



## A STUDY OF COMMON ERRORS IN HYPOTHESIS FORMULATION AND TESTING AMONG UNIVERSITY STUDENTS IN SOCIAL AND MANAGEMENT SCIENCES

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**ABSTRACT:** *Formulating and testing hypotheses have been major issues for students, especially in the field of social and management sciences. This study examines these issues. Content analysis was used whereby five (5) projects of undergraduate and postgraduate students were analysed to identify errors in hypothesis writing and testing. The study findings revealed that there are common errors such as inadequate representation of specific variables of the project topics and wrong use of statistical tools in testing hypotheses. The study recommended that students should spend ample time reading literature on research and hypothesis formulation and testing. In addition, supervisors should have adequate knowledge of formulating and testing hypotheses so as to guide those they supervise in following the acceptable principles in the field of social and management sciences.*

**KEYWORDS:** *Research, Variables, Hypothesis, Formulation, Testing, Hypothesis Testing.*



## INTRODUCTION

The development of human society to what it is today can be attributed to breakthroughs orchestrated by research undertakings. To solve a social phenomenon, there is the need to do a detailed study to identify the social problem. Research is a fundamental key for promoting knowledge and helping man to relate more effectively with his environment. Research can be seen as a repetitive process that has a definite beginning and end. It is a well planned set of activities to investigate and build a technique and procedure to find the results of a realistic problem. It involves well ordered collection, analysis and interpretation of data. Jacob (2015) submits that research simply refers to the process of providing a reliable solution to a problem through well organized methods of data collection, analysis and interpretation of data. In management sciences, hypothesis is an important concept that gives direction to an investigation, especially in quantitative research design.

Anikweze (2013) submits that the purpose of hypothesis in research is to confirm speculations about the possible outcome of the study. Usually at the proposal stage, researchers are required to construct reasonable conjectures about the anticipated outcome of the investigation if one has an idea of what to expect. Such conjectures should be stated as null hypotheses along with their alternative hypotheses (Anikweze, 2013). Research requires data and data collected are important tools in carrying out a successful study. The data collected in research is subjected through hypothesis testing to help the researcher draw a reasonable conclusion.

Generally speaking, a hypothesis is only an assumption expressed, which may or may not be true. A hypothesis in inferential statistics is a claim about the connection between two or more variables. These assumptions relate to the features of people in question and are often based on data from a sample that was chosen at random from the population (Akenbor, Enaini & Imade, 2010). Thus, an assessment of hypotheses is a process used to verify a presumption. Statistical techniques can be used to do this. ANOVA, Z-test, regression analysis, the sign test, markov chain, cochran's Q-test, simplex methods, factor analysis, chi-square test, t-test, sign test, principal components, sign test, and so on are some of the statistical techniques employed when testing hypotheses (Ogum, 2009). This study therefore examines common errors in hypothesis formulation and testing in social and management sciences.

### Statement of the Research Problem

Hypothesis formulation and testing have been a contentious issue in academia and limited studies have been made to investigate the factors responsible for the poor construction and testing of research hypotheses among students in Nigerian universities. Otu (2023) posits that many students lack the basic steps or have knowledge of the rules guiding hypothesis formulation and testing, and this issue may be caused by inadequate knowledge on the topic by lecturers, poor project or dissertation supervision, inadequate insights on the variables under investigation and the appropriate statistical tool to use to test the research hypotheses.

The author contends that, despite bias potentially favouring evidence that supports the researcher's hypothesis, this violates research ethics and might lead to the development of a false hypothesis. This precautionary measure might aid in avoiding the acceptance of "false" theories. Furthermore, Ghanem (2003), pointed out that one of the challenges a researcher may have is getting inadequate data, particularly when the researcher plans to make inferences from the completed study. Examining the data gathering process is one strategy to combat this



(Ghanem, 2003). The sample may still be unbalanced even in the case that the researcher selected the best sample size and methodology. When developing a hypothesis, one of the main difficulties a researcher may have, particularly if they are a novice, is how to structure and construct questions that would address their hypothesis.

### **Objectives of the Study**

The study was carried out to identify errors made by some students in the management and social sciences in the University. This study seeks to examine some academic projects and dissertations to identify errors in formulating and testing hypotheses, and to proffer possible solutions.

