Chapter Three: 

Hypothesis

Modern day formal research, whether carried out within the domain of physical sciences or within the realm of social sciences follows a methodical procedure which gives it the necessary acceptability, legitimacy and credibility; so that the outcomes and the findings of such research enriches, extends and expands the existing level and content of knowledge in the related field of research. This procedure for formal research consists of logically defined steps starting with the identification of a problem of interest for the researcher which may emerge from the study and observation of a certain phenomena. The identified problem or issue is then clearly and specifically defined usually in the form of the questions “what and why”.

3.1 Concept and Definitions of the Research Hypothesis:

The “well defined question” is often in the form of a broad statement usually called the Research Question which is not testable by any scientific means thus it needs to be expressed in a testable format- a format which is known as the Hypothesis. However prior to the formulation of the hypothesis the research question is subjected to a detailed literature review for determining the work that has been already done in the concerned domain of knowledge as well as to ascertain whether a similar research has already been carried out and even if a similar research has been carried out, whether there is some other dimension of the research question that needs further elucidation. In fact the well defined research question is the precursor to the hypothesis. The literature review in between helps in the better alignment of the problem to the existing knowledge and also provides the researcher with a wider background understanding of what needs to be investigated. This understanding in turn facilitates the formulation of the hypothesis.

The English word hypothesis comes from the ancient Greek word hupothesis, meaning "to put under" or "to suppose". A Hypothesis is usually a tentative statement that relates to a set of facts about an observable phenomenon existing in a given domain. The tentative statement is usually about the relationship between two or more variables. A
hypothesis is a specific, testable prediction about what can be expected from a study. It can be called a preliminary or an untested postulation. The assertions made in the hypothesis need to be tested for accuracy, veracity and relevance by further enquiry, investigation or experimentation. The hypothesis can be an assumption or a claim about a population parameter often made in the form of an unproven proposition or supposition that underscores certain observations about a phenomenon related to the specific population which can be tested empirically. Thus hypothesis is a set of assumptions which can be proved or disproved after investigation and testing. Some of the definitions of Hypothesis given by different scholars are as follows:-

“Hypothesis is a formal statement that presents the expected relationship between an independent variable and a dependent variable” (Creswell, 1994).

“A hypothesis can be defined as a tentative explanation of the research problem; a possible outcome of the research or an educated guess about the research outcome” (Sarantakos, 1993:1991).

“A hypothesis is a statement or explanation that is suggested by knowledge or observation but has not, yet, been proved or disproved” (Macleod Clark J and Hockey L, 1981).

“Hypotheses are simple tentative guesses, good hunches - assumptions for use in devising theory or planning experiments intended to be given a direct experimental test when possible” (Eric Rogers, 1966).

“A hypothesis is a conjectural statement of the relation between two or more variables” (Kerlingor, 1956).

“Hypotheses are relational propositions” (Kerlingor, 1956).

“Hypothesis relates theory to observation and observation to theory” (Ary, Jacobs and Razavieh, 1984).

A hypothesis is “a wise guess that is formulated and temporarily adopted to explain the observed facts covered by the study” (Calmorin and Calmorin, 1999).
In his papers on the DN model (deductive nomological model) Carl Hempel (1942 & 1965) visualized the hypotheses as concepts anchored in the plane of observation ready to be tested.

In the standard understanding in the present era, a hypothesis refers to a provisional statement of an idea which merits evaluation. The basic understanding is that a research question cannot be scientifically investigated or solved unless it is reduced to the hypothesis form. For a proper investigation or evaluation the frame of the hypothesis should define specifics in operational terms. A hypothesis requires further effort by the researcher in order to either confirm or disprove it. Sometimes but not always one can also formulate a hypothesis as an existential statement stating that some particular instance of the phenomenon under examination has some characteristic and causal explanations having the general form of *Universal* statements, stating that every instance of the phenomenon has the particular characteristic.

Any useful hypothesis will enable predictions by reasoning. It might predict the outcome of an experiment in a laboratory setting or the observation of a phenomenon in nature. The prediction may also invoke statistics and only talk about probabilities. Karl Popper (1935, 1959) argued that a hypothesis must be *falsifiable*, and that one cannot regard a proposition or theory as scientific if it does not admit the possibility of being shown to be *false*. Other philosophers of science have rejected the criterion of falsifiability or supplemented it with other criteria, such as *verifiability* (e.g., *verificationism*) or *coherence* (e.g. *confirmation holism*). The *scientific method* involves experimentation, to test the ability of some hypothesis to adequately answer the question under investigation.

