should have a clear sense of purpose; it should not be “all over the map.” It should be to the point, focused and concise. Your proposal should also indicate the boundaries of the research. Failing to delimit the boundaries of your study is a common mistake of several students’ proposals.
- Failure to develop a coherent and persuasive argument for the proposed research.
- Failure to cite landmark works in your literature review. There should be a proper foundation for understanding the development and scope of the problem.
- Failure to follow approved style of writing. Although a research proposal is a plan of research study, it is expected to be well-written and follow the approved style and rules of good academic writing. Poor grammar or careless writing will disqualify your proposal.
- Failure to follow citation and referencing format.

4.0 CONCLUSION

Every institution determines the requirements for conducting research studies. The proposal is one of such requirements. Writing your research proposal must follow approved guidelines. In preparing your proposal, you should maintain a balance between substance and brevity. Your proposal should be comprehensive enough to open the door to your readers’ interest and secure the approval of your supervisors.

5.0 SUMMARY

In this section, we have examined the research proposal as a significant step in conducting research studies. It is an indispensable plan of action that guides your success in your inquiry. The research proposal determines whether you succeed or fail

in the conduct of your research investigation. A well-written research proposal will consist of several essential elements: Title, abstract, table of contents, and the other essential aspects of the dissertation or thesis.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. What is the value of the delimitation of a study?
- ii. Discuss methodology as a component of a well-written research proposal
- iii. What is a research proposal?

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UNIT 3 ELEMENTS OF RESEARCH PROPOSAL (1)

CONTENTS

1.0 INTRODUCTION

In most organized institutions where the significance of research is recognized, proposals are key imperatives in the journey towards research study. The Proposal presents you with the opportunity to determine if your research aims and objectives are valid and if your chosen methods to conduct the study are suitable and feasible. It is compulsory for your proposal to be approved by your supervisor before the commencement of the research. The proposal is the suitable guide to the successful completion of your research study. Your proposal should reveal three important points to the assessor:

- How much of homework you have done in consulting relevant sources of data in your research area;
- It will eliminate the gap in the literature;
- It will reveal the feasibility and practicality of your research

2.0 INTENDED LEARNING OUTCOMES (ILOs)

At the end of this unit, you are expected to:

- Determine the essential elements of any research proposal in library and information science.
 - Write a proposal for your study area.
 - Highlight the practical steps in conducting feasible research studies
- **MAIN CONTENT**

3.1 Introduction – background to the study

This provides the background on which the research is built. This aspect of the research study is developed by providing background information that supports the research area. Without this, the research will hang without legs which is impossible. There is no human or object designed with legs that can stand without legs. The background to the study provides a very strong footing for your research.

- **The Statement of Research Problem**

The statement of your research problem tells your supervisor the problem you want to investigate. This must be clearly stated. You must avoid every ambiguity in relaying your research problem. Research studies are conducted to solve practical problems or add to existing knowledge base and research literature (Connaway and Radford, 2017). Therefore, the statement of your research problem should explain in detail the

essence of the problem, the practical benefits of providing solution to the problem and the gap it fills in the body of knowledge.

3.3 Research Questions/Assumptions/Hypothesis

Most research studies especially quantitative studies are characterized using research questions and hypotheses. Some studies employ assumptions. When the problem to investigate is identified, the researcher proceeds to formulate tentative solution. This is the hypothesis. It is regarded as an intelligent guess which is a purposed answer to the research questions. This intelligent guess can be stated in a positive or null form i.e., for or against the proposed solution. This tentative solution constitutes the basis for the research process (Varghese, 2017).

- **Objectives**

The objectives convey the key aims of the research study. This is stated in the SMART principle, the acronym that stands for specific, measurable, achievable, realistic and time- bound. A correctly stated objectives must be specific not vague, measurable, and achievable; it must be realistic, and time bound. This means that such terms as ‘learn’, ‘understand’, ‘comprehend’, ‘know’ are unacceptable terms in stating the objectives of your research study. Your proposal should be able to highlight the specific direction of your research study. If you miss out in a clearly defined aims and objectives, you close the door to a valid and reliable research result.

3.5 Justification of the research

Every research should have a compelling reason for the investigation. This is stated in the justification of the research. Your justification should strongly fit your research into place such that the audience can easily capture the essence of the study. The justification of the research also indicates the practical benefits of the research, and its contribution to your long-term objectives (Dudovskiy, 2018). These can relate to the elimination of gap in the literature, practical benefits of the research, and its contribution to your long- term career objectives. Ideally, the proposed research must make some practical contributions as well.

- **Significance of the research**

This is the statement that explains the reasons for the research study. In this part of the proposal, the researcher makes attempt to justify the importance of the research work and its impact to the field of specialization, it's contribution to new knowledge and the benefits others will derive from it. Some people regard significance of the study and justification of the study as the same. They do not exactly convey the same meaning. Significance of the study focuses on the importance of the study while justification dwells on the compelling reason to carry out the study. A researcher may expatiate on the compelling reasons why a study should be carried out that may turn out to be mere academic exercise of very little value. The significance of your study should clearly state the contribution your research makes and its benefits.

3.7 Scope/Delimitation/Limitation of the Research

It is important for your research proposal to specify the extent of coverage in the scope of the study. This should also indicate areas that the research may not delve into

even though such areas may be closely related to the investigation. Again, the research should specify the limitations or constraints of the study. Every research has one form of limitation or the other such as the constraint of time, fund, physical, material, and human resources. The researcher should truthfully specify the limitations that constrain the research investigation. Therefore, the scope, delimitation and limitations of the research should be made very clear and in very specific terms. One major error in research proposal is for the researcher to be all out to impress the Supervisor. To further his ego, he/she may want to indicate that the research is comprehensive. No research study is all embracing. You take the tiny aspect of your study and eliminate other adjoining areas or else the study will never be completed.

4.0 CONCLUSION

A high-quality research study must be well-planned for. A solid foundation to achieve this is the preparation of a research proposal. The proposal is described as akin to the architect's blueprint. If no professional builder does build without a building plan, likewise, researchers cannot conduct research studies successfully without well prepared proposals. The proposal is a major guide and direction to the researcher. Research studies involve funds, significant amount of time, high level of intellectual effort and may span years. Therefore, conducting research cannot be done haphazardly without plan.

• 5.0 SUMMARY

The existence of any research implies that there is a clearly defined problem to study. Your statement of the research problem should explain your research problem in detail that leaves no one in doubt of the existence of a problem. Research proposals are fundamental to the success of research studies. It helps to set the scene and foundation for the study, provide a focus in the aim and objectives, explain the importance of the research, and establish the rationale for the research. A carefully prepared research proposal also includes the areas demarcated for the study and the areas that would be left out. The proposal represents what should be careful planning that is imperative for a well-conceived research study. It spells out the details of the proposed study and serves as an excellent guide to the researcher as he undertakes the study. The elements that are included in a research proposal are introduction and background to the study, statement of the research problem, hypothesis, assumptions, aim and objectives, significance and justification of the study and scope and delimitation.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. Discuss in detail the importance of a research proposal to research studies
 - Differentiate between the justification of the study and significance of the study
 - What is the difference between delimitation of the study and limitation of the study

• REFERENCES/FURTHER READINGS

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UNIT 4 ELEMENTS OF RESEARCH PROPOSAL 2

CONTENTS

1.0 INTRODUCTION

The significance of research proposals cannot be overemphasised as we have mentioned in earlier discussions. It provides a guide to the researcher and opens the door for research granting institutions to assess your suitability for a research support. This second segment of the elements of research proposal dwells on review of related literature. The review of literature enables intending researchers to be able to stand on the shoulders of others to see far into their field of research. We are also discussing methodology, organisation of the study, and the definition of terms. Methodology outlines the techniques and procedures that details the specific steps to employ in carrying out the study. The organisation of the study depicts the structure of each of the chapters that make up the study and definition of terms which provides a common understanding of the key terms and concepts used in the study.

• INTENDED LEARNING OUTCOMES (ILOS)

At the end of this unit, you are expected to:

- Identify the various components that make of methodology in a research proposal
- Determine the relevance of review of related literature in a research proposal
- Explain the structure of organising the different chapters of a research study
- Explain the meaning and value of defining technical terms in research study

• MAIN CONTENT

• Review of Related Literature

This provides a preliminary review of related literature – what is already known about the research topic; examining what has been found out through scholarly

investigation, and what are the gaps (Connaway and Radford, 2017). This review puts your research in focus and provides the shoulders of others to stand on and see far and wide in your research area. It includes a brief outline of the most relevant models and theoretical frameworks relevant to the study. The review of related literature is an expansion of the historical background which is reflected in the statement of the problem. This section describes the foundation on which the proposed study is designed to rest. It examines the works of others, evaluates their methods and findings, and analyses the gaps that exist and how the proposed study will address the issues.

- **Methodology**

The methodology provides a general view of the methods and procedures designed for the study. It includes the identification and description of the population, sample, sampling technique, instruments for gathering and methods of data analysis. The techniques and tools to collect and analyse data should be explained in detail and clearly. The methodology clearly specifies the nature of the study viz quantitative or qualitative. This section also indicates the kind of data whether primary, secondary or both, the sources of data for the study and the various data gathering methods or tools e.g., questionnaires. It identifies and includes pre-test or pilot study if the study requires such. If the study requires triangulation or mixed methods, this section describes the various approaches and the rationale stated for the choice. This section of the proposal also describes in unambiguous terms how the data will be analysed. For quantitative studies, there should be a description of how data will be categorized and analysed using specified statistical methods such as descriptive, bivariate, multivariate, inferential etc (Connaway and Radford, 2017). For studies that employ mixed methods – quantitative and qualitative approaches, the proposal should specify the appropriate statistical packages chosen for the analysis. Your methodology would be evaluated on the following criteria:

- Reliability – are the tools and techniques used reliable and consistent? This means the procedures adopted will produce the same result when repeatedly used.
- Replication – This implies that your procedures for the study are sufficiently described that another researcher could follow and repeat the study.
- Validity – This implies that your chosen tools and procedures will measure what they are design to. The measures adopted should accurately reflect the concept under investigation. It concerns the integrity of your results generated from the techniques employed in your research study. The results or findings from the study should be such that can be applied to the larger population.

- **Organisation of the Research**

The organisation of the research provides information on the structure of your work. It is basically an outline of the study as it will appear in the research report. The organization of the research specifies the number of chapters the report will have and summarises the content of each chapter. Except where otherwise required, most research in library and information science contain five chapters:

Chapter **One** provides the introduction which is the background to the study. This explains the foundation of the research. It is in this chapter that the statement of the problem is stated in a detailed manner. This chapter also includes a brief explanation of rationale for the entire research study, the research aim, and objectives, and details the organization of the research.

Chapter **Two** is usually the review of related literature, and accordingly, contains a discussion of models and theoretical frameworks that have been previously introduced to the research area. This chapter is not a general review of literature but an analysis of related literature in the research area. It generally discusses the viewpoints of other researchers and authors on the research area and presents studies and findings related to the research problem under investigation.

Chapter **Three** is the research methodology. This chapter defines the research process, methods, and research design. It provides the justification for the choice of instruments, sample and sampling techniques, the implementation of data gathering and analysis methods.

Chapter **Four** is the presentation of the data gathered through the instruments identified in chapter three such as questionnaires/interviews/observation/etc. This presentation could be through simple descriptive statistics such as bar or pie charts or inferential statistics such as ANOVA, Mann Whitney Test, Chi-square etc. The presentation is followed by discussion of findings. Brief discussions have been included to explain each chart. This focuses on the achievement of the research aim and objectives. This chapter also contains in-depth discussions in relation to each research objective, hypothesis, or assumptions.

Chapter **Five** constitutes the summary, conclusions, and recommendations. This chapter draws from the analysis and discussion of findings in chapter four. It indicates the conclusions based on the findings of the study and provides recommendations extracted from the findings. Sometimes, this chapter provides areas that require further research investigation.

- **Definition of Terms**

This section of your proposal deals with the operational definition of key terms used in your research study. Generally, it refers to the definition of the technical terms as applied to the study. Operational definition of terms is aimed at standardizing the use of terms in the description and discussion of the data. This provides consistent and common understanding of the meaning of key concepts, terminology and technical terms used in the study, particularly if the term is not widely known or is esoteric. A clear definition of terms will enhance the understanding of your audience on the use and application of the technical terms. According to Baram (2020), the definition of terms helps to explain the meaning of terms which may be obscure or difficult, using terms that are commonly understood and whose meaning may be unclear.

4.0 CONCLUSION

One of the first steps you are expected to take towards conducting a research study is a carefully prepared research proposal. To fulfil one of the major requirements for

graduation for the degree of Bachelor of Library and Information Science, you are going to need to craft a convincing and successful research proposal. This proposal must possess the essential components without which it will not sail through the assessment of your supervisor. The review of related literature, methodology, organisation of study and definition of terms are imperative for any research proposal.

5.0 SUMMARY

Your research proposal is incomplete without the review of related literature, methodology, organisation of the study and definition of terms. The review of related literature helps you as a researcher to have a preliminary view of what has accomplished in your research area. This prevents duplication and wastage. Also, the methodology outlines the systematic steps, procedures, and techniques the designed study is expected to employ. A well-designed methodology should be repeatable and replicable. The organisation of the study provides the structure of arrangement of chapters of the research study, and the definition of terms gives the acceptable explanation of technical terms used in the study; to help the readers and the audience to achieve a consistent and common understanding of the terms.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- Discuss three criteria in evaluating a methodology
- What are the components of organization of the study section of a research proposal
- Discuss the statement that “you stand on the shoulders of others to see far”
- What is the difference between definition of terms and operational definition of terms?

7.0 REFERENCES/FURTHER READINGS

Connaway, L. S.& Radford, Marie L. (2017). Research methods in library and information science. Santa Barbara, California: Libraries Unlimited.

Baram, Z. (2020). What is the importance of definition of terms in research?

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MODULE 3 RESEARCH METHODOLOGY

- Unit 1 Research Methods and Design
- Unit 2 Data Collection and Instrumentation
- Unit 3 Validity and Reliability of Instruments

UNIT 1 RESEARCH METHODS AND DESIGN

CONTENTS

- Introduction
- Intended Learning Outcomes (ILOs)
- Main Content
 - Research Methods
 - Research Design
- Summary
- Conclusion
- References/Further Readings

1.0 INTRODUCTION

This unit brings us to the steps, procedures and techniques researchers employ to carry out their studies. Our discussion will be a bird's eye view to open your eyes to the methods that will be helpful as you prepare for your research journey and beyond.

- **INTENDED LEARNING OUTCOMES (ILOs)**

At the end of this unit, you should be able to

- Explain the various research methods that are essential in conducting research studies.
- Determine the research necessary for your kind of study.
- Examine the characteristics of a good research design.

- **MAIN CONTENT**

- **3.1 Research Methods**

Kothari (2004: 7) defines research methods “as all those methods/techniques used to conduct research. It refers to the methods researchers use in performing research operations.” In other words, research methods specify the specific procedures for gathering and analysing data. The methods you adopt in carrying out your research studies are incorporated in your research design. The description of the research methods in studies leads to the development of the research approach.

The research approach is categorized into two basic approaches – the quantitative approach and the qualitative approach. The quantitative research approach generates data in a quantitative form which goes through rigorous quantitative analysis. In this, statistical analysis and conclusions are essential. The use and analysis of numerical data provide very effective insights in making decisions related to cause-and-effect problems. An author once said, “numbers provide a better perspective that helps make critical business decisions.” The quantitative research approach, unlike the qualitative approach, employs inferential analysis in arriving at conclusions. It is amenable to large samples; the process is repeatable, and it produces data and knowledge that can easily be reproduced. However, the quantitative approach involves large samples, which may be time-consuming, costly and burdensome; it also requires a thorough understanding of statistical methods or analysis or the engagement of an external statistician.

On the other hand, the qualitative approach exists in the form of subjective assessment of qualitative data such as attitudes, opinions, perceptions etc. This kind of approach generates results in non-quantitative form without any form of rigorous or rigid quantitative analysis. The qualitative research approach is flexible; you can adjust in your methods as new knowledge unfolds; and “can be conducted with small samples.” However, results from the qualitative research approach cannot be generalized to very large populations.

In your research study, the research design and methodology are contained in a chapter that specifies the path through which you conduct your research. It usually indicates the path that leads to the formulation of your problem and the construction of research objectives, the collection of data, analysis, and the presentation of results from the data obtained during the study period.

3.2 Research Design

This is the framework on which the research methods and techniques stand. According to Claybaugh (2020), the research design is simply the aggregate of the “strategy utilized to carry out research that defines a succinct and logical plan to tackle known research questions through the collection, interpretation, and analysis of data.” Research design brings together the techniques the researcher has outlined which are suitable for the subject under investigation. The research design also defines the type of research to be adopted for a particular study. The design also specifies the means of data collection and analysis. Research design can also be looked at as qualitative research design or quantitative research design.

It is the step in examining the problem statement and theoretical approach and then considering which method best tests the hypothesis in a quantitative study or answers the research questions in a qualitative study. The research design is sometimes considered as the underlying logic for your research study. In this case, it could be deductive or inductive logic. Quantitative inquiries apply deductive logic, which is characterised by the use of syllogism, while inductive logic underlies qualitative inquiries which proceed from particular instances to general principles, or from facts to theories.

Therefore, the research design aspect of your research study is designed to provide an appropriate framework for your investigation. In this section, you determine the appropriate research approach that would facilitate or help you obtain relevant information for your study. Durrheim (2007) refers to research design as “a strategic framework for action that serves as a bridge between research questions and the execution or implementation of the research. He says that it is a plan that helps the research to arrange the conditions to collect and analyse his data in a manner to achieve the utmost benefit. The research design is one of the concrete steps that distinguish everyday observation from planned research or systematic observation. Again, this emphasizes the fact that every meaningful research pursues the solution to concrete research questions through carefully outlined steps to the execution of the inquiry.

3.3 Importance of Research Designs

Research design can be looked at as a design for a building. Professionally, every significant building is carefully and systematically planned for. No matter how qualified a building team may be, without a plan, they will not accomplish any remarkable feat. Great buildings are not achieved through ad hoc decisions. Clearly articulated research design is important to ensure a systematic and logical research inquiry; it guarantees replicability of the study; enables generalizability to a larger population. It provides the researcher the needed framework for tackling a problem in librarianship; helps him to appropriately delineate the research purpose and boundaries and acquaint him with potential problems while executing the research project.(Nwaorgu 2015).In fact, without a research design, data collection, interpretation and analysis cannot be reliable, valid, and justifiable. It is important to note that no research can be carried out without a research design. Your research design helps you to fulfil the specified purpose of your study and guides you to follow the investigation consistently until it is completed. Durrhaim (2007) identifies five stages that depict the role of research design as a bridge between the research question and the completion of the research:

Stage 1: defining the research question,

Stage 2: designing the research,

Stage 3: data collection,

Stage 4: data analysis, and

Stage 5: writing a research report.

Although this is a very simplistic categorization of the stages involved in the execution of a research study, however, it captures and summarises the essential steps. Research design as the name implies involves a series of decisions that indicate the data gathering process, analysis and compiling the result which ultimately answers the research questions that guided the study. Your research design is like an ‘architectural blueprints’ according to Bickman, Rog & Hendrick (1998). This means that researchers prepare their research designs before the undertaking the study. The design must be specific, fixed and cannot be altered unilaterally as the research study

progresses. Research designs are not arbitrary statements, but blueprints developed in accordance with scientific principles to be able to achieve valid and reliable results. However, in qualitative studies, there may be good reasons to change the original research design especially when the researcher encounters some pragmatic issues which may determine what the final research design becomes.

3.4 Types of Research Design

Saeed (2020) categorised research design into four classes:

- Descriptive Research which is an in-depth research design that answers the what and how questions.
- Exploratory Research design defines the subject of the research and answers the what, why, and how questions.
- Exploratory Research explores the subject of investigation and answers the what and how questions.
- Evaluation Research design focuses on the productivity of the subject of examination. It is generally regarded as very expensive.

Research designs are generally divided into

- Quantitative Research Design: This outlines the steps in conducting the research that analyses the interaction and relationship of variables in terms of numbers and statistical applications in interpreting, analysing, and drawing inferences.
- Qualitative Research Design: This defines the framework for conducting research studies which seek to establish answers to the why and how of the phenomenon under investigation.