## **METHODOLOGY**

The researcher adopted documentary research also known as content analysis. Documentary research is often conducted in the field of social and management sciences to assess a set of documents for historical or social value, or to establish a wider knowledge through the study of relevant reports, documents related to the event or object under study. Different works of literature were reviewed and five academic projects in the field of management and social sciences were analyzed to identify errors in constructing and testing hypotheses.

## **CONCEPTUAL REVIEW**

### **Research**

The concept of research has been defined by several scholars and their definitions are oftentimes in the confines of their field of specialization or discipline. Researchers from natural sciences usually define research from the experimental perspective while scholars from the behavioural field of study view research from the non-experimental angle (Adekeye, 2016). In other words, research is a systematic, coherent and sequential way of data collection, analysis and interpretation with a view to making a dependable conclusion and useful recommendations (Ujo, 2004). Sambo (2005) conceived that research has to do with the application of the scientific method to problem solving and involving careful observations, orderly co-variations among measurable phenomena, objective interpretation of facts and validation of accepted theories or their revision in the light of new facts or evidence.

The Encarta Dictionary (Microsoft, 2009) defines research as an organized study involving methodical investigation into a subject in order to discover facts, to establish or revise a theory, or to develop a plan of action based on the facts discovered. Muhammed (2005) defines research as an organized inquiry that aims at providing information for solving identified problems. Research is defined as a systematic and objective search for new knowledge of the subject of study and/or application of knowledge to the solution of a novel problem. Research is a scientific study whereby solutions to problems are derived through systematic process. This process involves identification of problems, design study, review of literature, data collection, data analysis, report writing and sharing of findings (Charles, 2013). Hypothesis



testing is usually done at the stage of data analysis and findings help researchers to draw a reasonable conclusion and proffer recommendations.

## Hypothesis

Hypothesis is one of the characteristics of realistic research. Anikweze (2013) considers a hypothesis as a tentative but reasonable assumption regarding a possible solution to a research problem. It is a postulation that will lead to possible solutions of an identified problem. Many authors (Cohen & Manion, 1994; Kerlinger, 1999; Osuala, 2005; Sambo, 2005; Gall et al., 2007) see hypothesis as a conjectural statement of the relations between two or more variables. Obasi (1999) defines a hypothesis as a tentative statement that can be accepted or rejected only when subjected to empirical verification. In quantitative research, the use of inferential statistics is used to test hypotheses.

Researchers are encouraged to consult other journal articles, dissertations, and the work of other researchers who have investigated related subjects, and use these sources as a guide while developing hypotheses (Bryman & Bell, 2011). But in the author's opinion, this is only a little obstacle; more difficult ones might appear as a hypothesis is accepted. Numerous judgements must be taken while doing research in a qualitative manner, which increases the likelihood of mistakes or errors. Ghanem (2003) suggests that while deciding whether to accept or reject a hypothesis, researchers adhere to the mechanism model, which consists of three fundamental phases to reduce these mistakes. The initial phase involves formulating a hypothesis, which attempts to generate a proposed scientific hypothesis as an initial response to the phenomenon in question. Subsequently, the researchers evaluate their hypotheses and may come up with new ones if their working hypotheses do not hold up to testing. Finally, the hypothesis confirmation stage seeks to clarify the final hypothesis through the application of one or more of the three scientific methods: research, observation, or experimentation (Ghanem, 2003).

## Types of Hypothesis

Glass and Stanley (1970), as cited in Anikweze (2013), distinguished two types of hypotheses, namely scientific and statistical testing. Both are commonly used in research undertakings.

### Scientific Hypothesis

The scientific hypothesis is usually a recommended answer to a problem. It also refers to a proposition stating intelligent, informed and testable guesses. This type of hypothesis is usually used in survey research because it is often based on experience. However, some scholars who adopt survey research make use of the questionnaire that is linked to research questions instead of hypothesizing. Rogers (2022) submits that scientific hypothesis refers to an idea that proposes a tentative explanation about an event or phenomena observed in a natural world. The two major characteristics of scientific hypotheses are falsifiability and testability which are represented in an "if...then" statement, and this is subject to experimentation and observation.