A hypothesis can also be in the form of a supposition or an explanation (as a theory) that is provisionally accepted in order to interpret certain events or phenomena, and to provide guidance for further investigation. If it remains un-refuted by facts, it is said to be verified or corroborated.

If the hypothesis specifies values for every parameter of a population, it is called a *Simple hypothesis*; if not, it is called a *Composite hypothesis*. A *Research hypothesis* is the statement created by researchers when they speculate upon the outcome of a research or
an experiment. If it attempts to nullify the difference between two sample means (by suggesting that the difference is of no statistical significance), it is called a *Null hypothesis*. The null hypothesis in other words is the hypothesis that states that there is no relation between the phenomena whose relation is under investigation. The *Alternative hypothesis*, as the name suggests, is the alternative to the null hypothesis: it states that there exists some kind of a relation between the independent and the dependent variables related to the problem or the study domain.

The importance of a good hypothesis is enormous and is undeniable for the purpose of the furthering of verifiable knowledge which in turn lays a solid foundation for further research and development. *Fred Kerlinger (1956)* says “hypothesis is perhaps the most powerful tool; man has invented to achieve dependable knowledge”.

In framing a hypothesis, the investigator must not currently know the outcome of a test or that the outcome remains reasonably under continuing investigation. Only in such cases the experiment, test or study potentially enhances the probability of showing the truth.

A good hypothesis therefore:

1) Precisely, simply and unambiguously states the specific question to be studied;
2) Should be logical and as concise as possible;
3) Has a clear rationale in the “if-then” format;
4) Makes a prediction of a possible outcome of the study;
5) Does not use judgmental expressions;
6) Guides and gives direction to the study;
7) Structures the next phase in the investigation;
8) Provides continuity to the study;
9) Postulates the relationship between variables that can be empirically evaluated;
10)Corresponds with existing knowledge;
11)Limits the study or the research to a specified domain;
12)Establishes researcher’s background knowledge enabling the acceptance of suggestions made by the researcher.
13)Dictates the format of the Research design;
14) Defines facts which are relevant for the study;
15) Should be testable without violating ethical standards;
16) Should include the possibility of disapproval after investigation;
17) Provides the framework for the conclusions.

Hypothesis is a clear statement of what is intended to be probed through research that needs to be specified before the research is conducted and should be openly reported. This allows identification of the research objectives and the key abstract concepts involved in the research. Creswell (1994) says “hypotheses become signposts for explaining the purpose of the study and guiding the research”.

How the hypothesis is a part of the scientific research gets highlighted in the following flow chart proposed by Meenakshi Sharma & Subhadha Battina:

Diagram-3.1: Hypothesis-Flow chart

- Statement of research question
- Review of related literature
- Formulation of Hypothesis
- Implications of the suggested Hypothesis
- Deductive Reasoning
- Observation, testing and experimentation
- Collection and Analysis of Data
- Analysis of results
- Confirmation or Rejection of the Hypothesis
Hypothesis is expressed as a relationship between an independent variable and a dependent variable in the “if-then” or the “cause-effect” form where “if” or the “cause” is represented by the independent variable and “then” or the “effect” refers to the dependent variable. In other words the hypothesis statement may read as "If [these changes are made to a certain independent variable], then we will observe [a change in a specific dependent variable]."

3.2 Concept and Definition of the Variable and its role in the Hypothesis:

A variable is a well defined factor or an element in an observable phenomenon which takes on different values in terms of quantities, qualities, properties or characteristics of persons, things or situations that change or vary in the context of the phenomenon with respect to space and/or time. The variable is a measurable entity. In the context of a hypothesis a variable identifies the specific concepts to be focused on, studied, evaluated and investigated. There are different categories of variables or variables can be categorized in many ways depending upon the role they play in different situations. The same variable representing the specified qualities can play different roles in different contexts. Of the various types of variables the two most important and crucial for any hypothesis are the dependent and the independent variables.