Other writers also added experimental research design, correlational research design and diagnostic research design. Experimental research is commonly applied in the natural sciences. It establishes the relationship between the cause and effect of phenomena. Experimental research design depicts the framework that observes the impact of the independent variable on the dependent variable. Experimental research is rarely applied in library and information science studies.

Correlational research design determines the procedure for conducting studies that establish a relationship between two connected variables. This kind of research usually involves two different groups. The correlation coefficient is most often employed to establish the correlation between two variables, whose value ranges between -1 and +1.

Diagnostic research design outlines the procedure or steps to evaluate the underlying cause of a specific phenomenon. This kind of studies help to open the causes of malignant situations in society.

3.5 Research Design and Research Approach

There is a general relationship between research design and research approach and a thin line of difference. The research design indicates the overall framework or

structure that provides the outline or steps for carrying out a carefully planned research investigation. Research approach is narrower which specifies the techniques, tools or procedures employed in data gathering and analysis.

3.6 Characteristics of a Good Research Design

- i. **Reliability:** a good research design should provide a framework that consistently produces same research result. With the same research questions, the same standard of result should be obtained. It should flexible, effective, efficient, appropriate, and economical (Saeed, 2020).
- ii. **Validity:** a good research design should provide procedures or structure that helps the researcher in measuring exactly what the tools are design to. This also implies that the questionnaire derived from the design should be valid.
 - **Neutrality:** The research design should provide a framework that is neutral and free from bias. It should be less prone to error.
 - **Generalization:** The research design should provide procedures that produce results that apply to the entire population of study and not just the sample. This also means that the outline of the design can be used to conduct the same study on any part of the population with the same accuracy.

4.0 CONCLUSION

A research design should provide well formulated plan of action for a research study. This should include the procedures techniques to carry out the research. A carefully prepared research design usually includes detailed information on sampling, data gathering, and analysis. Similar to an architectural blueprint, it should specify the size of sampling and technique, the instruments of measurement and mode of data analysis.

5.0 SUMMARY

A research design is methodical, organized and developed by a researcher to carry out a scientific inquiry. It details pre-planned, well-thought-out steps directed at providing answers to specified research questions. Research designs help researchers arrive at authentic, reliable, and valid research results.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. Discuss four characteristics of a research design
- ii. Define and discuss quantitative research design and qualitative research design
- iii. What are the four classes of research design?

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UNIT 2 DATA COLLECTION AND INSTRUMENTATION

CONTENTS

1.0 INTRODUCTION

The next step is data collection when you have completed your sampling process and your participants or subjects are identified. This is the field work, i.e., you go to the field to gather your data. This stage is very engaging; it takes time, costs money, and requires diligence in ensuring you gather the relevant data as accurately as possible. Data gathering may be for numeral or non-numerical data. Social science research deals mainly with descriptive data. However, the nature of the problem determines the data gathering process. As a researcher, your goal is to collect the appropriate data that would answer the research questions and fulfil the objectives of your study.

Observations, interviews, questionnaires, phone calls, personal and official documents, photographs, recordings, drawings, journals, email messages and responses, and informal conversations are qualitative data sources. Many data sources are acceptable if the collection approach is ethical, feasible, and contributes to understanding the phenomenon under study. The four data collection techniques we discuss in this chapter are observing, interviewing (including focus groups and email), administering questionnaires, and examining records. These techniques share one aspect: The researcher is the primary data collection instrument.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This unit brings you to the instruments used for data collection in social and behavioural research studies. Therefore, at the end of the discussion, you are expected to

- describe the data collection sources and techniques;
- determine the steps to begin data collection;
- identify the different kinds of questionnaires and categories of questions;
- recognize the techniques for conducting successful interviews and
- determine participant observations and content analysis as tools of data collection.

- **MAIN CONTENT**

3.1 Data Collection Methods

Research and researchers employ various methods or techniques to gather data for analysis. The frequently used data analysis techniques include the questionnaire, the interview, observation, and content analysis. According to Williamson (2002), “these methods for gathering data are most common, but not exclusively, used in survey research.” More than one data collection method could be used in your study. This increases the probability of greater validity of your findings. It is important to note that whatever data collection method or combination of techniques used, your “approach should be ethical, feasible and should contribute to the understanding of the phenomenon under study” (Williamson, 2002).

3.2. Questionnaires

In social and behavioural sciences, the questionnaire is used extensively as a data-gathering instrument. It is a relatively efficient and reliable instrument in gathering large amounts of data in survey research studies. It was invented by Sir Francis Galton. Bhattacharjee (2021) defines the questionnaire as a series of items or questions designed to elicit responses from participants in a standardized manner. This set of questions may be structured or unstructured. The questionnaire is the most used gathering instrument in library and information research. It is a veritable and reliable data collection instrument which employs questions that are designed for the “respondents to read, understand, and respond to in a meaningful way.” However, it must be appropriately constructed to achieve its usefulness. When questionnaires are well constructed, they yield reliable and valid measures of required variables. According to Shaughnessy, Zechmeister and Zechmeister (2012), “even if the sample of respondents was perfectly representative, the response rate was 100%, and the research design was elegantly planned and perfectly executed, the results of a survey will be useless if the questionnaire is poorly constructed.”

3.2.1 Types of Questionnaires

The questionnaire is usually classified according to the mode of administration such as the mail, telephone, e-mail, or web questionnaires. These types of questionnaires encourage frank responses because of a high level of researcher anonymity. In other

words, the respondents respond to the questionnaire without the researcher being present. It can also be categorised according to the type of questions such as structured, open-ended or Likert scale responses. The types of questions in a questionnaire are discussed further below.

Types of Questions in a Questionnaire

There are different ways of constructing questionnaires. Some questionnaires have simple yes or no answers. This type of question is highly restricted and yield very little information. Different questions elicit different responses. Some questions give participants the freedom to respond to the options. In constructing questions, the researcher should be careful of introducing bias using leading questions. Also, the questions in a questionnaire determine the type of statistical analysis and interpretation to be adopted. Generally, there are three common forms of questions in constructing a questionnaire: open-ended, structured, and rating-scale questions.

Open-Ended Questions

Open-ended questions allow participants to respond freely to questions in their own words. This permits flexibility in response to questions. It will enable individuals to express their thoughts freely. According to Seltiz, Wrightsman, and Cook (1959), open-ended questions are “beneficial for exploratory studies and “are called for when the issue is complex, when the relevant dimensions are not known, or when the interest of the researcher lies in the exploration of a process or the individual’s formulation of an issue.” They are usually more difficult to summarize and analyse. The views expressed in open-ended questions may be so divergent that collating or grouping them, interpreting and analysing may be an arduous task. Sometimes, the responses may be completely different from the viewpoint expressed in the questions.

Structured Questions

Structured questions are such that the participants are restricted in the number of response alternatives. In this type of question, the respondents are presented with selecting the appropriate answer from a series of listed options. For example,

- Which of the following services are available in your library?
 - Circulation services
 - Information literacy instruction
 - Literature search

- Select from the list the highest qualification of staff in your library?
 - PhD
 - Masters
 - Bachelors

Structured questions produce limited and predetermined responses. They are also easy to collate, tabulate, compute frequencies, percentages, analyse and summarize. However, structured questions can confine respondents to a yes or no kind of response. This kind is not only limited but unyielding in eliciting responses from the

participants. Where it is avoidable, you are encouraged to eliminate or limit your use of yes or no questions in your questionnaire design.

Likert Scale/Scaled Responses

The questions in a questionnaire can also be constructed using specific rating scales. The commonest rating scale in the social sciences is the Likert scale. This provides participants with the opportunity to respond to a possible scale of responses. For example, *the postgraduate students of your library use the Online Public Access Catalogue (OPAC) more than the undergraduate students.*

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

Or it could take the form of:

- Very unimportant
- Unimportant
- Undecided
- Important
- Very important

Or it could take the form of:

- Very unsatisfied
- Unsatisfied
- Undecided
- Satisfied
- Very satisfied

The options depend on the focus of the research or the problem the study seeks to solve. The Likert scale makes pre-coding simple, easy and straightforward. The Likert scale was named after Rensis Likert, who developed the rating scale for his doctoral thesis. It is the most widely used rating scale in survey research and has also found its way into popular culture (Lodico, Spaulding & Voegtler, 2005). The Likert scale can be a 4-point, 5-point or 6-point item format.

Guidelines in Constructing Questions

Constructing the questions for your questionnaire is essential in determining the efficiency of the instrument. The instrument's reliability and validity are ingredients that the researcher should deliberately ensure his instrument achieves in data collection. Some of the crucial guidelines to follow in constructing your questions include:

- Provide clear and crystal instructions at the beginning of the questionnaire. The instruction should not be such that it requires explanation or interpretation.
- Avoid ambiguous questions. Double-barrelled questions should not be used. Two questions in one should be clearly avoided, e.g., *does your library loan books without registration and charge fines?* Leading questions should also be avoided.
- Avoid bias in asking questions and providing options to choose from

Pilot Testing

Pilot studies are essential steps taken prior to carrying out the full research study. The pilot study is a small-scale preliminary study that helps the researcher ascertain if the main study's crucial components are in order. It is a practical field for testing the questionnaire or the data gathering instrument employed for the study. Pilot testing allows you to subject your test items to a series of preliminary tests, which is essential to “work the kinks out” of the study (Lodico, Spaulding, & Voegtle, 2006). Pilot testing helps to ensure the reliability and validity of research instruments. It allows you to eliminate or minimize any problems that may be associated with data collection procedures. Pilot testing is the same as pretesting the instrument, which helps to correct areas of misunderstanding or confusion. It saves time and money and minimizes the chances of the research study producing unsuccessful outcomes.

Interviews

Interviews are one of the common and effective data gathering techniques in the social and behavioural sciences. It allows the researcher to interact with the participants, fostering a close rapport and a sense of trust with the respondent. It also provides an opportunity for the researcher to probe deeper to elicit honest and more responses. However, conducting interviews are deemed to be extremely expensive, especially face-to-face. Interviews are also classified into structured and unstructured.

Structured Interviews: like the structured questionnaires, interviews may use a fixed format that requires a formally structured schedule of questions. The respondents respond to the scheduled questions without deviation. The questions are prepared ahead of time. The use of structured or standardized interviews is based on certain assumptions. The structured interview provides the same stimulus to participants so that responses to questions are comparable. Researchers who use this technique have a relatively good understanding of what they want to unravel during the interview, according to Flick (2006). It is also assumed that the interview questions are comprehensive to cover all areas relevant to the study. The use of structured interviews is on the assumption that all the questions are short, simple, and easy for the participants to understand. According to Lune and Berg (2017), structure “interviews are useful when the data to be gathered concerns tangible information such as recent events, priorities, or relatively simple matters of opinion. They are also a preferred method when multiple interviewers or teams are to conduct comparable interviews in different settings.”

Unstructured Interviews. Like the unstructured questionnaires, unstructured Interviews use free-format or loosely structured format instead of the rigidity of the structured interviews. In an unstructured interview, the researcher freely discusses with the respondents, with the conversation flow varying considerably according to each participant's responses. Unstructured interviews do not use specific questions in discussing with the respondents. This means that the researcher does not ask the respondents the same set of questions. However, unstructured interviews require the researcher to be well informed in asking questions that elicit the most information from the respondents.

Capturing the data in interviews is essential. Note-taking is a traditional method for capturing data for structured interviews, while audio or video recording is usually most suitable in unstructured interviews. Where audio recording is not possible in unstructured interviews, note-taking becomes imperative even though extremely ineffective and disruptive of the flow of the interview conversations. An unstructured interview is very laborious, time-consuming, and costly. Analysing data gathered through unstructured interviews is difficult. Different questions most often generate different responses that may be difficult to collate, summarize and analyse.

Participant Observation

Participant observation is a method of data collection used in qualitative studies. It is commonly used in anthropological and sociological studies. It has also made inroads into educational studies and other social and behavioural sciences. It is a qualitative method of data collection that falls under the umbrella of "ethnographic methods." Someone described participant observation as a data collection method that involves "extended immersion in a culture and participation in its day-to-day activities." Generally, participant observation means being involved in the events, situations, or activities as an insider or participating and working with the group. In this, the researcher interacts with members of the group as one of them.

Various authors have defined participant observation. Marshall and Rossman (1989: 79) defines it as "the systematic description of events, behaviours, and artefacts in the social setting chosen for study." According to Erlandson, Harris, Skipper & Allen (1993), participant observation creates an avenue for the researcher to describe existing situations, which provides a "written photograph" of the situation under study. This data collection method offers you the opportunity to watch the events, conditions or activities as an insider while gathering the data from the group. This means the researcher freely interacts with the subjects, participates in every activity, and adapts to the ways of life of the group members while studying their behaviour, activities, and circumstances. Kawulich (2005) writes that participant observation is the process that empowers researchers to learn in the natural setting, the activities of the respondents being studied by observing and participating in their activities. Schensul, Schensul, and LeCompte (1999: 91) define participant observation as "the process of learning through exposure to or involvement in the day-to-day or routine activities of participants in the researcher setting."

Bernard (1994) defines participant observation as the process of establishing rapport within a community and blending into them so naturally, then removing oneself from

the setting or community to immerse oneself in the data to understand what is going on and be able to write about it. In this definition of participant observation, the author goes beyond being a participant observer; he includes observation, natural conversations, interviews of various sorts, checklists, questionnaires, and unobtrusive methods.

Although participant observation is a staple in sociological and anthropological studies, it also gains usefulness in library and information science. It allows the researcher to interact with the participants to check users' peculiarities, use vocabularies in interviews, and observe events that the respondents may not be willing to disclose. According to DeWalt and Dewalt (2002: 92), "the goal for the design of research using participant observation as a method is to develop a holistic understanding of the phenomena being studied and as much as possible ensure objectivity and accuracy within the limitations of the method." Participant observation, when objectively employed, is a method of increasing the validity of the study. The researcher's direct involvement helps garner a better understanding of the context and phenomenon under study. A combination of methods or techniques such as interviews, document analysis, questionnaires with observation enhances the validity of the instrument.

To deploy participant observation as a method of data collection, the researcher must consider some important elements such as the research questions guiding the study, where the research study is based, the possibility of being involved in observation, the respondents' availability and hospitality to accommodate the observer and the strategies to record and analyse the data (DeWalt & Dewalt, 2002).

Advantages of Participant Observation

Choudhury (2021) outlines some of the advantages of participant observation:

(i) It enables the observation of events or situations in their natural occurrence

This method allows the respondents to be seen, observed, and data gathered in their natural habitat. The strength of this advantage is maintained when the observation is unobtrusive. The researcher is likely to gather the wrong data when he is seen and known as an observer. The respondents will become conscious, uncomfortable, and therefore, neutrality will be compromised.

(ii) The Researcher maintains a close relationship with the participants

Participant observation provides the opportunity for the researcher to maintain an excellent rapport with the respondents. This very close primary relationship with the group members creates an avenue to participate in all activities directly, which fosters a better interpretation of the situation than a non-participant observer.

(iii) The Researcher studies the real character of Respondents

Close participation and contact with respondents or events help the researcher identify, observe, and deal with the real character of participants. Participant observation facilitates an intensive and inclusive study of the group and assists in gaining into the real character of such a group.

(iv) The Researcher gains a better understanding:

When you are involved with the participants, you gain a better understanding of the feelings and emotions of the respondents than a non-participant observer. A visit to the persons in the slum exposes you to understand better the feelings, hardship, and emotions of slum dwellers than the outsider.

Disadvantages

a) Disposition to subjectivity

Most often, participant's observation predisposes researchers to subjectivity. Being deeply involved in an event or the affairs of a group you are studying may lead to a loss of objectivity. The researcher may be carried away by his emotions and sentiments, impairing his impartiality and unbiased recording and analysis of data. The researcher may also develop some soft spots for the respondents, pushing him to justify some of the negative information they may perceive about the group.

b) Close association breeds biased interpretation

The researcher's involvement with the participants also predisposes him to biased interpretation of events. The close association and emotional participation with group members open an opportunity for the researcher to create a special position for himself. This may influence him positively or negatively and invariably may mean observing and recording findings from his point of view rather than a scientific point of view.

Content Analysis

Matthews and Ross (2010) define content analysis as a research technique applied to textual data or messages. The UK Essays (2018) refers Bernard Berelson (1952) definition of content analysis as a research technique for the objective, systematic and quantitative description of clear content of communication. Content analysis examines the data and its categories and condenses them into fewer categories for easy understanding. It focuses on words, phrases or concepts in a text and synthesizes the meanings and relationship. Content analysis is a method that is commonly used in the mass media. It is a research instrument that examines the actual content and internal features of communication. Content analysis focuses on texts which include books, essays, interviews, news items, speeches. It also covers historical documents and discussions.

To employ content analysis in your research study, you would need to break down the content or text of your study into classes and segments that are manageable and amenable to easy analysis. Inferences and conclusions can then be drawn from the analysis.

4.0 CONCLUSION

Every researcher collects and analyses data using different measurement tools. The questionnaire is one of the frequently used instrument especially in survey studies. Other instruments for data gathering include the interview, observation, and content analysis. Most often, researchers employ more than one data gathering instrument to increase the probability of greater validity of findings. The general rule is that whatever method or combination of techniques you employ in your research study,

your approach should be ethical, feasible and should expand the universe of knowledge.

5.0 SUMMARY

In this unit, we have examined the sources and techniques of data collection. Some of the techniques include the questionnaire, interview, observation, and content analysis. The questionnaire is the most used instrument in gathering data. It can be mail, telephone, or web questionnaire. The questionnaire can be classified according to the questions they contain such as open-ended, structured, simple 'yes' or 'no' and Likert scale questions. Similarly, interviews are also popular in data gathering in the social sciences. It allows the researcher to interact with the participants which establishes a form of relationship, rapport, and trust with the respondents. Interviews can also be classified into structure and unstructured.

It allows the researcher to interact with the participants, fostering a close rapport and a sense of trust with the respondents. It also provides an opportunity for the researcher to probe deeper to elicit honest and more responses. However, conducting interviews are deemed to be extremely expensive, especially face-to-face. Interviews are also classified into structured and unstructured.

Researchers also employ participant observation and content analysis as tools of data collection. Participant observation is very common in anthropological studies, although it is gradually being used in educational studies. In participant observation, the researcher is involved in the events, situations, or activities under study as an insider. While content analysis is a technique that is applied to textual messages or data.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. What is participant observation?
- ii. Discuss four major advantages of participant observation
- iii. Interviews can be divided into two. Discuss.
- v. Discuss content analysis as a research method of study

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UNIT 3 VALIDITY AND RELIABILITY OF INSTRUMENTS

CONTENTS

1.0 INTRODUCTION

Reliability and validity are two essential features in the assessment of any research measurement instrument. This unit discusses the validity and reliability of research instruments or tools which are used when conducting research studies. Validity focuses on what an instrument is designed to measure, and truthfully it achieves that. Meanwhile, reliability deals with the consistency with which the instruments measure what it is designed to measure. While validity and reliability are significant features of research designs and findings, they are indispensable elements of instruments of measurement in research. Validity and reliability help researchers eliminate errors in the instrument of measurement and decrease researcher bias in the research (Singh, 2014). Validity and reliability are concepts that help researchers enhance the accuracy of the evaluation of their research instruments, as Tavakol & Dennick (2011) observed. To guarantee validity and reliability, researchers employ different tools to collect data.

- **INTENDED LEARNING OUTCOMES (ILOs)**

At the end of the unit, you should be able to:

- Explain the use of validity in research instruments
- Ascertain the significance of reliability in measurement instruments
- Differentiate between validity and reliability

- **MAIN CONTENT**

- **Validity of instruments**

Validity is very significant in research. It is a requirement in research design, measurement, and results. Generally, when the conclusions, results and findings of your study are true, the study is valid. Validity of instrument in research is a key determinant of the efficacy of research studies. Every research is prone to errors because of defective measuring instrument. Therefore, as you develop your research study, you should be concerned with the validity of your measuring instruments, your inferences, and conclusions. Generally, the basic aim of every research is to produce

valid inferences and conclusions. According to Connaway and Powell (2010), research is considered valid when the conclusions are true. To truly fulfil this purpose requires special attention to the concept of validity which portrays the need to minimise the effects of external influences or variables that might affect the ultimate findings of your research. Validity is very important in designing your research instruments. A valid research instrument increases the accuracy and usefulness of findings.