### Statistical Hypothesis

This type of hypothesis is widely used in social and management sciences as it is subdivided into two, namely the null and alternate hypotheses. The null hypothesis is represented as ( $H_0$ ) while the alternate hypothesis is ( $H_1$ ). Oftentimes, it is the null hypothesis that is tested and its rejection means the alternate hypothesis is accepted or becomes relevant. The null hypothesis



and the alternate hypothesis are mutually exclusive and the outcome of the hypothesis is only known when the hypothesis is subjected to statistical test (Jacob, 2015). To understand hypothesis testing better, it is imperative to discuss the following:

- i. Level of significance
- ii. Type I and type II errors.

### **Type I and Type II Errors**

The researcher's decision based on hypothesis testing is based on the limited information from the sample frame curved out from the population. This limitation has created the possibility of some errors. Type I and type II errors emanate from the research process or during the computation process and one of the errors is usually committed by the researcher. Type I is the probability of rejecting the null hypothesis when it is true. Type II error on the other hand is the probability of accepting the null hypothesis when it is false. Jacob (2015) stated that choosing a low level of significance is one of the effective ways to minimize the error of rejecting a true null hypothesis. Summarily, type I and type II errors are inversely related, that is, a decrease in the probability of rejecting a true hypothesis leads to an increase in the probability of retaining a false one. Table 1 below describes decision in testing hypothesis:

**Table 1 Displaying Decisions in Hypothesis Testing**

<b>Alternative decision in hypothesis testing</b>		
<b>Decision</b>	<b>Null hypothesis is true</b>	<b>Null hypothesis is false</b>
Reject hypothesis	Type I error	No error
Accept hypothesis	No error	Type II error

**Source:** *Jacob, 2015 (Adopted)*

### **Functions of Hypotheses in Quantitative Research**

Hypothesis is an important tool of research and it performs several functions. Firstly, the relationship expressed in the hypothesis indicates what the researcher should do (Charles, 2013). In this regard, hypothesis aids in organizing the effort of the researcher. Secondly, hypothesis gives the researcher better clarity in understanding problems under investigation with a framework of ways to collect, analyze and interpret data for their studies (Cohen & Manion, 1980).

Thirdly, hypothesis is a basic concept that gives research focus. In the opinion of Eboh (1998), the absence of hypotheses in research undertaking would result in mere empirical wandering. Fourthly, formulation of theory is made possible by hypothesis. Hypotheses are regarded as working instruments of theory in the sense that they help establish probable truth or falsity of assumed relationships between variables (Obasi, 1999). Lastly, hypotheses perform the function of expanding knowledge. In this regard, hypotheses spur the creative ability of researchers to deeper investigation and findings from the study may give birth to major principles and laws.



### Some of the Key Factors to Consider When Formulating and Testing Hypotheses

There are guidelines for formulating and testing hypotheses in research. Obasi (1999) highlights the requirements of a good hypothesis. Firstly, hypotheses should be clearly stated in the form of a declarative sentence (that is, the concepts under investigation should be seen in the statement of hypothesis usually in chapter in academic project). Secondly, hypotheses must meet the requirement of testability, that is, the variables (dependent and independent variables) should be clearly identified or stated. Thirdly, hypotheses must be derived from the problem under investigation. The statements of problem or research questions and objectives of the study should be in consonance with the statement of hypotheses. Obasi (1999) posits that a hypothesis derives its meaning from the statement of the problem and once the statement of the problem is not well constructed, the research becomes unfocused and meaningless. Fourthly, hypotheses should not be complex. It should be in simple words. Anikweze (2013) stated that hypotheses should be in a simple language for better understanding when read. Another important factor is that causal hypotheses must fulfill the criterion of testing technique or criterion of measurability. In addition, Anikweze (2013) argues that hypotheses should be limited in scope. This means that a hypothesis that lumps many factors (variables) together may be difficult to have accurate test results.

Other key factors students should consider are sources of hypotheses. According to Anikweze, (2013), Jacob (2015) and Obasi (1999), personal experiences, theories, literature from journals, textbooks, nature of research topics are some of the critical points to consider when formulating and testing hypotheses in research undertaking. Otu (2023) opines that some students in social and management sciences may not have been properly taught in class on how to formulate and test hypotheses in research. Adequate teaching of qualitative research design is key for students' understanding formulation and testing of hypotheses in research.