The two variables (dependent and independent variables) are often composite in nature. Both of these variables can be composed of a host of other variables called the constituting variables or sub variables. Thus an independent variable of a particular hypothesis may itself be made up of a host of sub variables which may be the case with the dependent variable as well. In such cases the hypothesis specifies the relationship between the dependent and the independent variables in terms of the relationships between each of the sub variables of the dependent variable and the sub variables of independent variable. To limit the focus of the study, the researcher may take into account only one or a selected few of the sub variables of both the dependent and the independent variables. For example, in a study on the linkage of life style patterns in urban population to the urban prosperity, the dependent variable “urban life style patterns” may include sub variables like dressing style; frequency of restaurant visits; frequency of attending parties etc. whereas the independent variable “urban prosperity”
may include sub variables like the income from job, income from rentals, income from inheritance, number of dependents in the family etc.. The hypothetical statements for the example will be as follows:-

1) A correlation exists between job income and dressing style in urban population;
2) A correlation exists between rental income and the dressing style in urban population;
3) A correlation exists between inheritance income and dressing style in urban population;
4) A correlation exists between number of dependents and dressing style in urban population;
5) A correlation exists between total income and dressing style in urban population;

Each of the sub variables of the independent variable shall be connected to each of the sub variables of the dependent variable as expressed above. The sub variable of the dependent variable “dressing style” has been correlated to each of the sub variable of the independent variable “urban prosperity”. The same process is repeated for the other sub variables of the dependent. The set of statements together thus form the hypothesis which is then tested for different values of each of the sub variables of the independent variable.

3.3 Testing the Hypothesis:

Testing of the hypothesis is the next step in the process. It is carried out on the basis of the data collected from the selected sample(s). When a possible correlation related to the phenomena is investigated, such as the one given in the example above, the hypothesis that a relation exists cannot be examined in the same way one might examine a proposed new law of nature. In such an investigation, if the correlation fails in a few cases, these do not necessarily falsify the hypothesis. Instead, statistical tests are used to determine how likely it is that the overall effect would be observed if the hypothesized relation does not exist. If that likelihood is sufficiently small (e.g., less than 1%), the existence of a relation may be assumed. Otherwise, any observed effect may be due to pure chance.

In statistical hypothesis testing, two hypotheses the null hypothesis and the alternative hypothesis are compared. The null hypothesis as already stated here-in-earlier is the
hypothesis that states that there is no correlation between the dependent and independent variables in the phenomena whose relation is under investigation, or at least not of the hypothesized form. The null hypothesis ($H_0$) is a hypothesis which the researcher tries to disprove, reject or nullify. $H_0$ is thus an essential part of any research design and is always tested even if indirectly. The alternative hypothesis, as the name suggests, is the alternative to the null hypothesis: it states that there is some kind of relation. The alternative hypothesis may take several forms, depending on the nature of the hypothesized relation; in particular, it can be two-sided (for example: there is some effect, in a yet unknown direction) or one-sided (the direction of the hypothesized relation, positive or negative, is fixed in advance). The null often refers to the common view of something while the alternative hypothesis is what the researcher thinks is the cause of the phenomenon. It is actually the null hypothesis which is put to the test; if the null hypothesis gets proved then the alternative hypothesis is automatically disproved but if the null hypothesis fails to pass the test then the alternative hypothesis is proved and gets accepted. For the example hypothesis, the null hypothesis can be formulated as follows:

1) There exists no correlation between job income and dressing style in urban populations;
2) There exists no correlation between rental income and dressing style in urban population;
3) There exists no correlation between inheritance income and dressing style in urban population;
4) There exists no correlation between number of dependents and the dressing style in the urban population;
5) There exists no correlation between total income and dressing style in urban population;

The set of statements stated earlier emphasizing the affirmative correlation between the dependent and the independent variable in the example case thus becomes the alternative hypothesis. If during the process of testing the stated correlations of the null hypothesis do not get established subject to some preset significance level, the null hypothesis-

there
is no correlation between urban prosperity and urban lifestyle gets rejected and the alternative hypothesis gets accepted.

Often the problem with $H_0$ is that many researchers and reviewers believe that acceptance of the null hypothesis is a failure of the research or the experiment. This notion is against the very spirit of scientific enquiry; since accepting or rejecting any hypothesis is actually a positive result. Even if the null hypothesis does not get refuted the domain of scientific knowledge has gained something new in the process. Strictly speaking the term ‘failure’ should only be applied in the context of errors in the process of investigation and analysis of data or in the experiment design or else in the initial incorrect assumptions.