Validity is generally categorised into types:

Internal Validity refers to the extent to which a research study establishes a trustworthy cause-and-effect relationship between the variables which cannot be explained by other factors. In other words, your research instrument is valid if it accurately identifies casual relationships and rules out other explanations of the relationships. This pertains to the conclusiveness of your research results which are only attributable to the impact of the independent variable, and not caused by other unknown factors (Williamson, 2002). Internal validity guarantees that your conclusions are credible and trustworthy. However, the validity of measurements is most crucial to experimental research designs.

External Validity – This refers to the extent to which you can generalise the findings of your research study to a larger group or population. This means the applicability of your findings to a broader group or the generalizability of your conclusions to a broader context. One of the major testings of your research instrument is its external validity. This is determined by the replicability of your study in another setting and the extent of arriving at the same result. This is closely related to instrument reliability. External validity of research instruments is affected by the sampling technique and the response rate to the instrument employed. Generally, a high response rate is essential if results should be accepted as accurate. This means that to increase your external validity, you should ensure your response rate is maximised.

Construct Validity – This refers to the accurate and proper labelling of variables being investigated. Your research instrument should allow the specification of the actual cause and effect and the identification of the constructs involved (Connaway & Powell, 2010).

3.2 Threats to Internal and External Validity

Powell & Connaway (2010) identified several ways threats manifest to internal and external validity. Likely threats to internal and external validity in library and information studies include selection bias and mortality effects, history effects, and testing effects.

Selection Bias and Mortality Effects

Selection bias and mortality effects apply to designs that involve multiple groups. Selection bias takes place when the groups being compared do not have the same characteristics; they are different from each other in very noticeable ways. Therefore, researchers should pay attention to selecting groups that are comparably like minimizing the effects of section bias. On the other hands, mortality effects occur when some of the respondents selected for investigation drop out of the study, which

results in inequality in the groups. In either case, the cause-and-effect relationship observed in the investigation may be the result of differences in the study groups. This also applies in a study where the groups to be studied have different levels of experience in investigation. Which means that the results from the study may be a function of the noticeable difference in the experience of the participants. To minimize mortality effects, the researcher should adopt appropriate measures to ensure groups are relatively comparable and should employ incentives to motivate the participants to remain in the study and avoid attrition.

History Effects

The groups designed for study may be faced with the effects of unrelated events arising from disparity in their history. This type of effects is prevalent in studies that span over a long period of time. History effects also occur where there is involvement of comparisons over a period. When this is experienced, the researcher will not be able to categorically state that history effects are not threatening the validity of the study.

Testing Effects

This applies to studies that employ pre-test and post-test administration. When researchers administer pre-test to participants and the post-test is subsequently administered to the participant within a very short time interval, the validity of the results may be in doubt. The effects of the pre-test may bear on the post-test either negatively or positively thereby affecting the validity of the result. Of course, as a researcher, you should understand that your respondents may be sharp and smart, and the pre-test treatment may condition their subsequent responses which ultimately affect subsequent interaction with the post-test responses. With this kind of result, generalizing your findings to a more natural setting may be misleading.

- **Reliability of Instruments**

Research instruments are designed for measurement. They are otherwise referred to as measurement instruments. Reliability of the instrument is the consistency with which the instrument measures what it is intended to. When an instrument is used repeatedly, it must not unreasonably vary the result. For instance, when you measure the height of a book with a ruler severally, you should consistently get the same result if the ruler is a reliable instrument. According to Chakrabarty (2013), reliability measures research's consistency, precision, repeatability, and trustworthiness. This helps eliminate errors or bias and leads to consistent measurement when used over time and across the various items in the instrument. Consistency of results is the primary ingredient in reliability. One of the ways of ensuring reliability of research instrument is through pilot testing. This helps to identify the weaknesses in the instrument. After the pilot test, the researcher evaluates the responses and makes necessary improvements by dropping or modifying items of concern to improve the quality of the instrument and thereby improve the reliability of the results. However, the researcher must note that pilot testing must be administered in as much as possible a real condition like the designed study condition. This is more like simulating a real research situation. It implies that your sample design and data collection procedures should be similar to what you will employ in your study (Wildemuth, 2017). The

purpose of reliability analysis is to eliminate items that are inconsistent with the design of the study.

4.0 CONCLUSION

The validity and reliability of instruments are essential concepts researchers consider in preparing their instruments. This means that quality research must ensure that instruments, conclusions, and findings are valid and reliable. Researchers employ validity and reliability as the primary means of ensuring integrity and trustworthiness of their studies.

5.0 SUMMARY

Validity and reliability are two terms that are more complex in research instrumentation than the general description we have attempted above. However, they are concerned with the accuracy of measurement and research findings. In the design of your research instrument validity implies the extent to which your instrument measures what it is designed to measure. While reliability refers to obtaining consistent and stable research results or findings. Validity and reliability are subject to threats that the researcher should guard against. These threats if not carefully treated affect the consistency, precision and trustworthiness of your research instrument and the reliability of your research results.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. What is the significance of validity and reliability in instrument measurement?
 - Certain factors can constitute threat to internal and external validity. Discuss these factors.
 - Discuss the major differences between internal and external validity

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UNIT 4 SAMPLING PROCEDURE AND TECHNIQUES

CONTENTS

1.0 INTRODUCTION

Every research study focuses on groups or size of subjects. No researcher can study the entire universe. The technique of streamlining the participants for investigation is regarded as sampling. This is usually achieved using internationally accepted procedures. The reliability of our research findings or results is generally dependent on our sample and the technique of drawing the sample. This unit introduces you to the procedure for determining your sample when you want to carry out your research study.

- **INTENDED LEARNING OUTCOMES (ILOs)**

At the end of this unit, you should be able to:

- Define and describe the meaning of sampling technique.
- Determine the components of a research sample size.
- Determine the population size of any research study.
- Define and describe the meaning of margin of error in sampling.

- **MAIN CONTENT**

- Sampling Procedure
3.2 Research Sample Size

- **Sampling procedure**

Every research focuses on a particular target population or universe. A population represents the entire subjects or respondents that fall within the study horizon. According to Best and Kahn (2006: 13), “a population is any group of individuals that has one or more characteristics in common and that are of interest to the researcher.” For instance, a study of the undergraduate use of library resources in the National Open University of Nigeria (NOUN) lists all the undergraduates of NOUN as the population. Thus, a study on this vast population is impractical, if not impossible, due to the entire population's size, number, and geographical spread. Usually, the population is large, and it may not be practicable to administer research instruments to every member. Studying the entire population, especially in survey research, is involving. It will be time-consuming, very costly, laborious, and burdensome. However, when the entire population is studied, it produces the highest accurate and reliable data. It eliminates every element of chance and bias. Practically, the large the size of the observation, the more the likelihood of element of bias. When the entire population is small, accessible, and homogenous, it becomes imperative to collect data from the entire universe.

Therefore, a sample comes into play in research studies. This is “a small proportion of the population that is selected for observation and analysis.” A sample is regarded as the representative group from which data is to be collected. Drawing a sample is significant in research studies, especially when the population is “large in size, geographically dispersed or difficult to contact” (Bhandari, 2020). The sample is always smaller or less than the total size of the population. The population or sample are the respondents or subjects that provide information to the researcher for data collection and analysis. According to Bhandari, (2020,) researchers necessarily draw samples because of necessity, i.e., it is impossible to study the entire population; practicality, i.e., it is easier and more efficient to administer your instrument and collect data from a sample; samples are cost-effective and manageable. It is easier and more reliable to organize and analyse data from a sample. Therefore, sampling is the process of selecting a representative from the entire population. This selection is not carried out haphazardly. Samples are chosen systematically, which gives every member of the population an equal chance of being selected. Generally, sampling is divided into two: Probability sampling and non-probability sampling.

Probability sampling

Probability sampling follows procedures in selecting samples to ensure that every respondent has an equal probability of being included in the sample. In this kind of sampling, the samples cannot be selected at the discretion of the researcher. If you choose randomly 50 library users from the list of registered library users, all the registered users have an equal chance of being selected for the sample. This probability sampling procedure gives all the registered users an equal opportunity of being included. Probability sampling is generally preferred over nonprobability sampling because it ensures that selected samples represent the population. Using a predetermined list in sample selection makes probability sampling superior to nonprobability sampling. Probability sampling includes the following examples:

- **Simple Random Sampling**

This is referred to as simple random sampling. This is the selection of subjects or respondents in such a way that gives each equal and independent chance of being selected. This means the subjects are randomly selected until the required number is reached. Random sampling is achieved using a table of random numbers. Using the table of random numbers, the researcher assigns consecutive numbers to each member of the population from which the sample will be drawn. The use of the table of random numbers was manually done before the emergence of the Internet. Today, there are free programs on the Internet that can assist researchers in randomly select a sample from the population. The <https://www.randomizer.org> is an excellent site for the random selection of subjects from the population.

- **Cluster Sampling**

This sampling method allows the researcher to divide the population into several groups or clusters to draw a sample. From this division, a sample is selected using a simple random or systematic random sampling technique.

- **Systematic Sampling**

A population could be listed in selecting a sample, and every *nth* (i.e., 5th) number is chosen. This will apply to every *nth* number until the desired number is completed. In systematic sampling, the researcher randomly selects subjects from the target population and selects all the samples following a fixed sampling interval. Systematic sampling is easier to deploy than random sampling when you are confronted with a large population, and the population could be listed. For instance, a target population of 10,000 undergraduate students in North Central Nigeria needs to draw a sample of 400 students for your study. The entire population of 10,000 is divided by the sample size of 400 to get the interval you require in selecting the subjects, which is 25. This means that every 25th in the sample is selected until the total sample size is reached.

- **Stratified Random Sampling**

This is a method of sampling that divides the population into smaller homogenous units known as strata. The groups are formed based on shared characteristics or similarities such as age, level, income etc. It helps researchers to select a representative sample that best represents the target population. Stratified random sampling is also referred to as proportional random sampling or quota random sampling.

Non-Probability Sampling

In non-probability sampling, the population units can be selected at the discretion of the researcher. Those samples will use human judgements for selecting units and has no theoretical basis for estimating the characteristics of the population. Some of the techniques used for non-probability sampling include:

- **Quota sampling**

This is the choice of sample from a homogenous population that are segmented into specified sub-groups, and then a non-random set is chosen from each sub-group according to a predefined quota. The individuals are selected according to specific qualities. The selection of the final subset is carried out according to the researchers understanding of the population.

- **Judgement or purposive sampling**

In this kind of sampling, the selection of samples is based on the researcher's existing knowledge or professional judgment. This is not commonly used in social and behavioural research studies. It is also referred to as purposive, selective, or subjective sampling

- **Convenience sampling**

This is a kind of sampling that is described as convenient to the researcher. The sample is drawn from the population that is readily available or convenient to the researcher. When you administer questionnaires to library users as they go into the

library, the final sample you will obtain is described as a convenience sample. The generalizability of this kind of sample is very limited.

- **Snowball sampling**

In the social sciences, researchers also adopt the snowball sampling technique. This is a nonprobability sampling technique which allows participants in the study to recruit other future subjects from among their group of friends or acquaintances. In this technique, the sample is cumulative that develops like a rolling snowball. Connaway and Powell (2010) refers to snowball sampling as accidental sampling. It is recommended as an appropriate method of sampling “when members of the population are difficult to identify and locate.” In such situation, the researcher engages the members of the population who can be identified and located to identify and locate other subjects of the population to participate in the study.

- **Volunteer sampling**

Volunteer sampling is described as self-selected sampling where participants self-select or volunteer to be included in a research study. The volunteers respond to an advert or volunteer when asked. This means that the researcher might publish a notice in journal requesting individuals to volunteer to participate in a study. However, it is important to note that the volunteers may not be representative of the entire population of their community.

3.2 Research Sample Size

The selection of a sample is essential in the success of research endeavours. The right sample size determines the success of data gathering and the eventual data analysis. Using the proper parameters in sample selection enables you to draw the right sample size or representative sample. Researchers do not select samples arbitrarily. They deploy the parameters that help them make informed calculations of the right sample size. To determine the right sample size, it is important to understand the key concepts that affect the determination of the research sample size. These concepts include:

- Population size:** This consists of the aggregate number of subjects or individuals within the research study group. In most research studies, the population is very large that it is practically impossible to include all for a research study. Therefore, it is imperative to choose a manageable size that is representative of the entire population referred to as a sample.
- Margin of error:** This reflects the percentage points of deviation of your results from the real population value. This percentage is helpful in the statistical analysis in selecting a sample and how much error may be acceptable. This is determined as a function of the confidence interval. The confidence interval shows the level of uncertainty. Common confidence intervals are given as 90%, 95% and 99%.
- Standard Deviation:** This refers to the level of variance in a survey. Usually, an acceptable safe number is .5, which means the sample should reflect a large size.

4.0 CONCLUSION

Choosing a representative sample is imperative in survey studies. It saves cost and time; facilitates the accurate interpretation of data.

5.0 SUMMARY

In research studies, researchers identify the population, which is the aggregate of the individuals or subjects within the research area's coverage. In most cases, it is impossible to study the whole population. This makes it imperative to choose a representative group to use in the study. This representative group is described as the sample. Samples are composed of participants or subjects. There are different ways of choosing a sample for a research study. The techniques of sample selection are generally classified into probability and non-probability sampling. Some of the probability sampling techniques include simple random sampling using a table of random numbers, cluster sampling, stratified random sampling and systematic sampling. The non-probability sampling techniques include purposive or judgmental sampling, quota sampling, and convenience sampling. Samples are selected so that it guarantees the generalizability of the results to the larger population.

6.0 TUTOR MARKED ASSIGNMENT (TMA)

- i. Briefly discuss the meaning of population of a study
 - Why do researchers select sample for study?
 - Discuss two examples of non-probability sampling technique
 - Justify the use of table of random numbers in simple random sampling

7.0 REFERENCES/FURTHER READINGS

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MODULE 4 DATA ANALYSIS

Unit 1	Methods of Data Analysis
Unit 2	Qualitative and Quantitative Data Analysis
Unit 3	Descriptive Statistics
Unit 4	Inferential Statistics

UNIT 1 METHODS OF DATA ANALYSIS

CONTENTS

1.0 INTRODUCTION

This section provides an introductory account of the various methods of data analysis that are relevant to library and information science. It gives you theoretical and practical insights and exposes you to the basic skills you require to analyse your data in your research studies. The knowledge contained in this piece is helpful for your undergraduate research work and provides a foundation for your postgraduate research.

- **INTENDED LEARNING OUTCOMES (ILOs)**

At the end of this unit, you should be able to

- Describe the various methods of data analysis relevant to library and information science research;
- Describe the theoretical and practical insights to data analysis;
- Determine the method of data analysis relevant to your undergraduate research;
- Build the necessary foundation for postgraduate research work.

- **MAIN CONTENT**

3.1 Methods of Data Analysis

Data analysis methods refer to the various techniques employed by researchers to examine the data gathered from the respondents or subjects and answer the research questions that guided the study. Your analysis could involve quantitative data, which will require statistical analysis and interpretation of figures and numbers. On the other hand, the analysis could involve qualitative data, requiring “identifying common patterns within the data and making interpretations of the meanings of the data” (Togia & Malliari, 2017).

Data analysis is generally categorised mainly into three. This includes quantitative, qualitative and mixed methods data analysis.

- Quantitative data analysis in the form of descriptive and inferential statistics. Descriptive statistics incorporate simple statistics such as frequencies, means, standard deviations and even chi-square. In contrast, inferential statistics covers

such standard statistical analysis as Analysis of Variance (ANOVA), regression analysis, Mann Whitney test. Quantitative data analysis which includes descriptive and inferential statistics will be discussed in detail in units 3 and 4.

- Qualitative data analysis is not as direct or definite as quantitative data analysis. Most researchers are usually overwhelmed by the volume of qualitative data that confront them. It is common to be faced with mounds of information in qualitative research studies. The standard practice in qualitative research is to review your data, record them and create research memos in your journal. This is usually the first analysis. Unlike quantitative data analysis where the analysis begins at the end of data collection, qualitative data analysis begins from the start of data gathering. According to Lodico, Spaulding and Voegtle (2006), qualitative research analysis of data occurs throughout the study and guides the ongoing process of data collection. This means that the different segments and pieces of data that are collected in qualitative research are systematically and gradually combined to form broader, more general descriptions and conclusions. Generally, the steps in conducting qualitative data analysis as Lodico, Spaulding and Voegtle (2006) note, include:
 - Preparing and organising the data
 - Reviewing and rechecking the data
 - Coding the data into segments or categories
 - Preparing descriptions of themes such as people, places, and activities
 - Building themes and testing hypotheses
 - Reporting and interpreting data.
- Mixed methods connote the use of two or more techniques and methods to measure the variables under investigation. This is also referred to as triangulation. Burgess (1984) says that triangulation is “the notion of three points of view within a triangle.” The mixed methods allow researchers to use a range of methods, data, investigators within any study as pointed out by Gorman and Clayton (2005). This is also in line with some research in library and information science which combines questionnaires, interviews, documentary analysis and observation enhance the validity of findings or results. Researchers believe that effective combination of methods or approaches provides the complete or insightful understanding of a phenomenon studied. However, the underlying principle in the choice of mixed methods lies on what best answers your research problem.

However, there are other methods that are also commonly identified in the literature of librarianship which we need to examine briefly in this discourse. Arora (2021) identifies three other methods of data analysis which are listed as textual analysis, statistical analysis, diagnostic analysis, predictive analysis and prescriptive analysis.

- **Textual analysis** This refers to the techniques of examining and analysing texts or contents that are unstructured to extract readable facts. Arora calls the process “slicing and dicing heaps of unstructured, heterogenous files into easy-to-read, manage and interpret data pieces.” The process of text analysis is major challenge to researchers across different fields of study. Textual analysis is also referred to as text mining, text analytics, and information extraction.
- **Statistical analysis.** This is usually a general name for quantitative data analysis. However, it could specifically refer to data collection, interpretation, and validation using a combination of statistical techniques. Arora (2021) says it is the technique that performs several statistical operations to quantify the data and apply statistical analysis. Statistical analysis is often performed with tools such as Statistical Analysis System (SAS), Statistical Package for the Social Sciences (SPSS), MATLAB etc.
- **Diagnostic analysis.** This is more elaborate than statistical analysis. It provides in-depth analysis of research data collected. It is also called root cause analysis which includes data recovery, mining, and drill down and drill through according to Arora (2021). Diagnostic analysis focuses on three functions viz:
 - Identification of anomalies which requires the researcher to identify areas that raise further questions for closer analysis.
 - Drilling into the analytics. In this, researchers look for patterns that exist outside the data sets where data from external sources could be pulled from to identify correlations and determine the causal effect.
 - Diagnostic analysis also uncovers hidden relationships that result to anomalies. Probability theory and regression analysis can be usefully applied to uncover anomalies in data analysis.
- **Predictive analysis.** As the name implies, predictive analysis uses the current data to predict future occurrence. In this type of analysis, historical data is treated to find critical patterns and trends. Predictive analysis is helpful in fraud detection, organizational risk reduction, optimizing marketing campaigns and improvement in corporate operations.
- **Prescriptive analysis.** The outcome of predictive analysis leads to prescriptive analysis. This proffers courses of action and decisions or recommendations that could be applied after predictive analysis.

4.0 CONCLUSION

The culmination of your research plans, research design and data collection is in the data analysis. To analyse your data collection successfully and produce valid and reliable results, the method you designed for the analysis is very important. The type of research determines the method of data analysis to employ. Quantitative research requires statistical analysis and interpretation of figures and numbers while qualitative research compels the use of data analysis method that involves “identifying common patterns within the data and making interpretations of the meanings of the data.

5.0 SUMMARY

Researchers are faced with two broad methods of data analysis: quantitative or qualitative data analysis. Other methods derive their roots from these two. Qualitative studies require the researcher to carefully follow the stages of data preparation and organisation which entails taking notes and transcribing interviews. It also involves reviewing and exploring the data, coding the data into categories, creating descriptions of events or places, developing themes, and testing hypotheses and reporting and interpreting data. However, researchers are increasingly becoming aware of the need for collecting both quantitative and qualitative data. The mixed methods provide an in-depth examination of context, processes and measurement of results which combines the strengths of both qualitative and quantitative research. Although the mixed method is more laborious and requires you to be competent in quantitative and qualitative methodologies, triangulation design gathers data in both methods simultaneously.

6.0 TUTOR-MARKED ASSIGNMENT (TMA)

- i. What is quantitative data analysis?
- ii. Define and discuss qualitative data analysis
- iii. What is the difference between quantitative and triangulation?
- iv. In what research situation would you recommend the mixed methods?
- v. Which method of data analysis is most amenable to statistical analysis?