**Table 2: Nature of Data and Appropriate Inferential Statistics**

S/N	Nature of Data	Appropriate Inferential Statistics
1.	Two Nominal variables (i.e. both independent variables are nominal) or ordinal	The Chi-Square ( $X^2$ ) test
2.	Nominal or ordinal Independent variable and an interval dependent variable (Used when two means are involved)	The T-Test
3.	More than two means or when one there is more than one independent nominal variables are involved	Analysis of Variance (ANOVA)
4.	When there are categorical variables and continuous dependent variable	Analysis of covariance (ANCOVA)
5.	Predicting relationships between one dependent variable and one independent variables	Linear Regression
6.	Predicting relationship between multiple independent variables against one dependent variable	Multiple Regression
7.	When two interval variables are involved (that is, both independent and dependent variables are interval measures)	Pearson-Product-Moment correlation



8.	When two ordinal variables are involved	Spearman rank-order correlation
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**Source:** *Researchers' Design (2024)*.

### **Practical Application of Formulating and Testing Hypothesis in Research**

The basic requirements for constructing and testing of hypotheses have been adequately discussed. Thus, this aspect of the study is to practically demonstrate the right and wrongful ways of constructing and testing of hypotheses. In the light of this, wrongful formulation and testing of hypotheses are discussed below:

#### **Specimen 1**

**Topic:** Stress and its Management in Educational Institutions: A Study of Lecturers at the University of Abuja

**Date:** November, 2012

**Project Type:** Undergraduate

#### **Statement of the Hypotheses**

**H<sub>01</sub>:** The causes of occupational stress do not differ significantly among lecturers across gender, rank and disciplinary specialization.

**H<sub>A1</sub>:** The causes of occupational stress differ significantly among lecturers across gender, rank and disciplinary specialization.

**H<sub>02</sub>:** The effects of occupational stress do not differ significantly among lecturers across gender, rank and disciplinary specialization.

**H<sub>A2</sub>:** The effects of occupational stress differ significantly among lecturers across gender, rank and disciplinary specialization.

#### **Statistical Tool for Testing Hypotheses: Chi-Square**

#### **Specimen 1 Analysis**

Obasi (1999) opined that the statement of hypothesis should consist of two or three variables that can be measured and tested empirically. From specimen one, it was seen that the students' statement of hypotheses consisted of more than three variables. However, the use of chi-square is applicable for variables such as rank, gender and variances among variables.

#### **Specimen 2:**

**Topic:** Impact of training on Employees' Performance in University of Abuja Teaching Hospital, Gwagwalada

**Project Type:** Postgraduate

**Date:** December, 2021



## **Statement of Hypotheses**

### **Hypothesis 1:**

**H<sub>0</sub>:** Training opportunities do not motivate workers for improved productivity in University of Abuja Teaching Hospital.

**H<sub>1</sub>:** Training opportunities motivate workers for improved productivity in University of Abuja Teaching Hospital.

### **Hypothesis 2:**

**H<sub>0</sub>:** Training facilities and methods in University of Abuja Teaching Hospital are not adequate to enhance job performance.

**H<sub>1</sub>:** Training facilities and methods in University of Abuja Teaching Hospital are adequate to enhance job performance.

Statistical tool used for testing hypotheses – Chi-Square

## **Specimen 2 Analysis**

The hypotheses for this study were wrongly worded. The topic was on performance while the student stated productivity in the hypotheses statements. Also, training facilities and methods are too bogus to be tested using chi-square. The researcher or student should have simply used specific variables of training and performance.

## **Specimen 3:**

**Topic: Incentives and Performance among Junior Staff of the University of Abuja**

**Date: December, 2016**

**Project Type: Postgraduate**

## **Statement of Hypotheses**

### **Hypothesis 1:**

**H<sub>0</sub>:** There is no significant positive impact of the incentive package on junior staff performance in University of Abuja.

**H<sub>1</sub>:** There is no significant negative impact of the incentive package on junior staff performance in University of Abuja.

### **Hypothesis 2:**

**H<sub>0</sub>:** Junior staff have a negative attitude towards work because of a poor incentive package.

**H<sub>1</sub>:** Junior staff have a positive attitude towards work because of a poor incentive package.

### **Hypothesis 3:**

**H<sub>0</sub>:** Incentives of junior staff cannot influence better attitude to work





**Hi:** Incentives of junior staff can influence better attitude to work.

Statistical tool used for testing hypotheses – Chi-Square

### **Specimen 3 Analysis**

The students failed to identify specific indicators or variables of incentive package and employees' performance.