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UNIT 2 QUALITATIVE AND QUANTITATIVE DATA ANALYSIS

CONTENTS

1.0 INTRODUCTION

Analysing your data is vital to the conclusion of your research study as you have spent time and money in gathering the required data. Social science research employs two common methods of data analysis. These are qualitative and quantitative data analysis. Although there is the mixed method otherwise known as triangulation, our discussion in this units focuses on qualitative and quantitative data analysis.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This section examines the peculiarities of qualitative and quantitative data analysis. Therefore, at the end of the lesson, you are expected to:

- List the several ways that differentiate qualitative data analysis from quantitative data analysis;
- Describe the strengths and weaknesses of qualitative research compared with quantitative research.

3.0 MAIN CONTENT

3.1 Qualitative Data Analysis

What is qualitative data? This is nonmetric or non-numeric data that typically depict the attributes, characteristics or categories that define events or occurrences which cannot be quantified. Interviews, focus groups, and observations most often provide qualitative data presented in narrative and visual form. Qualitative data is also generally referred to as categorical data because the properties and attributes of a phenomenon being observed can be arranged categorically.

Although there is a lot of reservation in using qualitative data, its importance in ascertaining the characteristics or traits of observations cannot be overemphasized. It provides the basis for forming parameters through which larger data sets can be obtained. It provides the foundation for the description of all observable occurrences. According to QuestionPro (2021), qualitative data helps market researchers answer questions like “who their customers are, what issues or problems they are facing, and where they need to focus their attention, so problems or issues are resolved.” It gathers and describes the emotions or perceptions of people. It is data that approximates and characterizes.

How do researchers collect qualitative data? The process of collecting qualitative data is described as exploratory; it involves in-depth analysis and research. Qualitative data collection methods are mainly focused on gaining insights, reasoning, and

motivations. Qualitative data collection methods are suited to gathering such data that cannot be measured.

Qualitative research collects descriptive/narrative and visual nonmetric data that provides insights into the problem of study. It is described as a market research method that focuses on obtaining data through open-ended and conversational communication. This method focuses on the “what” and “why” people respond the way they do. Take, for instance, a public library in Lokoja that is worried about the low patronage of its services. This situation arrives through a preliminary observation on daily visits to the public library. Through an in-depth interview of library clients, the library can gather insights into the low patronage of library services. The successful interview of the patrons reveals that the low patronage is a function of an unattractive library environment, lack of current books and general poor library services. The qualitative research methods allow for probing and questioning participants and observing their motivation and feelings from which conclusions could be derived.

Figure 4: Qualitative research methods

Some of the characteristics of qualitative research include:

- Qualitative research does not rely on a single data source. It requires the use of multiple data gathering methods such as interviews, observations, and documents, etc.
- Most often, qualitative research gathers raw and unadulterated information. This builds trust and confidence in the researcher and provides a platform for smooth communication with the respondents.
- Similarly, qualitative research enables the researcher to collect real-time data at the sight where the respondents are confronted with the problems being examined.

3.2 How useful is Qualitative Research in Library Services?

In library and information services, librarians desire and design to capture accurate, detailed insights into library and information operations. This makes it imperative to capture factual data to enable proper understanding of events or phenomena. Therefore, qualitative research is useful in library and information operations or services when:

- Qualitative research is useful in the library when new form of service or operations is planned for the clientele.
- When the library is interested in strengthening any aspect of its operations, qualitative research will help capture accurate and detailed required data.
- It is useful when the library is interested in understanding their strengths and weaknesses.

- It is useful when there is need to understand the library users and their characteristics

Afzal (2006) writes that qualitative research is rooted in logical, rational and philosophical analysis. Although qualitative research is widely criticized as an unscientific approach, it is still widely employed in many scientific studies. The field of library and information science (LIS) has been gaining prominence in every part of the world. Therefore, librarians and libraries are compelled to meet the needs of clients and organisations more efficiently and effectively. Qualitative research is contributing significantly to the understanding of several issues in information. Fidel (1993) adds that qualitative research is “non-controlling, holistic and case oriented, about processes, open and flexible, diverse in methods, humanistic, inductive and scientific.” Qualitative research is helping researchers in LIS to develop a broader understanding of its usefulness in solving research problems. The use of qualitative approaches in user studies is also becoming a point of great focus.

3.3 Validity and Reliability in Qualitative Research

Validity refers to the degree to which qualitative data accurately measures what it is designed to measure. Generally, researchers are more comfortable associating validity with quantitative research that is numerically based. However, validity in qualitative research is measured by two essential characteristics. These are trustworthiness and understanding. These two terms are also qualitative and non-numerical. According to Gay, Mills & Airasian (2012), researchers address the credibility, transferability, dependability, and confirmability of the studies and findings to establish trustworthiness and understanding in qualitative research. Credibility in qualitative research brings into focus the complexities of the study and the problems the research addressed in such a manner the readers can easily interpret and understand. Transferability refers to presenting the research report so that readers can easily connect and identify the setting. This implies that the report is detailed and descriptive, and readers can identify the context and its application. To ensure dependability, the researcher takes steps to validate the data to achieve stability. Unvalidated qualitative data creates instability and results in a non-dependable research result. Confirmability concerns the researcher’s neutrality and objectivity in handling the data. One of the ethical guidelines in research requires the researcher to be neutral and objective in gathering, interpreting, and analysing data.

To enhance the trustworthiness and understanding of your research, Maxwell (1992) counsels researchers to address the descriptive validity, interpretive validity, theoretical validity, generalizability, and evaluative validity as reflected in the table below:

Maxwell’s criteria for the validity of qualitative research

Criteria	Factual accuracy
Descriptive validity	Concern for the participant's perspective.
Interpretive validity	The ability of the research report to explain the phenomenon that has been studied and described.
Theoretical validity	Internal generalizability: generalizability within the community that has been studied.
Generalizability	External generalizability: generalizability to settings that were not studied by the researcher.
Evaluative validity	Whether the researcher was able to present the data without being evaluative or judgmental.

From Maxwell's perspective, descriptive validity refers to the researcher's accurate account without any form of distortion. This means the researcher's description of the inferences drawn from the study must not be warped. Interpretive validity refers to interpreting the respondents' input accurately. The researcher must avoid the display of personal bias in decoding participant's words or actions accurately. Theoretical validity refers to relating the phenomenon under study to a broader theoretical framework, weaving them together, and extending the application to other related subject areas. In evaluative validity, the researcher must exhibit clear cut objectivity to report the data unbiased, without making tainted judgments or evaluation of the data. The researcher should be concerned with understanding and describing the phenomenon under study rather than evaluating it. A valid research result should be generalizable beyond the immediate settings and contexts.

On the other hand, reliability refers to the extent to which the study data consistently measures what it is designed to measure. In this context, reliability concerns the techniques deployed in data gathering. That means the data collection using the same techniques should consistently produce the same data over a period.

Analysing your data is a vital stage of your research. Usually, fieldwork is tedious, time-consuming, and expensive. After collecting your data, the next stage is the analysis. Depending on the data gathered, your analysis could be qualitative or quantitative. Qualitative data analysis involves collecting and analysing non-numerical data. It is a form of data analysis common in the humanities, social sciences, education, library science etc. Even though qualitative data deals with non-numerical data, it is also used to gather in-depth data on problems and generate new ideas for research. There are two main approaches to qualitative data analysis: deductive approach and inductive approach.

- **Deductive Approach**

When you as a researcher predetermine the structure of analysing your qualitative data, which you may have collected, it is regarded as a deductive approach. This means that the researcher predetermines the structure to adopt in analysing the data before data gathering. This is applied when the researcher has a fair idea of the likely responses that would come from the respondents. The deductive qualitative data analysis approach is quick, simple and saves time.

- **Inductive Approach**

This is the opposite of the deductive approach. It is a more thorough approach, more time-consuming, laborious, and costly. It is an approach that is not based on a predetermined structure or prior set ground rules. Researchers adopted the inductive approach when they have little or no understanding of the research phenomenon.

3.4 Steps to Qualitative Data Analysis

Recall that we identified qualitative data collection methods in previous pages to include interviews, records, observation, case studies, etc. To ensure reliable data analysis, you need to follow the steps discussed below.

Step 1: Arrange your Data

There is a need to put some structure in the data you have collected. Usually, the data is unstructured and scattered when gathered from the respondents. The first step, therefore, is to transcribe the data. This means arranging your data systematically. It also means converting the data into text format. You can use computer-assisted qualitative data analysis software (CAQDAS). Various CAQDAS programs can analyse qualitative data, such as interview transcripts, magazine or billboard ads, speeches, music, and television news stories. Examples of popular programs used by several researchers include ATLAS.ti and MAXQDA.

Step 2: Organize all your Data

The next step is to organize your data. The chances are that your data may be large. It is logical to transform and arrange them. This arrangement provides some order and logic. Following this, you organize your data according to your research questions and the objectives of your study. One of the failures in preparing for analysis is to begin the analysis with unorganized data. This is a major pitfall every researcher should avoid. Analysis with unorganized data may lead to a waste of time, resources most likely invalid conclusions.

Step 3: Code Your Data

Even though your data is qualitative, coding is still essential. It is imperative to categorize and assign properties and patterns to your data. Coding helps you in easy manipulation of the data in the analysis. It helps you to compress a large amount of data you may have collected. Categorizing and assigning patterns to your data makes it easy to gain insight and be able to arrive at informed decisions.

Step 4: Validate your Data

Validating your data is not peculiar to qualitative data analysis. It is a recurring step that the researcher upholds throughout the research process. Data validation is an important step in the successful conduct of any research. It is imperative to

deliberately ascertain that there is no flaw in the data you have arranged, organized, and coded before the final stage of your analysis. You validate your data in the light of the accuracy of your research design or methods, and the extent to which the methods adopted will produce accurate data consistently.

Step 5: Presenting Your Report

This is the last stage of your qualitative data analysis. This is the stage of systematically presenting your data and compiling your report. This should contain every detail of the journey of the study. The report should contain the method you adopted in conducting the study, the research design, and the limitations. It must also state the findings, conclusions, and recommendations.

3.5 Quantitative Data Analysis

Quantitative research in simple terms, refers to the process of gathering and analysing numerical data. Gay, Mills and Airasian (2011) define quantitative research as the gathering and analysis of numerical data which helps to describe, explain, predict, and draw inferences on phenomena being studied. It is the opposite of qualitative research which collects and analyses non-numerical data. Although quantitative research is prevalent in the natural sciences, it is still applicable in the social and behavioural sciences.

Research hypotheses are tested using statistics which involves quantitative methods. To collect quantitative data, researchers design research questions and hypotheses that are stated in observable and measurable terms.

3.5.1 Data Collection in Quantitative Research

Just as we discussed in qualitative research, quantitative research employs several methods in gathering data for analysis. It often employs standardized, formalised, or established methods in data collection. Some of these methods include surveys using telephones, mail, the Internet, or questionnaire.

Quantitative research entails stating the research questions, hypotheses and specifying the research procedures to carry out the study. It also requires identifying a large sample of participants that would provide statistically meaningful data.

3.5.2 Advantages of quantitative research

Quantitative research deals with numerical data. It employs inferential statistics in data analysis which helps to extrapolate or generalize research findings to the research population. Apart from generalizability, quantitative research has several other advantages:

- **Replicability**

Replicability is a major strength of any research method. This is where the research could be repeated following the same steps and getting the same result. Quantitative research method is amenable to replicability because it employs standardized data collection methods and quantitative data analysis protocols. Quantitative research also makes it possible to reproduce studies in other different settings, with different participants and results compared statistically.

- **Hypothesis Testing**

Quantitative research employs established and formalized methods to test hypothesis. This means that the data collection methods and analysis also follow measurable and established procedures that allow hypothesis testing. Hypothesis testing using inferential statistics genders valid and reliable outcomes and inferences that can be applied to a wider research community.

- **Convenient Way to Handle Large Samples**

Quantitative research allows the handling of data from large samples. It provides the procedures to process and analyse large data using reliable and valid methods.

- **Precision in Reporting Results**

Quantitative research uses numbers that allows greater precision in reporting results. Using the appropriate measuring instrument, quantitative research allows the researcher to report in exact terms, figures derived from variables studied.

3.5.3 **Disadvantages of quantitative research**

Quantitative research poses a herculean task to so many researchers especially the inexperienced. Some of the drawbacks of quantitative research include:

- **Inadequate in Explaining Complex Concepts**

Quantitative research often uses precise and restrictive operational definitions to explain concepts. Sometimes, these precise and operational definitions do not adequately explain and represent complex concepts that may require detailed qualitative explanation.

- **Structural and Procedural Bias**

Although quantitative research employs formalized and established procedures in data collection and analysis, it does not eliminate procedural or structural bias that may be introduced in the study. Procedural and structural bias involve missing data, inappropriate sampling methods, imprecise measurements that may lead to wrong inferences.

- **Cultural and Historical Deficiency**

In the sciences and laboratories, quantitative research employs settings that are not natural in conducting studies. This excludes the historical and cultural peculiarities or contexts that may affect data collection, analysis, and research results.

3.6 **Mixed Methods Research**

For decades, there has been arguments or frictions over quantitative or qualitative research methods. The consensus is that both methods are important. While some disciplines favour qualitative research, others prefer quantitative research. However, there are occasions where the two methods are imperative in understanding any phenomenon. This gave rise to the term triangulation which refers to the “use of both qualitative methods and quantitative methods to fully understand the nature of a research problem” (Wimmer & Dominick, 2014). Triangulation is also referred to as mixed methods research. It is important to note that your research findings are generally affected by the mode of procedure employed for data collection. This also means that if your findings are affected by the data collection technique used, the

validity will be in question. This is a reason that compels researchers to use two or more techniques and methods to measure their research variables. According to Burgess (1984), triangulation or mixed methods implies “the notion of three points of view within a triangle.” This is the idea of the mixed methods research which Gorman and Clayton (2005) suggested, to allow the researcher the opportunity to use a range of methods, data, investigators, and theories within any study. Most doctoral research in several universities advocates

triangulation which most often involves the simultaneous use of questionnaires, interviews, documentary analysis, and observation to collect research data. Although this may be very tasking and burdensome, however, consistent findings among the different data collection techniques invariably imply that the findings are relatively valid.

Triangulation is not a one-off technique that automatically guarantees validation. It requires a systematic planning, and a deliberate gathering of different types of data. However, when the mixed methods design is properly laid out and executed, it is a strategy that helps obtain layers of knowledge about a complex phenomenon. According to Denzin (1978), there are generally four types of triangulations viz:

- Data Triangulation – This is where the investigator combines data from different sources i.e., using two or more methods for the validation of the findings and results. This is also referred to as cross examination because of the multiple checks on the findings from the researcher study.
- Investigator Triangulation – This is the combination of data collected by multiple researchers i.e., the use of multiple researchers in the study of a particular phenomenon.
- Methodological Triangulation – This combines the data collected through different methods. In other words, researchers employ several methods to achieve multiple perspectives on issues being investigated.
- Theory Triangulation – This combines data collected from multiple theoretical perspectives. This kind of triangulation is not common in library and information science studies.

Wildemuth (2017), adds that in a study of a library issue requiring investigator triangulation, the investigator may integrate the data gathered by different researchers. If it is in a study requiring data triangulation, the researcher may gather data from several sources: cataloguing staff, library management staff, policy and procedure manuals, and library web transaction logs. For methodological triangulation, the investigator may employ direct observation of the workplace, library staff interviews, content analysis of policy manuals and transaction log analysis. In each case, the application of triangulation in the process will require comparing the findings from each investigator/source/method, and carefully ensuring that the results and inferences drawn from the study are valid.

- **CONCLUSION**

Every research study involves the collection of data and the choice of methods of analysis. Data analysis can be achieved through the qualitative, quantitative technique or triangulation. Triangulation of multiple data sources and data collection methods increases the rigour of the process and enhances the validity of findings and conclusions. Multiple types of triangulation strengthens research studies.

5.0 SUMMARY

In this unit, we have examined qualitative and quantitative data analysis. Qualitative data is non-numeric that shows the attributes, characteristics or categories that define events or occurrences which cannot be quantified. Qualitative research is very useful in library and information science. The approaches to qualitative data analysis include deductive and inductive approaches. Similarly, quantitative data analysis refers to the gathering and analysing of numerical data. Its strengths lie in replicability, hypothesis testing, convenience in handling large samples and precision in report results. The mixed methods or triangulation is the use of both qualitative and quantitative methods to study and fully understand a phenomenon.

6.0 TUTOR-MARKED ASSIGNMENT (TMA)

- i. What is triangulation of research?
- ii. Discuss four types of triangulations
- iii. Discuss three advantages of quantitative research

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UNIT 3 DESCRIPTIVE STATISTICS

CONTENTS

1.0 INTRODUCTION

This unit is intended to help you develop basic understanding of statistical terminology and be able to determine the statistical concepts applied in some professional literature in librarianship. It is also aimed at helping you develop the competence and know-how to analyse your research data using simple descriptive statistics. It provides you with the foundation for more advanced statistical coursework especially at the postgraduate level. The emphasis here is on practical application of the basic concepts in descriptive statistics to your undergraduate research work.

This segment, therefore, explains the application of the statistical procedures in describing the information gathered during your research study. The discussion focuses on the interpretation and applicability of these statistics and not just the theoretical rationale and mathematical derivation.

- **INTENDED LEARNING OUTCOMES (ILOs)**

At the end of this unit, you should be able to

- Describe the process of preparing data for analysis;
- Define, describe, and differentiate between types of descriptive statistics,
- Employ any form of descriptive statistics in your research analysis
- Use frequency tables and pie charts to present and interpret your data.
- Present, compute and interpret the mean, median, and mode of a distribution
- Identify the situations where the mean, median, or mode is considered the most appropriate measure of central tendency.
- Identify, compute, and interpret the range and standard deviation of a distribution.

- **MAIN CONTENT**

- **3.1 Descriptive Statistics**

Descriptive statistics describes the analysis of data using simple statistics such frequency distribution, measures of central tendency to describe or summarize data meaningfully and generate patterns helpful for conclusions. They are simply helpful ways to describe your data, which assists your readers to easily interpret and utilize your research data. Descriptive statistics provides you avenues to describe data using simple tables, percentages, frequencies, measures of central tendency, pie charts,

histogram, and graphs. The measures of central tendency as descriptive statistics incorporate the mode, median and mean. These are used to describe the central position of a “frequency distribution for a group of data.”

Preparing Data for Analysis

Data gathering is undertaken in the field where responses are recorded in various forms. These data require some form of transformation, transcribing or decoding. Therefore, when you have collected your data, you convert the participants’ responses into some numeric system or coding. This could be scoring quantitative data or coding qualitative data. At this stage, it is essential to score your data accurately and consistently. This ensures errors are minimized. It also means that the instrument used for data collection should have spelt out the steps to following the data. However, scoring open-ended items are more problematic, complex and tasking. when open-ended items are to be used, the researcher should determine and delineate at the beginning the procedure for scoring and follow that conscientiously.

3.2 Frequency Distributions

Frequency distribution is one of the commonest methods of descriptive statistics. It is used to simplify and organise a set of scores. This involves tabulating the scores in a simple and straight measurement scale and indicating the number of times each score occurs. Frequency distribution is generally presented in a table of two or three columns. The first column lists the set of scores which represent the responses from subjects or items of data. The second column lists the frequency or the number of occurrences of each response. The third column lists the percentage of each response computed based on the total number of responses. The table below is a frequency distribution of types of libraries in a particular state in Southwest Nigeria:

Table 1: Frequency distribution of types of libraries

Institutions	Frequency	%
University libraries	6	4.1
College libraries	10	6.9
Research/special libraries	4	2.8
Public libraries	18	12.4
School libraries	80	55.1
Law libraries	4	2.8
National libraries	1	0.7
Private libraries	22	15.2
	145	100

This is a frequency distribution of the responses on the number of each type of library in the chosen state. The table simplifies and organises the data for easy interpretation and inferences to be drawn. From the table, you can deduce that four percent of

Figure 5: Pie chart of frequency distribution of types of libraries

libraries in the state are university libraries, the college libraries in the state are ten which constitute 6.9% of the libraries in the state. The same deduction can be made for all the other types of libraries.

Interestingly, the data in the frequency distribution table can assist you to produce frequency graph, histogram, bar chart or pie chart.

The pie chart displays a pictorial analysis of the data on libraries in the state. It gives you an easy distribution of the various libraries across the state. The pie chart is a powerful tool in presenting your simple descriptive data which makes it easy and simple to understand, interpret and draw conclusions.

The data in the frequency distribution table can also be represented in a line chart, bar chart or histogram as in the example below:

Figure 6: Bar chart of frequency distribution of types of libraries

Mean (X̄)

This is the commonest, most used and well-known measure of central tendency. It is mostly used with continuous data. It is commonly regarded as the arithmetic average. Remember the general term 'grade-point average' which is the mean value of all the scores. This is generally calculated by dividing the sum of all the scores by the number of scores. Therefore, the mean is computed by adding all the values in the data set divided by the number of values in the data set. The formula for mean:

$$\bar{X} = \frac{\sum X}{N}$$

$$\bar{x} = \frac{\sum x}{N}$$

Where mean

\sum = sum of

X = scores in a distribution

N = number of scores

The scores of six library science students in a statistics test is represented thus:

Alfred	53
Musa	51
Matthew	48
John	67
Laraba	54
Mariam	56

Find the mean

X = 53, 51, 49, 67, 54, 56

330

$$\bar{X} = \frac{\sum X}{N} = \frac{330}{6} = 55$$

The mean shows the score performance of the students. You can derive conclusions and draw some inferences from the performance.

Median (Md)

The median represents the point in an array that stands half-way between above and below of the scores. It indicates the measure of position. In other words, the median is the middle score which is arrived at by inspection rather than calculation. Sometimes, the median may not easily be determined by inspection but may require the addition of two numbers where the array of scores is an even number as in our earlier example: 53, 51, 49, 67, 54, 56. The scores in red i.e., 49 & 67 becomes the median. In this case, the two scores are added together and divided by two to arrive at 58.

Group A	Group B
9	45
7	38
6	35
4	35
4	23
3	18
1	15

The Mode (Mo)

This denotes the most frequently occurring value in a series. The mode is the item around which there is maximum concentration. It is the size of occurrence which has the maximum frequency. The mode is described as a positional average and is not affected by the values of extreme items (Kothari, 2004). The mode of distribution is useful in the study of popular sizes. However, the mode is not amenable to algebraic treatment and sometimes remains indeterminate when there are two or more modal values in a distribution. It also does not permit assigning relative importance to items

in a distribution. The mode is a measure of central tendency that can be used for categorical variables.

According to the Open University of Hong Kong (2012), any distribution that is both unimodal and symmetrical, puts the mean, median, and mode very close to each other at the peak of the distribution. While in a bimodal or asymmetrical distribution, the mean, median, and mode are likely to be different. However, the mode will be at the tallest peak in a bimodal distribution.

The mean, median and mode as measures of central tendency work together in analysing your data. As a researcher, you are not restricted to the choice of only one measure of central tendency. Each one provides slightly different information, and all of them can be useful.

Measures of Variability

Usually, researchers do not depend heavily on measures of central tendency. Although they are very useful statistics for describing a set of data, but they are very limited. The means or medians of two set of scores that are widely divergent will reveal very little of the differences in the scores. The mean and median of a first group of students was 50% because they all scored 50. For the second group of students, a student scored 100% and another scored 0. This means the group mean and median are also 50. Meanwhile, the groups are clearly not the same. This paints a picture of the limitation of the measures of central tendency. To take care of this kind of situation, researchers go further into the measures of variability, which indicates the spread out of group scores that could truly reveal the degree of variability or variation in the scores. The most common measures of variability include the range, the quartile deviation, and the standard deviation.

The Range

This is the most appropriate measure of variability for nominal data. As the name implies, it is the range of recorded scores which simply displays the difference between the highest and lowest score in a distribution such as a test scores for the public library users from 20.5 to 78.6 which is 58.1. This is arrived at by subtraction. Although the range provides quick estimate of variability of a distribution, it does not say much, and its use is limited.

Quartile Deviation

This is the most appropriate measure of variability for ordinal data. The quartile deviation is computed as the one half of the difference between the upper quartile and the lower quartile of the scores of a distribution. The upper quartile represents the top 25% of the scores or the 75th percentile. While the lower quartile is the 25% of the scores or the 25th percentile. This difference between the lower quartile and the upper quartile and divided by two produces the measure of variability. The result of the computation of the quartile deviation indicates how close together or spread out the scores. If the result of the quartile deviation is small, the scores are close together; if the result of the computation is large, the scores are more spread out. This is a more stable measure of variability than the range and measures of central tendency.

Variance

$\bar{x} = \frac{\sum x}{n}$ The variance is a measure of variability. It is the level of spread among scores. If the variance is small, the scores are close together; if it is large, the scores are more spread out. It is calculated by taking the average of squared deviations from the mean. Its calculation shows how far each score is from the mean. It indicates the degree of spread in your data set. The more spread the data, the larger the variance is in relation to the mean. Take the scores of five students at a school library to be 40, 30, 35, 45 and 35. Computing the mean of these scores produces $= 185/5 = 37$. This gives a difference in mean scores as indicated below:

Calculating the Variance

When you use computer software for statistical analysis, the variance is calculated automatically. However, you can calculate variance following the five steps and the formula discussed below.

Step 1: Find the mean

To find the mean, as we did above, add all your scores and divide the total by the number of scores

Mean (\bar{x})

$$\bar{x} = (40 + 30 + 35 + 45 + 35) \div 5 = 37$$

Step 2: Find each score's deviation from the mean

Find the deviation from the mean of each score by subtracting the mean from each score.

Since $\bar{x} = 37$, subtract 37 from each score as indicated below:

$$40 - 37 = 3$$

$$30 - 37 = -7$$

$$35 - 37 = -2$$

$$45 - 37 = 8$$

$$35 - 37 = -2$$

Step 3: Square each deviation from the mean

Multiply each deviation from the mean by itself. This will result in positive numbers.

Squared deviations from the mean:

$$3^2 = 3 \times 3 = 9$$

$$(-7)^2 = 7 \times 7 = 49$$

$$(-2)^2 = 2 \times 2 = 4$$

$$8^2 = 8 \times 8 = 64$$

$$(-2)^2 = 2 \times 2 = 4$$

Step 4: Find the sum of squares

The sum of squares is calculated by adding all the squared deviations.

Sum of squares

$$9 + 49 + 4 + 64 + 4 = \mathbf{130}$$

Step 5: Divide the sum of squares by $n - 1$ or N

Divide the sum of the squares by $n - 1$ (for a sample variance) or N (for a population variance).

Our working example is population variance N , where $N = 5$.

Variance:

$$130 / 5 = \mathbf{26}$$

The computational formula for variance:

$$= \frac{\sum (X - \bar{X})^2}{n}$$

The sum of the squares of the difference will produce:

$$9 + 49 + 4 + 64 + 4 = 130 / 5 = \mathbf{26}$$

The variance is hardly used by itself. It is a pathway to the standard deviation. The standard deviation is derived from variance.

Standard Deviation

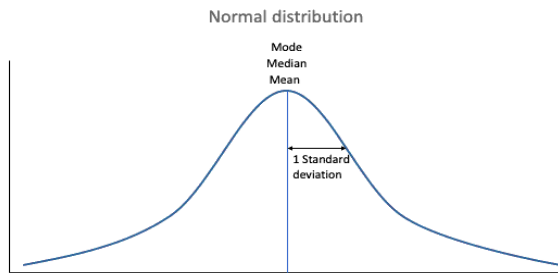
This is the commonest and most used measure of variability. This is computed from the square root of the variance of scores. For instance, in our example above, the variance is **26** and the square root is **5.1**. The standard deviation is adjudged to be the most stable measure of variability. It is a useful measure of spread for normal distributions or parametric statistics. According to Bhandari (2021), normal distributions allow data to be symmetrically distributed with no skew. Most values cluster around a central region, with values tapering off as they go further away from the centre. The standard deviation tells you how spread out from the centre of the distribution your data is on average.” The standard deviation provides a standardized value you can use to compare one set of scores to another. When the mean and standard deviation of a set of scores are known, you have a platform to determine what all the scores look like. This means both results can help you describe a set of data quite well.

Normal Distribution

In research, it is common to hear of normal distribution, normal curve or skewed distribution. When data is collected and examined, it reveals the distribution to be normal or skewed. In normal distribution, the data is symmetrically distributed with no skew. When your data is translated graphically and it is normally distributed, it displays a “bell shape with most values clustering around a central region and tapering off as they go further away from the centre.” For instance, examine the final year students result or degree students results generally, you will notice the spread of scores from ‘As’ to ‘Fs.’ You will discover on a closer look, that there are “equal but small number of As and Fs, more Bs and Ds, and then lots of Cs in the middle” (Gay, Mills, & Airasian, 2012).

Source: scribbr.com

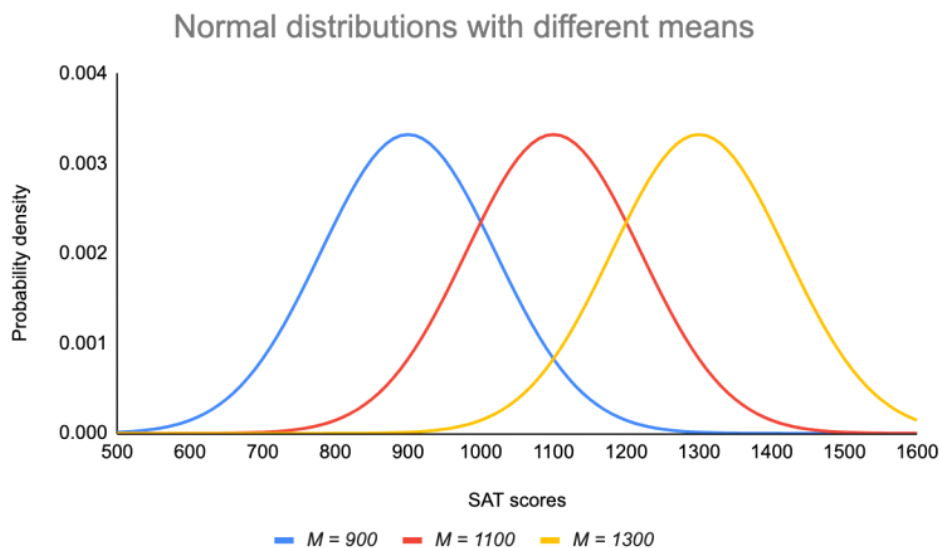
Figure 7: Students scores



When you take the readings of the height of a group of people, and plot the graph, you will get the bell-shaped curve. This is because most people are between 5 feet and 6 feet tall. Only very few will be over 7 feet tall. Likewise, very few too will fall under the category of 4 feet tall. The middle will be clustered with the group of persons who are 5-6 feet tall. This kind of distribution with fewer persons at the extremes and more people in the middle is referred to as normal distribution. Most variables we deal with on regular basis are considered normal distribution. Examples include age, weight, reading ability, job satisfaction, scholastic aptitude test, and intelligent quotient scores. Imagine for instance, where students sat for a test in an examination and all students score A. Or all the students score E or C. That will be strange. The distribution for this kind of score will be skewed, in other words abnormal.

Figure 10: Normal distribution with different means

Source: scribbr.com



What is the significance of normal distribution in research? Normal distributions show that the distribution is symmetric about the mean – half the values fall below the mean and half above the mean. This means that fifty percent of the scores are above the mean, and 50% are below the mean. It also means that the mean, median and mode have the same value. The normal distribution can be described by two values: the mean which is the location parameter and the standard deviation which is the scale parameter.

Normal distributions are also called Gaussian distributions or bell curves because of their shape.

The mean determines where the peak of the curve is centred. Increasing the mean moves the curve right, while decreasing it moves the curve left.

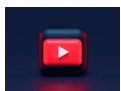
The mean determines where the peak of the curve is centred. Increasing the mean moves the curve right, while decreasing it moves the curve left. The standard deviation stretches or squeezes the curve. A small standard deviation results in a narrow curve, while a large standard deviation leads to a wide curve.

Empirical Rule

In normal distribution, there is the principle of empirical rule or the 68-95-99.7 rule, that indicates where most of your values lie. The summary of the rule indicates that:

- Approximately 68% of observations are within the first standard deviation ($\mu \pm \sigma$) from the mean.
- Approximately 95% of values are within the first two standard deviations ($\mu \pm 2\sigma$) from the mean.
- Approximately 99.7% of values are within the first three standard deviations ($\mu \pm 3\sigma$) from the mean.

The empirical rule is useful in statistics for forecasting final outcomes. When you have calculated your standard deviation, the empirical rule can be applied to determine the rough estimate of the outcome of the impending data to be collected and analysed. According to Hayes (2021), the empirical rule is also referred to as the *three-sigma rule* which is a statistical rule which states that for a normal distribution, almost all observed data will fall within three standard deviations (denoted by σ) of the mean or average (denoted by μ).



Click to watch this pertinent video on empirical rule

Skewed Distributions

In our previous discussion, we focused on normal distribution. In this segment, we are interested in the opposite of normal distribution. On the other hand, a distribution that is different from the normal is regarded as an abnormal distribution or is said to be skewed. A normal distribution is regarded as symmetrical; the graph is the bell-shaped curve with the mean, the median, and the mode all the same. Remember that a normal distribution has approximately the same number of extreme scores (i.e., very high and very low) at each end of the distribution (e.g., the same number of As and Fs when grading on the curve). In the graphical representation of the distribution, if one tail is longer than another, the distribution is skewed.

A skewed distribution is sometimes called asymmetrical distribution because they do not show any kind of symmetry; the values of the mean, the median, and the mode are different, and there are more extreme scores at one end than the other. In other words, symmetry

implies that one half of the distribution is a mirror image of the other half. A distribution can be left skewed. This means that it has a long-left tail. A left-skewed distribution is also called negatively skewed distribution. A negatively skewed distribution has extreme scores at the lower end of the distribution. Similarly, a right-skewed distribution has a long right tail. They are also called positively skewed distributions, and a positively skewed distribution has extreme scores at the higher end.



Watch this brief, simple and interesting video on skewed distribution

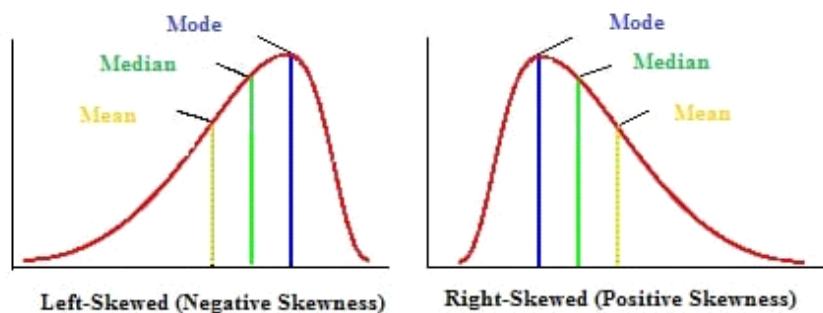


Figure 11: Negative and positive skewness

Source: <https://www.statisticshowto.com/probability-and-statistics/skewed-distribution/>

4.0 CONCLUSION

Descriptive statistics is helpful to researchers. It provides you the tools for simple basic statistical analysis that assists in the description of your data. It is also the foundation for more advanced statistical analysis of data. The simple practical application of basic statistical analysis to your research study begins with descriptive statistics. Such simple statistics as

frequency distribution, measures of central tendency, normal and skewed distributions help to describe or summarize data meaningfully and generate patterns helpful for conclusions

5.0 SUMMARY

In this unit, we have examined descriptive statistics, in which we focused on measures of central tendency which describe or summarise data meaningfully and generate helpful patterns to aid your conclusions. The mean, median and the mode are common measures of central tendency, and they work in tandem with the measures of variability.

Frequency distribution helps to simplify and organise a set of scores using frequency tables. From this, a graph, histogram, bar chart or pie chart can be developed.

When you collect and examine your research data, it displays a normal or skewed distribution. A normal distribution displays a bell shape with the data symmetrically distributed without skew.

The opposite of the normal distribution is the skew distribution. This is the abnormal distribution that is asymmetrical because there is no kind of symmetry. This means that the mean, the median and the mode have more extreme scores at one end than the other.

• TUTOR-MARKED ASSIGNMENTS

- State two reasons why it is important to summarize data.
- Define descriptive statistics and explain how they are used to describe data.
- Identify and construct tables and graphs for frequency distributions.

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UNIT 4 INFERENTIAL STATISTICS

CONTENTS

1.0 INTRODUCTION

Descriptive statistics help researchers to describe a set of data, while inferential statistics allow them to make inferences from a set of data. While descriptive statistics dwell on the characteristics of your data which focus on the frequency of each value (distribution), the averages of the values (central tendency) and the spread out of the values (variability), inferential statistics go further to generalize on the population. Descriptive statistics precisely describe the data you gathered; inferential statistics generalize.

This unit brings you to inferential statistics that assist researchers to make intelligent guesses or conclusions that applies to the larger population. Inferential statistics relies on representative sample to arrive at valid statistical inferences about the population. The discussion on inferential statistics will take us to such areas as linear regression and correlation, statistical significance and hypothesis testing, and nonparametric tests.

- **INTENDED LEARNING OUTCOMES (ILOS)**

At the end of this unit, you should be able to do the following:

- Explain the concept of inferential statistics
- Determine the essence of inferential statistics in research
- Describe the logic of null hypothesis testing in research
- Develop and test hypothesis for your study
- Select any of the aspects of inferential statistics to apply to your study.

- **Main Content**

- **Inferential Statistics**

In the previous unit, we examined descriptive statistics which summarize the characteristics of a data set. This unit brings us to inferential statistics which help us to reach conclusions and make predictions based on the data being worked on. Gay, Mills, and Airasian (2012) define inferential statistics as the techniques for determining the likelihood that research results from sampled data would be the same if obtained from the entire target population. In other words, they are statistical techniques that are employed to make inferences about parameters, based on the data gathered from the sample.

Generally, inferential statistics assist researchers to understand the larger population from which a sample is drawn for study. Which means that inferential statistics assist in making estimates or generalizations about target populations and testing hypotheses to make conclusions about the target populations. Some authors have described inferential statistics as the “mathematics and logic of how this generalization from sample to population can be made.”

Inferential statistics uses the characteristics of the sample to assign characteristics of the target population and determine the strength of the relationship between independent and dependent variables. Hypothesis testing are associated with inferential testing. Every standard and professional research develops research questions and hypotheses that guide the study. Hypothesis is an intelligence declarative statement which relates the relationship between the independent and dependent variables which are empirically verifiably. Generally, hypotheses are stated in Null form which are subjected to testing to determine if they are rejected or accepted. The procedure for testing the hypotheses requires the adoption of inferential statistics which uses the data drawn from the sample to determine the credibility of the hypotheses. We will discuss hypothesis testing in more detail in our later discussion.

3.2 Sampling Error and Sampling Bias

In applying inferential statistics, researchers are confronted with two primary concerns. These are referred to as sampling error and sampling bias. A sampling error occurs when the sample selected a researcher is not representative from the target population. Therefore, the data and the results produced do not represent the results that would be obtained from the entire population. Sampling error when introduced into the research process undermines the credibility of the entire outcome of the research results. Recall that in our discussion on sample, we talked about representative sample – a selected group that stands in for the whole of your target population. To select a sample that is a fair representation of your entire population, the researcher follows some sampling best practices. The primary ground rule is *getting your sample size right*. When the sample is too large, it becomes cumbersome, costly and time-consuming which will not amount to any meaningful gain; when it is too small, and it does not truly represent the entire population. However, it is important to note that sampling error is not the same as the mistakes researchers make when selecting or working with a sample. These are described as non-sampling errors. Some of the mistakes a researcher can make in dealing with sample include:

- **Wrong population specification.** When the researcher does not understand the population very well and selects the wrong participants to study. To avoid this kind of mistake, it is mandatory to thoroughly understand your research questions before constructing your questionnaire or selecting the participants.
- **Sample frame error.** This occurs when the wrong sub-population is selected for sampling. This is introducing bias unconsciously in the sampling process which inadvertently excludes some respondents that should be sampled. Conversely, this kind of sampling mistake can also mean

incorrectly including respondents from the target population who are not relevant to the scope of the study.

- **Selection error.** This is also common in sample selection. It occurs when only the interested respondents respond to the researcher's instrument. This might also come from the researcher's action of contacting some participants through phone calls or social media and neglecting the others. The researcher can take extra steps to secure respondents' participation. This might require pre-sample, actual sampling and post sampling follow-up.