### **Specimen 4:**

**Topic: Conflict and Management Strategies in Organization (The Study of University of Abuja)**

**Project Type: Postgraduate**

**Date: February, 2018**

### **Statement of Hypotheses**

#### **Hypothesis 1:**

**Hi:** Conflict management strategies employed by the University of Abuja Authority is effective in reducing negative effects of conflict.

**Ho:** Conflict management strategies employed by the University of Abuja Authority is not effective in reducing negative effects of conflict.

#### **Hypothesis 2:**

**Hi:** There is a relationship between conflict management strategies and administrative effectiveness in the University of Abuja.

**Ho:** There is no relationship between conflict management strategies and administrative effectiveness in the University of Abuja.

Statistical tool used for testing hypotheses – Chi-Square

### **Specimen 4 Analysis**

The student failed to clearly spell out the specific indicators of conflict and conflict management strategies. Hypothesis one failed to identify the specific negative effects of conflicts. Categories of variables may be difficult to test using chi-square. Also, the use of the Chi-square test cannot be used to establish whether one variable has a causal relationship with another.

### **Specimen 5**

**Project Topic: An Analysis of Salary Administration and Local Government in Nigeria: A Case Study of Gwagwalada Area Council, FCT**

**Date: 2012**



## **Project Type: Undergraduate**

### **Statement of the Hypothesis**

This study is guided by the following hypothesis:

**Hi:** The productivity of local government workers is influenced by their salary package.

**Ho:** The productivity of local government workers is not influenced by their salary package.

Statistical tool used for testing hypotheses – Chi-Square

### **Specimen 5 Analysis**

A detailed study of the above specimen showed that the topic was not properly captured. There is only one clear variable, which is salary administration. The choice of chi-square in testing the hypothesis is inappropriate because the study seeks to identify the influence between workers' productivity and salary package. These errors showed the researcher lacked adequate knowledge for constructing hypotheses.

The findings from other five (5) projects analyzed showed that:

- i. The researchers may have little or no knowledge of how to construct a hypothesis in the sense that they fail to identify independent and dependent variables, and criterion of clarity and simplicity.
- ii. It was also revealed that the students usually settle for chi-square. They also do not have adequate knowledge of the right nature of data and application of suitable inferential statistical tests.
- iii. Findings also revealed that they do not know that research questions should tally with the statement of hypotheses.
- iv. Some fail to state decision rule, p-value and significance level when testing hypotheses.
- v. Some of them fail to clarify concepts used in their study when constructing and testing the hypotheses of the study.
- vi. Findings revealed that some of the students do not know how to write a concise statement of the problem and research questions.
- vii. It was discovered that some students did not define the population of their studies and they arbitrarily choose sample size for their studies. A faulty sample size would affect the results of hypothesis testing.



## CONCLUSION

This study discussed errors committed by social and management sciences students in formulating and testing hypotheses. There are several sources for formulating the research hypotheses as discussed in the study and some of them include intuition, personal experience, findings from a past study and body of existing theory. Supervisors play active roles in helping students to construct and test the hypotheses. In constructing and testing hypotheses, students should pay keen attention to the key factors such as simplicity in language, declarative statement consisting of variables that are in line with the topic, defining the population and sample size, understanding the p-value, significance level and other important factors. The study concludes that some students in management sciences still find it difficult to construct and test hypotheses accurately.

## RECOMMENDATIONS

Having reviewed some projects/dissertations and errors identified, the following recommendations are made:

1. Good research begins with a good topic. Researchers should choose topics that have variables that are testable.
2. Students need to clearly understand the statement of the research problem before constructing hypotheses. A researcher who understands the meaning of research problems and research questions would have little or no difficulty stating hypotheses.
3. Students should spend ample time studying and understanding the level of significance, p-value, and decision rule so as to know when to reject a null hypothesis or accept the alternate hypothesis.
4. Students should have a better understanding of the nature of data or variables they are investigating in their research. Adequate knowledge of the nature of data and type of inferential statistical tool to use would go a long way to improve hypothesis testing.
5. Some project or dissertation supervisors need to upgrade their knowledge on how to formulate and test hypotheses in order to help students or their supervisors follow the accepted principles in the field of social and management sciences.



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