Invariably, sampling errors arise from an event of variation in the number or representativeness of the sample that responds. Sampling errors can be minimized by carefully designing your sample, selecting a sample size that is large enough to be representative and maintaining multiple contacts with participants to ensure a representative response. Sample size calculator can be used online: <https://www.surveysystem.com/sscalc.htm> or <https://www.surveymonkey.com/mp/sample-size-calculator/> here:

Keep an eye on your sampling and non-sampling errors so you can avoid them in your study.

- **Linear Regression and Correlation**

In most research studies, researchers measure one or more variables for each participant. This means that researchers collect pairs of data referred to as bivariate data and describe the data using the concept of correlation. Bivariate data allows the measurement of two variables on each research subject. In other words, the relationship between the variables is ascertained to establish if the change in one variable affects corresponding change in the other. One of the inferential statistics used by researchers to establish the relationship between two variables is correlation or simple linear regression analysis. Therefore, correlation is regarded as “the statistical association between two variables.” A correlation analysis provides information on the strength and direction of the linear relationship between two variables. When a variable is related to the other in some way, shows that correlation exists. In statistics, the scatterplot also called scatter diagram is a graph of paired (x, y) data used to determine the relationship between the variables. A scatterplot generally helps researchers to establish:

- That there is no correlation when the points do not show any pattern.
- That there is a non-linear relationship when the points on a scatterplot follow a pattern that is not a straight line.
- That there is linear relationship when the points on a scatterplot follow a pattern of straight line.

Other hand, a simple linear regression analysis provides the estimates to determine the parameters in a linear equation to predict values of one variable based on the other.

Linear relationships in variables can assume positive or negative values. Positive relationships point upwards to the right. While negative linear relationship points downward to the right. In positive linear relationships, as the values of 'x' increases, 'y' values increase. Similarly, when the x values decrease, y values decrease. This is different from negative linear relationship whereas x values increase, y values decrease and as x values decrease, y values increase.

However, variable relationships can be non-linear when there is an apparent pattern that is not linear. For example, as age increases height increases to a maximum height and levels off. Two variables may not have any relationship when there is no straight-line relationship or non-linear relationship, i.e., when there is a change in one variable, it does not affect the other variable.

3.4 Linear Correlation Coefficient

Linear correlation coefficient is used to estimate the strength and direction of the relationship between two variables. It is a precise and objective measure to determine the correlation between two variables. The Pearson's product-moment correlation coefficient (r) is the measurement of the degree of linear association between two variables or how the changes in one value correspond with changes in another value. This name was given in honour of Karl Pearson, who developed the term. It usually assumes the form from -1 to +1, where a negative relationship is indicated by a negative value. In other words, as one variable increases, the other decreases (or vice versa). A positive coefficient indicates a positive relationship, or, as one variable increases, the other increases, or they both decrease. When the value is 0, or near 0, it means there is little or no linear relationship between the variables. For example, we can determine correlation coefficient between the frequency of borrowing general mathematics books and the number of times they must be repaired. The linear correlation coefficient is computed using the formula:

$$r = \frac{\sum \frac{(x_i - \bar{x})(y_i - \bar{y})}{s_x s_y}}{n-1}$$

where \bar{x} and s_x are the sample mean and sample standard deviation of the x's, and \bar{y} and s_y are the mean and standard deviation of the y's. The sample size is n.

- **Statistical Significance and Hypothesis Testing**

Hypothesis is an intelligent guess which states the relationship between variables. Researchers state hypothesis in two forms – the **Null hypothesis** and the **Alternate hypothesis**. However, the null hypothesis is the most used form of hypothesis testing. The Null hypothesis testing is considered a formal method of deciding between two interpretations of a statistical relationship in a sample. This is stated in the negative form. This is expressed in the statement that there is no relationship in the population and the relationship in the sample is a function of sampling error (Open University of Hong Kong, 2012). The alternate interpretation is referred to as the alternate hypothesis. This is expressed in the positive form. It expresses the idea that there

exists a relationship in the population which is also reflected in the sample. Therefore, researchers interpret statistical relationship in a sample in either of these two ways. How do researchers determine exactly whether relationship exist in the variables under investigation or not? This is the logic behind hypothesis testing. The general accepted principle is to state and test the null hypothesis. This is done with the following basic assumptions guiding the testing:

- It is generally assumed that the null hypothesis is true. That is there is no relationship between the variables in the population.
- It is also assumed that the result of the sample relationship can be determined if the null hypothesis were true.
- It is also assumed that if there is no relationship between the variables in the sample, the null hypothesis is rejected and the alternate hypothesis accepted. Otherwise, the null the null hypothesis is retained.

3.6 Nonparametric Tests

Nonparametric tests or statistics that are used with smaller samples because they are distribution free that do not require the assumption of a normal population, i.e., they are distribution-free tests that are based on fewer assumptions. Nonparametric tests are not as powerful as parametric tests. According to Connaway & Powell (2010) the level of significance in nonparametric tests is the probability of rejecting a true hypothesis. It is usually set at .05 or .01, which means that the null hypothesis, or the prediction of no relationship, is to be rejected if the sample results are among the results that would have occurred no more than 5% or 1% of the time. This means that a significance level of .05 means that there is a 5% probability that the researcher will reject a hypothesis that is true. Some of the common forms of nonparametric tests are:

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$$

- **Chi-square test (X²).** This is one of the most basic nonparametric tests useful for determining if a statistically significant relationship exists between two categorical variables. Chi-square is frequently used for causal comparative studies. It is used to determine if any statistically significant difference between the expected frequencies and observed frequencies in one or more categories of a contingency table. The chi-square tests the probability of the frequency distribution occurring by chance. Chi-square is calculated by the following formula:

Where:

X ²	=	Chi-square obtained
Σ	=	the sum of
O	=	Observed scores
E	=	Expected scores

$$U = n_1 n_2 + \frac{n_2(n_2 + 1)}{2} - \sum_{i=n_1+1}^{n_1+n_2} R_i$$

- **Mann-Whitney U-test.** Is a nonparametric alternative test to the independent sample t-test. It is used to compare two sample means drawn from the same population to determine if the two-sample means are equal or not or to test for a significant difference between the two groups. Mann-Whitney U test is used when the assumptions of the t-test are not met. Mann Whitney U test is calculated using this formula:

Where:

- U = Man-Whitney U test
- N1 = Sample size one
- N2 = Sample size two
- Ri = Rank of the sample size

$$H = \left[\frac{12}{n(n+1)} \sum_{j=1}^c \frac{T_j^2}{n_j} \right] - 3(n+1)$$

- **Kruskall-Wallis H test** is used as an alternative to analysis of variance. Kruskal-Wallis is sometimes referred to as “one-way ANOVA on ranks” used to determine the statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. It is considered an extension of the Mann-Whitney U test to achieve the comparison of more than two independent groups.

Where:

- n = sum of sample sizes for all samples
- c = number of samples
- T_j = sum of ranks in the jth sample
- n_j = size of the jth sample

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

- **Spearman’s Rank-Order Correlation, ρ,** measures the strength and direction of relationship between two ranked variables. To use Spearman’s Rank-Order Correlation, two ordinal, interval or ratio variables should be present. The formula for calculating the Spearman’s Rank-Order Correlation:

Where:

ρ = Spearman's rank correlation coefficient

d_i = difference between the two ranks of each observation (paired ranks)

n = number of cases or observations.

5.0 CONCLUSION

While descriptive statistics are mostly employed in qualitative research, inferential statistics are used in quantitative studies. Inferential statistics assists to make generalisations on the population. Without the use of inferential statistics, it is difficult to make intelligent guesses or conclusions that applies to the larger population. Inferential statistics are potent techniques that help in statistical significance and hypothesis.

6.0 SUMMARY

This unit examined the basics of inferential statistics which are essential in reaching conclusions and making predictions based on research data. In other words, inferential statistics are techniques that are employed to make inferences; they are associated with hypothesis testing. However, the use of inferential statistics predisposes researchers to sampling error and sampling bias. Sampling errors in research different from researchers' mistakes in sampling. Some of the mistakes include wrong population specification. This is when the researcher has a vague idea of the population when leads to mistakes in sampling.

Researchers are also disposed to sample frame error which occurs when the wrong sub-population is selected for sampling and selection error which occurs when only the interested respondents respond.

In this unit, we also looked at linear regression and correlation. One of the inferential statistics used by researchers to establish the relationship between two variables is correlation or simple linear regression analysis. Therefore, correlation is regarded as "the statistical association between two variables." Another important area in inferential statistics is statistical significance and hypothesis testing. These are essential in deciding between two interpretations of a statistical relationship in a sample.

We also briefly examined the Chi-square test, Mann-Whitney U test, Kruskal-Wallis H test and Spearman's Rank-Order Correlation as examples of nonparametric tests.

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MODULE 5 THE RESEARCH REPORT

- Unit 1 Writing Research Report
- Unit 2 Ethical Issues in Research Procedure
- Unit 3 Referencing Style and Citation Techniques

UNIT 1 WRITING THE RESEARCH REPORT

*Research is complete only when the results are shared with the scientific community
-American Psychological Association*

CONTENTS

1.0 INTRODUCTION

The climax of every research study is the report. Towards the end of your undergraduate programme, you are expected to carry out an independent study that will result in a research report. This unit brings to you the pattern of style and form your research report should follow. The discussion below reflects the principle of clear, systematic and logical organization and presentation of research studies for undergraduate and postgraduate programmes in library and information science and several other disciplines. It is important you are familiar with the style and format to be produce an appropriate research report.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This unit will expose you to the style for presenting your research report; from this discussion, you will be able to

- Determine essential elements that make up research report;
- Ascertain the criteria for evaluating research reports and the pitfalls to avoid.

- **MAIN CONTENT**

3.1 Writing Research Report

When you have analysed your data, it is natural to compile your report. This is the opportunity you must share your research work with the outside community. It also means preparing your report for publication in a relevant journal. You can equally

share your report in a conference where it could be presented. Unfortunately, several research reports are tucked away as private personal record that may or may not be referred to in future. However, it is important for you to note that your research is incomplete until the written report is ready and available to the public. The question to ask is what is a research report? Gravetter and Forzano (2003:400) define research report as

a written description of a research study that includes a clear statement of the purpose of the research, a review of the relevant background literature that led to the research, a description of the methods used to conduct the research, a summary of the research results, and a discussion and interpretation of the results.

This definition captures the complete description of research report. It is the comprehensive and detailed description what you did as your research study.

Gravetter and Forzano (2003) write that your research report achieves three major purposes:

- Your report should describe what was done. It should describe the details of the steps followed to complete the research project. A true scientific study should be repeatable. This means that if another researcher follows the step-by-step process outlined in your report, he/she should arrive at the same result.
- Your report should contain the unbiased account of the findings. This involves the measurements employed, the statistical analysis carried out and the interpretation of the analysis.
- Your research was not carried out in a vacuum. Therefore, your report should depict its relevance to other existing knowledge in the area. No good research study stands alone. Scientific studies flow from “existing body of knowledge and adds to that body of knowledge.”

Most often, undergraduate students and researchers find research report writing very cumbersome. In reality, putting together the step-by-step process of your study is

tasking. however, it is important you understand the guiding principles that will help you when reach the stage of report writing and presentation.

Every research study requires an extensive reading and consultation of resources. These sources will provide you with all the basic information that will help when you are putting together your report. From the sources, you will also gather good models of research reporting that will be helpful. During the research study, maintain and keep your notes diligently. They form “excellent foundation for preparing your formal report.” When you study and follow the accepted conventional or formal style and format for preparing research report, you reduce the stress of writing the report. The publication manual of the American Psychological Association (APA) is a very important reference in preparing your research report. The Department of Library and Information Science uses the current edition of the APA manual in writing style and format of citations. The current version of the Publication Manual of American Psychological Association is 7th edition published in October 2019. This replaced the 6th edition which was published in 2009.

The general APA guidelines for writing style and format will be discussed in unit 3.4. however, it is important to note some of the major changes made in the current edition of the APA guidelines (McCombes, 2020):

- The publisher location is no longer included in the reference
 - × Covey, S. R. (2013). *The 7 habits of highly effective people: Powerful lessons in personal change*. New York, NY: Simon & Schuster.
 - Covey, S. R. (2013). *The 7 habits of highly effective people: Powerful lessons in personal change*. Simon & Schuster.
- The in-text citation for works with three or more authors is now shortened right from the first citation. You only include the first author’s name and “et al.”
 - × (Taylor, Kotler, Johnson, & Parker, 2018)
 - (Taylor et al., 2018)
- Surnames and initials for up to 20 authors (instead of 7) should be provided in the reference entry
 - × Miller, T. C., Brown, M. J., Wilson, G. L., Evans, B. B., Kelly, R. S., Turner, S. T., . . . Lee, L. H. (2018).
 - Miller, T. C., Brown, M. J., Wilson, G. L., Evans, B. B., Kelly, R. S., Turner, S. T., Lewis, F., Nelson, T. P., Cox, G., Harris, H. L., Martin, P., Gonzalez, W. L., Hughes, W., Carter, D., Campbell, C., Baker, A. B., Flores, T., Gray, W. E., Green, G., . . . Lee, L. H. (2018)
- DOIs are formatted the same as URLs. The label “DOI:” is no longer necessary.
 - ×doi: 10.1080/02626667.2018.1560449
 - <https://doi.org/10.1080/02626667.2018.1560449>
- URLs are no longer preceded by “Retrieved from,” unless a retrieval date is needed. The website name is included (unless it’s the same as the author).

- × Streefkerk, R. (2019, October 11). APA 7th edition: The most notable changes [Blog post]. Retrieved from <https://www.scribbr.com/apa-style/apa-seventh-edition-changes/>

Streefkerk, R. (2019, October 11). APA 7th edition: The most notable changes. *Scribbr*. <https://www.scribbr.com/apa-style/apa-seventh-edition-changes/>

- For eBooks, the format, platform, or device (e.g., Kindle) is no longer included in the reference, and the publisher is included.

- × Brück, M. (2009). *Women in early British and Irish astronomy: Stars and satellites* [Kindle version]. <https://doi.org/10.1007/978-90-481-2473-2>

Brück, M. (2009). *Women in early British and Irish astronomy: Stars and satellites*. Springer Nature. <https://doi.org/10.1007/978-90-481-2473-2>

3.2 Format of the Research Report

At the end of your independent but supervised research study, your compiled report is usually called thesis. Most institutions refer to the undergraduate research study as research project while thesis is used for the master's degree programme. The completed research work for the doctoral degree programme is referred to dissertation. Your research project must follow outlined formal format. Generally, your research project should follow the following format:

- Preliminaries

This includes several items that are classified under preliminaries. These items are numbered in Roman numerals. The details are:

- i. Title page
 - a Title
 - b Author's name and institutional affiliation
 - c Field of specialization
 - d Supervisor
 - e Date of submission

Most times, the format of the title page is specified by each department or faculty in the university. You should follow the instructions as specified by the department. The title page must reflect the approved title of the study.

- ii. Declaration
- iii. Dedication
- iv. Acknowledgements
- v. Abstract
- vi. Table of Contents
- vii. List of Tables
- viii. List of Figures

- ix. Appendices
- x. Abbreviations

- **Chapter One: Introduction and Background to the study**

- **Introduction**

This provides background information to the study and introduces the basis of examining the problem. It provides the foundation on which the research rests.

- **Problem statement/Statement of the problem**

This is the statement that explains the problem the research is investigating. This should be clearly and unambiguously stated.

- **Research Questions**

The questions guiding the entire study are stated in this section. The research questions are they key pointers to the study.

- **Hypothesis**

The hypothesis is regarded as intelligent guess that reflects the relationship between variables under investigation. The hypothesis is an intelligent answer to the research questions stated in declarative form. It is usually stated in the null or negative form. Every hypothesis stated must be tested statistically. Therefore, hypothesis is mostly used in quantitative researchers.

- **Assumptions**

Basic assumptions like the hypothesis are also intelligent guesses which are stated to support the hypothesis. That means they relate to the hypothesis.

- **Objectives of the study**

This contains statements that reflect the major purposes of the research. The objectives, research questions and hypothesis must be stated in symmetry. They work together. The objectives are specifically and directly connected with what the researcher planned to be achieved.

- **Significance of the study**

This states the importance or the place of the research study. It is important to indicate the value the study carries in the universe of knowledge. What gap does it fill? Or what benefits does it hold for the society or any group of users? Your readers should clearly articulate the value of your research study from your statement of significance.

- **Scope and Delimitations**

In this segment you state the extent of coverage of your studies in the scope. The scope indicates the boundaries set by the researcher which reflects the length, breadth, height and depth of coverage. It is also indications areas that may appear related, but which are not included in the scope. This is the delimitations. This means, you indicate the scope and the areas that are not within your consideration. It is also necessary to point out the limitations of the study. Whatever limitations or constraints that are beyond the control of the researcher are stated as limitations. It is not a disadvantage for research to have limitations. In fact, all research has limitations, and

the researcher is expected to them in this segment. The limitations of the study do not denigrate the significance of the study.

- **Justification of the study**

This refers to the rationale for the research, i.e., the reasons for conducting the study. The justification of the study must be strongly and convincingly stated such that the average reader quickly grasps the strong reasons for the study.

- **Organization of the study**

This details structure of the entire research report, i.e., how the various chapters are organized. This is important because it ushers the readers into the entire report.

- **Operational definition of terms**

It is important to define the key terms used in the study. This operational definition of the terms will not leave any reader in doubt as to the meaning or the use of terms in the study. The meaning of terms, technical or specialized as used in the study should not be misconstrued.

1.11 References

At the end of every chapter, the texts or sources of information consulted should be compiled and listed as references and arranged alphabetically according to the author's surnames following the American Psychological Association (APA) style. However, there are other recognized referencing used in several disciplines. But in the National Open University of Nigeria, the American Psychological Association style is approved and recognized for use.

- **Chapter Two: Review of Related Literature/Review of Literature**

This chapter is one of the essential backgrounds that determines the success or failure of the study. It examines the previous literature related to the study. It is done in fulfilment of the principle that you stand on the shoulders of others to very far. This chapter requires you to demonstrate your knowledge of existing literature relevant to your topic. A thorough literature review will help you to build a solid knowledge base on your research area. It helps you to avoid duplication; understand the theories underlying your topic and help you develop conceptual framework for your study. The review of related literature also assists you to “logically connect the previous body of literature with your current work” (Best & Kahn, 2006). To carry out a successful and quality literature review, you must conduct an extensive literature search. Usually, your literature search will begin from identifying the key words used to identify and describe the variables in your study. Most often, you might move from general idea to specific areas. Your literature search requires a combination of several sources. Some of the sources include online databases such as EBSCOHOST, general Internet search using Google, library search etc. it is important to consult your institutional virtual library: NOUN information Gateway. A comprehensive literature search will broad your understanding of the research you want to carry out.

- **Chapter Three: Research Methodology**

This chapter outlines logically and systematically the methods you intend to adopt for your study. This is the step-by-step procedure you would adopt in your research.

- **Chapter Four: Presentation and Analysis of Data**

After gathering the data, it is presented and analysed in this chapter. The data analysis could be by simple descriptive statistics or inferential statistics. It could be carried by qualitative or quantitative method.

- **Chapter Five: Discussion of Data**

The detailed discussion of the data presented and analysed is discussed in this section or chapter. The discussion also includes the findings of the study.

- **Chapter Six: Summary, Conclusion and Recommendations**

This is the concluding part that summarises the entire study including the major findings. It also includes the conclusions and the recommendations made.

Bibliographies

This is a systematic list of all the references consulted in the entire research study. It is usually presented alphabetically.

Appendices

All the additional items used in the study which could not be presented within the research report are presented as appendix. This includes such items as letters of permission to respondents, questionnaires, statistical tables consulted etc.

3.3 Evaluating a Research Report

Most often, research studies are not carried out for the fun of it especially in tertiary institutions. Your undergraduate project course is aimed at providing adequate background and training in research, preparing you to undertake research for problem solving and also lead to you to the modus operandi of inquiry into the creation of knowledge. Therefore, it is important to understand that every research study goes through assessment or evaluation to ascertain how they satisfy the requirement checklist.

Therefore, an understanding of the criteria for evaluation of research report will help you to understand the entire research process, the techniques and the tools better and be able to produce a better research report. The evaluation of your research is to ascertain the quality of your work. This follows formal criteria listed for the purpose according to the institution's requirements. Therefore, the evaluation is necessary to:

- i. determine the adequacy of your research work following laid down criteria
- ii. keep you informed of what is required when your research report is examined
- iii. to provide a guide that will help you when you are undertaking your study
- iv. give you an insight into how to judge completed research reports to ascertain their acceptability or adequacy.

Some of the criteria or checklist for evaluating research report include the following:

1. The title and abstract

How clear and concise are the titles and the abstract?

The relevance of the title to the topic

- 2 The clarity and proper delimitation of the problem
The statement of the hypothesis is considered – are they testable?
Significance, justification and assumptions, scope and delimitations clearly stated
- 3 Adequacy and coverage of the review of related literature; the relevance of the literature to the research problem; important findings reflected in the review; and the effectiveness of the summary provided

3.4 General APA Guidelines for Writing Style and Format

Academic writing and compiling research report in the form of thesis, dissertation or research findings follow specified style and format. Style, according to Gay, Mills, and Airasian (2011) “refers to the rules of grammar, spelling, capitalization, and punctuation followed in preparing the report.” It is common for universities or institutions to indicate or choose specific style for presenting research reports. This style could be an in-house developed guidelines or a published style manual. Generally, the accepted style in institutions in Nigeria is the Publication Manual of the American Psychological Association, also called the APA manual. We have been discussing the APA manual our previous discussions. You can check out the 7th edition of the APA here <https://apastyle.apa.org/products/publication-manual-7th-edition>.

In presenting your report, you should also follow meticulously, the prescribed general pattern of organization and arrangement of the report. Although research reports generally follow a format that parallels the steps involved in conducting a study, institutions specify the sections to be included and their titles. The format determines the separation or otherwise of summary, conclusion and recommendations and specifies if a separation should be designated for interpretation and discussion of the results of the study.

There are different manuals for writing style and format, although there are similarities in the rules. The American Psychological Association (APA) manual provides the guidelines for writing style and format in our discussion in this segment. The guidelines provide the instructions in the use of abbreviations and contractions, are generally discouraged in formal writing. The APA guidelines provide for the mechanics of style which include capitalization, abbreviations, numbers, and statistics in text. As indicated in the guideline, one space is used after a period at the end of a sentence; it specifies the use of quotation marks around examples, rather than italics, to promote accessibility.

The APA Style, as described in the 7th edition, provides guidelines for writing scholarly papers. Formal academic writing follows these guidelines for scholarly output. Similarly, publishers and editors of journals often require authors to follow specific style guidelines to avoid inconsistencies in the journal articles, book chapters, and academic papers. For example, the APA style guidelines, specifies the use of the spellings “health care,” as against the other version such as “health-care,” and “healthcare” which could be used interchangeably in one work.

Singular:	appendix	criterion	curriculum	datum	phenomenon
Plural:	appendices	criteria	curricula	data	phenomena

The APA also provides guidelines for preferred spelling should conform to the Merriam-Webster.com Dictionary (<https://www.merriam-webster.com>). where a word is not found in the recommended dictionaries, APA points the writer to consult an unabridged edition of Webster's dictionary (see <https://unabridged.merriam-webster.com>). Where a dictionary offers a choice of spellings, it is recommended to select one and use it consistently throughout your writing. The guidelines also provide the treatment of the plural forms of some words of Latin or Greek origin which can be troublesome for authors and writers. Some of the examples of the preferred spellings of include:

4.0 CONCLUSION

The culmination of every research study is the production of research report. Your research is incomplete without a comprehensive report that captures the entire steps, processes and techniques employed in carrying out the research. In preparing the research report, the general guidelines of the American Psychological Association (APA) for research writing and format are indispensable.

5.0 SUMMARY

This unit discusses the last steps researchers take in completing their studies. This is the production of research report. After data analysis, it is natural to compile your report. This is the avenue to share your research work with the outside community and preparing your report for publication in a relevant journal. In preparing your research report certain guidelines are essential. This includes

- Use unique style of writing according to acceptable standard
- Use innovative ideas and methods to justify the research
- Maintain a clear understanding of the contents of your research
- Develop in-depth knowledge of the subject
- Avoid unnecessary jargon in writing the report
- Proper explanation of the scientific terminologies used and providing a track bibliography
- Follow the institutional specifications for writing research report
- Thoroughly proofread from top to bottom of your research paper

The format of your report should include

- Preliminaries
- Introduction and background to the study
- Review of related literature
- Research methodology
- Presentation and analysis of data

- Discussion of data
- Summary, conclusion, and recommendations

In presenting your research report, it is important to remember that your research report is subject to evaluation. Some of the criteria used in evaluating research reports include:

- The clarity, relevance, and conciseness of the title and abstract
- The clarity and proper delimitation of the problem
- The statement of hypothesis should be unambiguous and testable
- The clarity of the significance, justification and assumptions, scope and delimitations
- Adequacy and coverage of the review of related literature; the relevance of the literature to the research problem; important findings reflected in the review; and the effectiveness of the summary provided

- **TUTOR MARKED ASSIGNMENT (TMA)**

- Discuss briefly some of the essential components of a good research report in library and information science.
- What are the seven steps that form the format of a research report?
- Briefly discuss the significance of the APA guidelines in writing research report

- **REFERENCES/FURTHER READINGS**

American Psychological Association (2020). Publication Manual of The American Psychological Association: The official guide to APA style, (7th ed.). available: <https://apastyle.apa.org/products/publication-manual-7th-edition>

Connaway, L. S. and Marie L. R., Marie L. (2016). Research methods in library and information science. Santa Barbara, California.

Gay, L. R., Mills, G. E., A., Peter W. (2011). Educational research: Competencies for analysis and applications, (10 ed.). Los Angeles, Pearson.

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UNIT 2 ETHICAL ISSUES IN RESEARCH PROCEDURE

CONTENTS

1.0 INTRODUCTION

Every research study is involving and serious responsibility. No research is strictly private and personal. There are individuals and participants who are also involved with your research. All the individuals involved with your research expect respect and honesty from you. This compels you to accept responsibility and behave ethically toward those who will be affected by your research (Gravetter & Forzano, 2018). Moreover, according to Matthews and Ross (2010), social research revolves around human beings whose experiences and attitudes impact on both the researcher and the participants. This underscores the importance of ethical issues when planning any research study. Ethical issues are necessary to help secure the quality of your research.

- **INTENDED LEARNING OUTCOMES (ILOs)**

This unit introduces you to the codes of ethics in research procedure. Without these ethical issues adequately coded, there would be rampant questionable research practices that would abuse the rights and privacy of individuals who may have volunteered to participate in research studies. Therefore, this unit is intended for you to:

- i. determine the necessity of informed consent before engaging the participants in your research study.
- ii. ascertain the tenets of confidentiality and anonymity of information secured from the subjects.
- iii. recognize all the codes of ethics that guide your research studies and reporting.
- iv. examine all the areas of ethical issues in research procedures
- v. recognize the essence of safeguarding against academic dishonesty or fraud in your research study.

- **MAIN CONTENT**

3.1 Ethical Issues in Research Procedure

Ethical issues in research are not about morality. It concerns the responsibility of researchers to be respectful and honest to all individuals who are affected by their research or research reports. Every research is governed by ethical guidelines that direct decisions, conduct and proper actions during the research study. One of the ethical principles in research was prepared by the American Psychological Association (APA) (APA, 2002, 2020). Universities and institutions determine

research ethical codes of conduct which guide every researcher in the institution. Research code of ethics help to establish safeguards aimed at protecting the rights of the participants or subjects. According to Lodico, Spaulding and Voegtle (2006), research ethics focus on “obtaining informed consent from participants, protecting them from harm, and ensuring confidentiality.” It is conventional to secure the consent of the participants when they are going to be involved in your research study. This also means informing of them of any likely risks involved, that participation is voluntary and that there is any form of consequences if they refuse to participate. In the final analysis, all the participants in your study are volunteers who decided to participate without any form coercion or deceit.

Some of the tenets of ethical issues in research procedure include:

Confidentiality. As a researcher, you must notify your participants of the confidentiality of the information they provide. And this promise must be kept. Research code of ethics requires that information secured from your subjects be kept confidential as promised to the participants and anonymity should be sacrosanct. And under no circumstances must this be compromised especially when potentially sensitive or damaging information is involved. According to the University of South Africa policy on research ethics (2016), “all personal information and records provided by participants should remain confidential. Participants should be clearly informed that confidentiality and anonymity will be safeguarded unless waived by the research participant. In this regard, participants may be allowed to respond anonymously to protect their identity and privacy. Usually, the questionnaire that is administered to the participants is accompanied with a letter explaining the purpose of the study and assuring the participants of the confidentiality of the information provided. It is not proper for any research instrument to be administered without this letter of consent to the participants.

Protection from Harm, Injury or Physical or Emotional Torture. This is one of the basic ethical concerns in research studies especially experimental studies. It is imperative that the participants are protected from any form of physical or emotional harm. The participants should be exposed to any tacit or outright form of harm for being involved in your studies. It is ethically wrong to expose your subjects to any harmful situation or exposed to hurting questions that could traumatize them.

Avoid academic fraud in research. Avoid all acts of dishonesty, lies and cheating that mislead your subjects. Definite cases of academic fraud or dishonesty are not ethically permitted in your research. It is fraud to trick your subjects to participate in your research. It also academic fraud to report falsehood to your audience. Your research should not raise questions about your academic integrity, including plagiarism and fraud as well as claims that do not stand up to verification (Lune & Berg, 2017), maintaining honesty in carrying out the study, reporting your findings accurately and acknowledge credit for ideas and effort are mandatory in social, behavioural and scientific research.

Informed Consent

The American Psychological Association (2020) specifies some of the tenets of ethics which the researcher must note. This includes informed consent. In this category, the researcher informs the participants “about the purpose of the research, expected duration, and procedures; their right to decline to participate and to withdraw from the research once participation has begun; reasonably foreseeable factors that may be expected to influence their willingness to participate; any prospective research benefits; and whom to contact for questions about the research and research participants’ rights”. The researcher should not be involved in any form of financial or other inducements to convince the subjects to participate in his/her research study. Stangor (2007) adds that the researcher has an obligation to ensure that his research is ethically compliant.

4.0 CONCLUSION

Any research involving humans as participants introduces issue of ethics. Therefore, researchers have ethical responsibility to the participants who are involved in their studies and to their discipline to report their findings accurately and honestly giving credit accordingly for the work or ideas of others. There are codes of ethics that guide research in institutions, organisations or regulatory agencies. These codes of ethics must not only be observed but must be part of your research report.

5.0 SUMMARY

Research is an important aspect of social development. Virtually every research involves human beings and therefore, code of ethics in conducting the research must be carefully examined. Ethical issues in research are codes of practice or principles which guides researchers in conducting their studies. This means that ethical principles enunciated by institutions, organisations or regulatory agencies should be carefully followed in conducting your research. In involving human beings as participants, it is imperative to avoid every form of physical, emotional or psychological harm to the participants. The participants should be free to participate or opt out when the study has begun; should be treated with respect and honesty. The consent of the participants should be sought and secured before the research begins or the instrument is administered. The purposes and procedures of the research should be carefully explained to the participants. The participants should not be in doubt as to the confidentiality of the information provided and the anonymity of the responses.

7.0 TUTOR MARKED ASSIGNMENT (TMA)

1. What is informed consent and why would you introduce it in social research? 2. Is it ever ethical to conduct research that does not use informed consent?

• REFERENCES/FURTHER READINGS

Lodico, M. G., Spaulding, Dean T. & Voegtle, K. H. (2006). Methods in educational research: from theory to practice. California: John Wiley.

Lune, H. and Berg, B., L. (2017). Qualitative research methods for the social sciences. London: Pearson.

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University of South Africa (UNISA) (2016). Policy on research ethics. Pretoria: UNISA.

UNIT 3 REFERENCING STYLE AND CITATION TECHNIQUES

CONTENT

1.0 INTRODUCTION

Academic writings are guided by internationally acceptable standard and format. Referencing style and citation techniques constitute part of the standard of acceptable academic materials. However, there several citation standards and referencing styles applicable to different academic disciplines. Institutions and academic departments adopt the citation and referencing standard that applies to all academic writings emanating from them. Citation and referencing are imperative in every professional academic calling. If you fail to acquaint yourself with the approved style and technique, the consequences might hunt you for years, impact negatively on your academic pursuit and professional career. The unit therefore unveils the complexities and simplifies the technicalities of referencing and citation in all formats of academic writing and scholarly publications.

- **INTENDED LEARNING OUTCOMES (ILOs)**

At the end of this unit, you should be able to:

- i) determine the various referencing styles acceptable for academic disciplines.
- ii) carry out practical lessons in the various referencing styles.
- iii) locate referencing style guides and referencing software

- **MAIN CONTENT**

- **Referencing Style**

Referencing is an internationally acceptable system used in academic, research and scholarly environments to indicate the sources, ideas, evidence or facts that are attributed to other authors or writers.

The University of Queensland (2021) defines a referencing style as rules that guide researchers, writers, students and scholars on how to acknowledge the thoughts, ideas and works of others in acceptable academic standard. When preparing your assignment, you need to acknowledge all the materials you draw upon, quote, paraphrase or mention. According to the Macquarie University (2021), “referencing is a standardised way to acknowledge all the ideas and concepts you have used and allow readers to trace and verify your sources.”

It is a crucial component of successful academic writing, which help you to prevent plagiarism and maintain academic integrity in your term papers, essays and research studies.



Click the play button to watch this important and comprehensive video on referencing

It is important to ensure that your referencing style is consistent throughout your works. Today, there are useful referencing software that can help you to manage a large number of references. Poor referencing style is one of the ways of displaying a poor academic writing.

There is no universal referencing style. Institutions and departments adopt the style that is suitable to them. Journal publications also provide instructions for Authors on the journal website indicating the referencing style acceptable.

3.2 Reasons for Referencing

The Macquarie University (2021) summarizes the reasons for having a complete and accurate reference list as indicated below:

- **To avoid plagiarism.** Proper referencing all cited sources – quoted or paraphrased, secures you from issues related to plagiarised content. Problems of plagiarism have very heavy consequences. Your thorough list of references indicate that your ideas and concepts as expressed in your work, either directly quoted or paraphrased, are derived from other sources which are reflected in your organized list of references.

Referencing is also linked to ownership and retainership of knowledge and ideas. Across many circles, knowledge is regarded as an individual property. This means that what people write belongs to them, not to the general society. They retain the rights to their knowledge and when it is used, you respect the original writer or speaker through acknowledgement by referencing.

- **It shows the extent of review of works that exist in your topic.** It is part of professional practice to stand on the shoulders of others to be able to see very far. Therefore, you give credit to scholars who have carried out some work in your area before you. This permits free flow of knowledge and ideas and facilitates the tracking and acknowledgement of the progression of research. This is how research is designed to work.

- **To display an understanding of the research works you consulted.** When you review the research works of others, you acquire knowledge from these researchers. This helps you to form new knowledge by reviewing and drawing on the already published works of others. Through this you join to become a part of the scholarly research process.
- **To contribute to your field of specialization.** As a student, researcher, or scholar, you contribute meaningfully to analysing and interpreting research results. Your proper interpretation of words, thoughts and the ideas of other successful researchers provide a backbone and weight to your own inferences and conclusions.
- **To create a bibliography/reference list.** When you have consulted the works of others, it is professional to compile a systematic and comprehensive list of such materials. From this, other readers can see the sources that you have read and conduct their studies benefiting from these sources. A comprehensive, accurate and systematic list of references allows your audience to follow up or refer to the sources of the information contained in your study.
- **It gives credibility to your arguments.** When you write or speak, it is expected that you express your ideas from what you have learnt. You lend credence to your ideas with information from other sources. It is important for your audience to know when your ideas end and the beginning of your supporting evidence. When you properly articulate this by referring to other writers or speakers, your arguments become credible. This shows that you are not an island in your ideas and that you have supporting evidence to back up your claims.

It is essential to remember that referencing is imperative in your essays, assignments, speeches and at the end of your assignments. When you are faced with any of the following circumstances, it is compulsory to reference in-text and in the list of references:

- When you make use of specific information such as statistics, dates, examples, theories,
- When you use exact words in quotations,
- When you use the information and express the same in your words, i.e., in paraphrases, summaries, etc.,
- When you consult books, journals, the Internet, videos, radio, TV, lecture notes, music and several other forms of resources.

3.3 Referencing Styles in Different Disciplines

There are several referencing styles used in various disciplines. It is essential to determine which style is preferred in your area of specialization. It may be necessary to ask your department or lecturers if you are not sure. When you have the referencing style that is approved for your area, you need to visit the Internet to study and master

the style so that you can apply it in every of your writings. It is professional to always present your references and citations correctly and consistently.

The most common referencing systems used at universities are:

- The Harvard System (sometimes called the Author-Date System),
- American Psychological Association (APA) Style,
- Modern Languages Association (MLA) Style,
- Chicago Style.

The Department of Library and Information Science follows the American Psychological Association (APA) style.

Our discussions below examine some of the prevailing referencing styles in institutions and organisations.

American Chemical Society

The American Chemical Society (ACS) has its referencing style that is widely used in chemistry and related disciplines. The ACS style manual is in its third edition. It provides instructions for numbered referencing and for in-text (Harvard style) referencing. An example is found in [ACS Style guide from Murdoch University Library](#).

American Medical Association

This is a referencing style used in medicine, especially in the journals published by the American Medical Association (AMA). The referencing style is contained in the AMA manual of style: a guide for authors and editors, in its tenth edition. You can find an example of the style: [AMA Referencing Style - Shafer Library, University of Findlay](#)

American Psychological Association

The American Psychological Association (APA) is the standard referencing style used in psychology and several other disciplines in the social sciences and humanities. It is one of the most popular referencing styles in academic institutions. It is in its 7th edition; although the 6th edition is still applied along with the current edition: [7APA \(7th edition\)](#), [6APA \(6th edition\)](#).

Chicago Style

The Chicago Manual's footnote referencing style is widely used in the arts and humanities. It is commonly called Chicago Manual of Style. Examples are here: [Chicago \(17th edition\) Footnotes and Bibliography](#), [Chicago \(17th edition\) Author-Date](#)

Harvard Referencing Style

The Harvard referencing style uses the author-date system for in-text referencing. It is also a very popular referencing style. You can find an overview of the Harvard referencing style in any of these documents which provide examples for different types of materials and details on specific variations of citations. Harvard, [Your guide to Harvard style referencing by The University of Sydney](#), [/Harvard - Deakin University guide to referencing](#).

Institute of Electrical and Electronics Engineers (IEEE)

The Institute of Electrical and Electronic Engineers (IEEE) is a professional body that publishes in the fields of electrical and electronic engineering and computer science. They have a referencing style widely used in those disciplines which uses a numbered reference list. This is contained in their style manual in its current version of 2021:7[IEEE Reference Guide](#).

Modern Languages Association

The Modern Languages Association (MLA) of America has their referencing style which is widely used in the fields of modern literature and linguistics. It is a very popular style in those fields. It is popularly referred to as MLA. It is in its eight editions (8[MLA \(8th edition\)](#)).

Oxford Style

The Oxford style uses a note citation system. It is referred to as a documentary-note style which has two components: in-text citation and reference list. Examples can be found here: <http://www.deakin.edu.au/students/study-support/referencing/oxford>

Vancouver Style

The Vancouver referencing style is commonly used in medicine and science. It uses a numbered system. In-text citation are indicated using a number in the order of appearance in the writing. The reference list which is displayed at the end of the article provides full details of all references cited in-text. They are listed in numerical order, and in the same order in which they are cited in-text (not in alphabetical order).

Examples are here: [Citing and referencing Vancouver by Monash University](#).

Digital Object Identifier

A digital object identifier (DOI) is a unique identification alphanumeric string assigned by the International DOI Foundation. It identifies the content and provides a link to its location on the Internet. The DOI is assigned when an article is published and is available electronically. The DOI identification strings start with a 10 followed by a full stop, a prefix and a suffix separated by a slash. The prefix is a unique number of four or more digits assigned to organizations; the suffix is assigned by the publisher and was designed to be flexible with publisher identification standards.

The format for DOI in your references: **doi:10.xxxx/xxxxx**. Some referencing styles recommend including the DOI in your citation when it is available. It is usually the final component of a reference list entry. Most reference list entries with a DOI. In your referencing system, DOIs for all works that have a DOI should be included irrespective of whether you used the online or print version. You can examine these sources for more information: [What is a DOI? APA Style Blog](#), [International DOI Foundation homepage](#), [DOI Handbook](#)

Uniform Resource Locators

The uniform resource locators (URLs) are also important identifiers referencing styles. The URL is also the final component of a reference list entry. Most reference list entries with either a DOI or a URL. A uniform resource locator specifies the location of digital information on the internet which can be found in the address bar of your browser. It is expected that the URLs in references should link directly to the cited work.

It is important to note that both DOI and URL are identifiers. When the two are available in a reference, include only the DOI. Include a URL in your reference for any online work that has one. For works with URL that are not live – which means they do not open when clicked, do not include such in your references.

• Citation Techniques

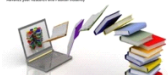
A citation or bibliographic citation is a reference that provides essential information through which you locate a book, web page, journal article or other resource. Citations supply details needed to specifically identify an item. For instance, a citation to a book includes author, title, place of publication, publisher and data of publication. Similarly, the citation to a journal article would include author, title of the article, title of the journal hosting the article, volume number, issue number, date of publication and pages bearing the article.

A Book

3.5 Bibliographic Citation Software

The advances in information and communications technology has created bibliographic software that facilitate the creation of citations either by manual entry or electronically. They are bibliographic management software packages that help you manage your citation data by allowing the addition of notes and sorting of records. They also provide link to word processing documents to enable you insert in-text or footnote citations and generate bibliographies. They provide access to a range of citation styles and a range of resources (web pages, books, journal articles, etc). The most popular of these bibliographic management software packages are EndNote and Mendeley.

 EndNote



EndNote: This is a commercial bibliographic and reference management software package which most researchers use to manage their bibliographies and references in essays, reports and articles. Using EndNote makes your writing faster. You can use the in-text citations to create a bibliography with the Cite while you write

feature in Microsoft Word. EndNote helps you to save time, stay organized and collaborate with other researchers.

The EndNote Basic is the web version of EndNote that is available for free. It is not as sophisticated as the commercial desktop version. It is easily accessible and easy to use. With EndNote Basic, you can import references from databases and library catalogues; generate bibliographic citations from websites and create groups for reference organization.

To get EndNote Basic: <https://access.clarivate.com/login?app=endnote>

For tutorials on EndNote: http://clarivate.libguides.com/endnote_training/home



Mendeley: According to the Macquarie University (2021) Mendeley is a research management tool that combines a desktop application with further online capabilities. It is a tool that has online academic social network capabilities which is also a reference manager and a citation instrument. Researchers depend heavily on it to organise their research literature and add citations when writing, as well as collaborate online with other scholars in their discipline through groups. Mendeley has a free version for download, although the licensed version provides access to more features. To use Mendeley, you are required to setup account using your email and choosing a password. You can download Mendeley for windows or MacOS using any of the links below:

Mendeley for MacOS: <https://www.mendeley.com/download-desktop-new/>

Mendeley Desktop for Windows: <https://www.mendeley.com/download-desktop-new/windows>

To use Mendeley Tutorials: <https://www.mendeley.com/guides/>

3.6 Mode of Referencing

In-Text Referencing

Your referencing beings in the text. This is known as an in-text citation or reference. This provides basic information on the source of the information included in the text. The basic information that goes with in-text referencing include the author's surname, year of publication and the page number of the text where the quotation was taken from. However, there referencing styles that use superscript numbers in the text direct readers to the bibliographic information at the footnotes (foot of the page) or endnotes (end of the paper).

The in-text referencing includes any or all of the following:

Quotation: Often, researchers, writers and scholars include in their works, the exact words from the original source. This is referred to as quotation. The recommended practice in citing this reference is to indicate the author's surname, the year of publication and the page number. This quotation also opens and closes with invited commas or quotation marks.

Paraphrase: Authors also use other person’s knowledge, ideas, theories or speeches and rebuilds such information in their own words. This rebuilding may include the use of different grammar, vocabulary, sentence structure and style. This author is still expected to provide the in-text referencing indicating the source of the information.

Summary: This is a brief description of the main theme or content of the book or article or any other resources you may have consulted.

Examples of citing directly in the text – Macquarie University
(https://libguides.mq.edu.au/ld.php?content_id=32381809)

Quoting ...

Quotation marks signal where a quote begins and ends. Quotation marks can be single or double; just be consistent. If you use single quotation marks, use them throughout your assignment.

Short quote:

Not all errors that students make when writing affect the reader’s ability to understand. However, “global errors affect reading comprehension and can include word choice, relative clauses, and word order as well as syntax” (Ritter 2000, p. 103).

Full stop after the bracket, not before

Brackets or parentheses surround the referencing details

Author (s) surname (s)

Year of publication

Page Number (check this in your referencing style guide)

Take a look at the following examples as culled from Macquarie University

Long Quote:

Sentence to introduce the quotation → Computers have changed the way students write assignments.

Before computers were common, students would write out their work, leave it for a day or two and then read it through and perhaps change the order of things (Lewis and Reinders 2003, p. 122).

· Font 1 size smaller
· Single line space
· Indent left and right margins

Sentence to explain the significance of the quote → While this has made writing assignments less time consuming, it has also introduced new problems.

Author (s) surname (s) Year of publication Page number

Brackets or parentheses surround the referencing details

Summarising ...

A summary is where you refer to the main ideas or themes of several paragraphs, a chapter, a book or article. You still **must use your own words**.

No quotation marks → It is important for writing tutors to recognize the different needs of students, and to adopt different approaches to teaching (Ritter 2000).

Full stop after the bracket, not before

Author (s) surname (s) Year of publication

There is usually no page number if you are summarizing a chapter, book or article

Paraphrasing ...

A paraphrase is where you use someone else's ideas, information, theories and so on but you rewrite these in your own words (including grammar, vocabulary, sentence structure and style).

No quotation marks → Not all errors that students make when writing affect the reader's ability to understand. However, some of the major causes for misunderstanding include incorrect vocabulary and grammar mistakes involving over sentence structures and syntax (Ritter 2000, p. 103).

Full stop after the bracket, not before

Brackets or parentheses surround the referencing details Author (s) surname (s) Year of publication Page Number (check this in your referencing style guide)

Examples of using Footnotes or Endnotes

The examples below are taken from the 16th edition of the **Chicago Referencing Style**.

- The 16th version of the Chicago referencing style uses numeric footnotes and author-date bibliography.
- The MLA style uses numeric footnotes and numeric endnotes, and in some disciplines an author-date bibliography may also be required.
- Turabian Bibliography style uses numeric footnotes and author-date bibliography.

Plagiarism could be diminished by describing referencing to students as “an important way of developing engagement with the ideas and practices of the discipline”.¹ Varis thus suggests to teach referencing as a way to demonstrate critical thinking.²

¹Vardi Iris, “Developing Students' Referencing Skills: A Matter of Plagiarism, Punishment and Morality or of Learning to Write Critically?” *Higher Education Research & Development* 31, no.6 (2012): 929.

²Ibid. 921 – 930.

Superscript number to indicate in-text citation, which corresponds to the same number in the footnotes

Complete reference the first time

“Ibid” is used in place of the author's name, the title, and as much of the information as is identical to the immediately preceding note. It cannot be used if the preceding note cites more than one work.

How to insert Footnotes or Endnotes in Microsoft Word?

- Your cursor should be in the location in the text where you wish the numeric citation to be placed.
- Click the **References tab**
- At the **Footnotes tab**, select **Insert Footnote** or **Insert Endnote**
- You can modify the settings by selecting the drop-down arrow from the **Footnotes tab**.

How to introduce external resources in your essay

There are several ways the reference details of a quote, paraphrase or summary may be supplied. A few examples of your sentences could read are listed below:

- As **Robinson (2015)** points out/states/outlines/suggests ...
- **Wui (1987)** states/suggests/outlines/argues/explains ...
- According to **Cozowisc (2003)** ...
- Referring to ..., **Jacobs (1998)** says/states that ...
- In the *title of the article/book*, **Fouldering (2012)** states/suggests ...
- In a study in 1997, **Deallio** showed/illustrated ...

3.7 A More Detailed Discussion on APA Citation Guidelines

Recall that we mentioned previously that the American Psychological Association (APA) style of referencing is widely used by students, researchers, and professionals in several disciplines in the social and behavioural sciences. It is the recommended referencing style in the National Open University of Nigeria and for the students of Library and Information Science. The prevailing APA citation guidelines are the 6th and 7th editions. The 7th edition was published in APA Publication Manual (2020).

Examples of APA 7th edition referencing style – in-text citation

Paraphrasing

Igwe (2016) examined the application of the thin client technology in the conduct of electronic examinations in the National Open University of Nigeria, which has provided cheap, easy, smooth and seamless electronic examinations in the university (pp. 112-115).

Remember that a paraphrase relates the original idea in your own words. This original idea could also be your previously published work. In paraphrasing, you extract the essential and relevant details, summarize and synthesize the information from your sources and state this in your own words. Although you can quote and cite the source, you are encouraged to emulate the practice of paraphrasing more than quoting directly. “When you paraphrase, cite the original work using either the narrative or parenthetical citation format.”

Velez et al. (2018) found that for women of colour, sexism and racism in the workplace were associated with poor work and mental health outcomes, including job-related burnout, turnover intentions, and psychological distress. However, self-esteem, person-organisation fit, and perceived organizational support mediated these effects. Additionally, stronger womanist attitudes – which acknowledge the unique challenges faced by women of colour in a sexist and racist society – weakened the association of workplace discrimination with psychological distress. These findings underscore the importance of considering multiple forms of workplace discrimination in clinical practice and research with women of colour, along with efforts to challenge and reduce such discrimination.

Your paraphrase may be a long one of several sentences. When you are confronted with this, your citation of the paraphrase is made once on first mention. After this, there is no need to repeat the citation as long as it is clear that your writing is still a reflection of the paraphrase. See the example from APA 7th edition:

Quotations

A direct reproduction of the author’s words verbatim in your writing is referred to quotation. Although paraphrasing is generally recommended in academic writings, there are also occasions when quotations are used such as when you need to reproduce exact definition of a term, when the exact words of the author conveys more meaning

than paraphrasing or when it is imperative to reproduce the author's exact wording. In advanced academic writing quotation should be highly limited.

Effective teams can be difficult to describe because "high performance along one domain does not translate to high performance along another" (Ervin et al., 2018, p. 470)

Quotations can be fewer than 40 words (short quotations) or more than 40 words (block quotations). When quotations are short, quotation marks are added around the words and incorporate the quote into your text for example:

Researchers have studied how people talk to themselves:

Inner speech is a paradoxical phenomenon. It is an experience that is central to many people's everyday lives, and yet it presents considerable challenges to any effort to study it scientifically. Nevertheless, a wide range of methodologies and approaches have combined to shed light on the subjective experience of inner speech and its cognitive and neural underpinnings. (Alderson-Day & Fernyhough, 2015, p. 957)

Treat quotation of 40 words or more as block quotations. This means, there will be no quotation marks to enclose the block quotation. It also implies starting the quotation on a new line indented in a whole block of 0.5 inches from the left margin, for example:

Examples of APA 7th edition referencing style – Book/E-Book Reference List

1. Whole authored book

Jackson, L. M. (2019). *The psychology of prejudice: From attitudes to social action* (2nd ed.).

American Psychological Association. <https://doi.org/10.1037/0000168-000>

Sapolsky, R. M. (2017). *Behave: The biology of humans at our best and worst*. Penguin Books.

Svendsen, S., & Løber, L. (2020). *The big picture/Academic writing: The one-hour guide* (3rd digital ed.). Hans Reitzel Forlag. <https://thebigpicture-academicwriting.digi.hansreitzel.dk/>

• **Paraphrased citations:** (Jackson, 2019; Sapolsky, 2017; Svendsen & Løber, 2020)

• **Narrative citations:** Jackson (2019), Sapolsky (2017), and Svendsen and Løber (2020)

1. Authored book

From the example above, you observe the following:

- the author, year of publication, title, and publisher of the book should be provided. The name format applies for books and eBooks.
- The year of publication of the book should be the same with the copyright page as indicated in the copyright page, even if this is the different from the date of release.
- Information about edition should be included in parentheses after the title.
- Include the DOI after the name of the publisher if it is included in the book.
- In this 7th edition, the place of publication is no more included.

2. Whole edited book

Hygum, E., & Pedersen, P. M. (Eds.). (2010). *Early childhood education: Values and practices in Denmark*. Hans Reitzels Forlag. <https://earlychildhoodeducation.digi.hansreitzel.dk/>

Kesharwani, P. (Ed.). (2020). *Nanotechnology based approaches for tuberculosis treatment*. Academic Press.

Torino, G. C., Rivera, D. P., Capodilupo, C. M., Nadal, K. L., & Sue, D. W. (Eds.). (2019). *Microaggression theory: Influence and implications*. John Wiley & Sons. <https://doi.org/10.1002/9781119466642>

• **Parentetical citations:** (Hygum & Pedersen, 2010; Kesharwani, 2020; Torino et al., 2019)

• **Narrative citations:** Hygum and Pedersen (2010), Kesharwani (2020), and Torino et al. (2019)

Edited Book

In the reference above, observe the following:

- The abbreviation “(Ed.)” is used for one editor and the abbreviation “(Eds.)” is used for multiple editors which comes after the names of the editor(s).
- Edition information is included in parentheses after the title.
- If there is a DOI, include it after the name of the publisher.
- Also, the place of publication is omitted.

1. Chapter in an edited book

Aron, L., Botella, M., & Lubart, T. (2019). Culinary arts: Talent and their development. In R. F. Subotnik, P. Olszewski-Kubilius, & F. C. Worrell (Eds.), *The psychology of high performance: Developing human potential into domain-specific talent* (pp. 345–359). American Psychological Association. <https://doi.org/10.1037/0000120-016>

Dillard, J. P. (2020). Currents in the study of persuasion. In M. B. Oliver, A. A. Raney, & J. Bryant (Eds.), *Media effects: Advances in theory and research* (4th ed., pp. 115–129). Routledge.

Thestrup, K. (2010). To transform, to communicate, to play—The experimenting community in action. In E. Hygum & P. M. Pedersen (Eds.), *Early childhood education: Values and practices in Denmark*. Hans Reitzels Forlag. <https://earlychildhoodeducation.digi.hansreitzel.dk/?id=192>

• **Parentetical citations:** (Aron et al., 2019; Dillard, 2020; Thestrup, 2010)

• **Narrative citations:** Aron et al. (2019), Dillard (2020), and Thestrup (2010)

Chapter in an Edited Book

Grady, J. S., Her, M., Moreno, G., Perez, C., & Yelinek, J. (2019). Emotions in storybooks: A comparison of storybooks that represent ethnic and racial groups in the United States. *Psychology of Popular Media Culture*, 8(3), 207–217. <https://doi.org/10.1037/ppm0000185>

• **Paranthenetical citation:** (Grady et al., 2019)

• **Narrative citation:** Grady et al. (2019)

Journal Article

- Include a DOI where there is one in a journal article.
- Include the issue number for the article.
- Include the pages before the DOI.

Carey, B. (2019, March 22). Can we get better at forgetting? *The New York Times*.

<https://www.nytimes.com/2019/03/22/health/memory-forgetting-psychology.html>

Harlan, C. (2013, April 2). North Korea vows to restart shuttered nuclear reactor that can make bomb-grade plutonium. *The Washington Post*, A1, A4.

Stobbe, M. (2020, January 8). Cancer death rate in U.S. sees largest one-year drop ever. *Chicago Tribune*.

• **Paranthenetical citations:** (Carey, 2019; Harlan, 2013; Stobbe, 2020)

• **Narrative citations:** Carey (2019), Harlan (2013), and Stobbe (2020)

Newspaper Article

1. Webpage on a news website

Bologna, C. (2019, October 31). *Why some people with anxiety love watching horror movies*.

HuffPost. https://www.huffpost.com/entry/anxiety-love-watching-horror-movies_l_5d277587e4b02a5a5d57b59e

Roberts, N. (2020, June 10). *Trayvon Martin's mother, Sybrina Fulton, qualifies to run for elected office*.

BET News. <https://www.bet.com/news/national/2020/06/10/trayvon-martin-mother-sybrina-fulton-qualifies-for-office-florid.html>

Toner, K. (2020, September 24). *When Covid-19 hit, he turned his newspaper route into a lifeline for senior citizens*.

CNN. <https://www.cnn.com/2020/06/04/us/coronavirus-newspaper-deliveryman-groceries-senior-citizens-cnnheroes-trnd/index.html>

• **Parenthetical citations:** (Bologna, 2019; Roberts, 2020; Toner, 2020)

• **Narrative citations:** Bologna (2019), Roberts (2020), and Toner (2020)

Webpage on a News Website

3.8 APA Online Citation Generator

APA Citation Generator Online is available here for virtually all kinds of resources: <https://www.scribbr.com/apa-citation-generator/> You can generate your APA reference list for any of the following resources by following the link:

Book: This includes allelectronic books, printed or digital books, chapters in edited collections, and multi-volume works.

Journal Article: This includes all articles published in (peer-reviewed) academic journals, which may be found in databases such as EBSCOHOST or JSTOR.

Website/Webpage: This includes pages from websites or articles from online-only news sites like CNN or Bloomberg.

Report: This includes research, technical, annual, or government reports authored by agencies, task forces, working groups, or other organizations.

Newspaper Article: This includes articles from print or online editions of newspapers like The Punch, The Sun or The New York Times.

Online Video: This includes all videos published on platforms like YouTube, Instagram or Vimeo.

APA Multiple Authors and Corporate Authors

The APA has different in-text citation formats for different number of authors or organization. When you are confronted with one, two or several authors, it is

important to pay attention to the required punctuation and the use of the ampersand (&) symbol.

Author type	Parenthetical citation	Narrative citation
One author	(Smith, 2020)	Smith (2020)
Two authors	(Smith & Jones, 2020)	Smith and Jones (2020)
Three or more authors	(Smith et al., 2020)	Smith et al. (2020)
Organization	(Scribbr, 2020)	Scribbr (2020)

Missing information

The following below specifies what to do when you are confronted with certain missing information such as the author, publication date or locator:

Missing element	What to do	Parenthetical citation
Author	Use the source title.*	(<i>Source Title</i> , 2020)
Date	Write “n.d.” for “no date”.	(Smith, n.d.)
Page number	Either use an <u>alternative locator</u> or omit the page number.	(Smith, 2020, Chapter 3) or (Smith, 2020)

*Take note of the format of the title (italics) and the quotation marks for the “n.d” for “no date”

4.0 CONCLUSION

In the recommended referencing style and citation techniques, it is essential to cite your references carefully against the original publication to ensure the information provided is complete and accurate. When your references are accurately prepared you establish credibility as a careful writer and diligent researcher. Consistency in preparing your citation and reference lists is imperative for every academic writing. The American Psychological Association style of referencing provides the guidelines that helps you present your references consistently. A well formatted references helps the readers and the audience to search the literature and retrieve the resources you consulted in your work. Similarly, you can search other people’s reference lists prepared in the APA style with ease which saves your save and effort.

5.0 SUMMARY

This unit has highlighted referencing style and citation techniques. There are existing and acceptable styles and citation techniques which are guide by standards and format recognised internationally. Accurate referencing and correct citations protect you from plagiarism, gives credibility to your arguments among several other reasons. Some of

the referencing systems used in universities include the Harvard system, American Psychological Association (APA) style. This is style that is recommended for library and information science studies and used by the National Open University of Nigeria. There are also the Modern Languages Association (MLA) style, and the Chicago style.

Other styles exist in some disciplines such as American Medical Association (AMA), the Institute of Electrical and Electronics Engineers (IEEE), the Vancouver style used in medicine and science. Moreover, citation techniques for information resources provide essential information which help to locate the required items. There are also reference management tools that assist researchers to organise their research literature such as EndNote and Mendeley.

6.0 TUTOR-MARKED ASSIGNMENTS



Prepare a sample each to illustrate the following according to the new APA in-text referencing style:

- Long Quote
- Short Quote
- Paraphrasing

• REFERENCES/FURTHER READINGS

University of Queensland (2021). Referencing Style guides.

<https://guides.library.uq.edu.au/referencing> (accessed August 2, 2021).

American Psychological Association (APA) (2021). DOIs and URLs.

<https://apastyle.apa.org/style-grammar-guidelines/references/doi-urls> (accessed August 6, 2021).