3.4 **Significance Level for the acceptance of a Hypothesis:**

Conventional significance levels for testing hypotheses (acceptable probabilities of wrongly rejecting a true null hypothesis) are 0.10, 0.05, and 0.01. In other words, if significance tests generate 90%, 95% or 99% likelihood that the results do not fit the null hypothesis then it is rejected in favor of the alternative hypothesis otherwise the null hypothesis is accepted. The criteria for rejection or acceptance of the null hypothesis must be determined in advance, before the observations are collected or inspected. If these criteria are determined later, when the data are already known, the test is invalid.

The above procedure is actually dependent on the number of the participants (units or sample size) that is included in the study. For instance, the sample size may be too small to reject a null hypothesis and, therefore, it is recommended to specify the sample size from the beginning.

3.5 **Errors in Hypothesis Testing:**

Due to sampling fluctuations, incorrect statistical data analysis or mistakes in computation or else due to the wrong interpretation of the results, two types of errors are generally committed during the process of hypothesis testing.

The two types of errors are called Type I error and Type II error. Type I error is committed when a true hypothesis is rejected whereas Type II error is committed when an incorrect hypothesis is accepted. During testing of the null hypothesis if the correlation
between the dependent variable and the independent variable gets incorrectly established to the level of significance and $H_0$ gets rejected as a consequence, a type I error is committed. On the other hand if the proposed correlation fails to pass the significance test and the $H_0$ gets accepted a type II error is committed. Thus an error free hypothesis testing is essential for the researcher or the reviewer to reach the correct conclusion from the research or review:

**3.6 Formulation of the Hypothesis for the present Study:**

The research question being studied has been defined in the Introduction of this dissertation in the following words:-

“Does indigenous leadership have a role in the development of the tribal communities in India?”

The definition of the research question followed by the review of available literature on the subject shall now be instrumental in the appropriate formulation of the hypothesis. The first and the foremost step in the direction of hypothesis formulation is the identification of the dependent and the independent variables as per the research question. The research question being studied has two aspects to it, one being the “development of tribal communities in India” and the other being “the role of indigenous leadership”. The question therefore explores whether the development of tribal communities in India is dependent on indigenous leadership. The “development of tribal communities in India” is being hypothesized to be dependent on “the role of indigenous leadership” thereby making “the development of tribal communities in India” the dependent variable and the “the role of indigenous leadership” the independent variable in the present case.

If TD represents “the development of the tribal communities in India” and “IL” represents the “role of indigenous leadership” then the hypothesized relationship can be expressed in mathematical terms as: TD is a function of IL i.e. $TD = f(\text{IL})$.

In section 1.7 of chapter-one (Introduction), the theoretical relationship between development and leadership as well as management has been established which has been mathematically expressed as $D = f(L, M)$ where D represents development (can be tribal
development TD as per the context), L represents leadership (can be indigenous leadership IL as per the context) and M represents managerial input. If M is kept constant and L is defined as IL and D is taken as TD for the sake of the present study then the theoretically established relationship gets converted into the function $TD = f(IL)$ which is the same as the function derived previously. The theoretical basis thus is in consonance with the formulated hypothesis for further investigation and testing for the empirical validation of the correlation between tribal development and indigenous leadership.

The hypothesis in question is a bivariate hypothesis with one dependent variable and one independent variable. The independent variable of the hypothesis *Role of Indigenous Leadership (IL)* can take only two values either zero or one i.e. either it exists in a tribal community or it is absent, whereas the dependent variable of the hypothesis *Development of Tribal Communities in India (TD)* is a composite variable which gets determined on the basis of a number of sub-variables such as *freedom to practice their way of life, freedom to exist in their ancestral habitat, social reforms by themselves to weed out unhealthy practices, freedom from social exclusion, freedom from economic exploitation* etc. as determined in section 2.7 of the second chapter.

It follows that the independent variable IL is not a composite variable and cannot be further factorized into sub-variables. The dependent variable TD however is a composite variable thus it can be factorized into its constituent or sub-variables. The sub-variables of TD determined in section 2.7 of the chapter-two (literature review) are as follows:

1) Freedom to exist in and to use their ancestral habitat and forests (F);
2) Freedom from social exclusion (S);
3) Alleviation of poverty (P);
4) Ability to stay healthy and live in hygienic conditions (H);
5) Freedom to pursue traditional education with appropriate modern education (E);
6) Freedom from pressures of assimilation (A);
7) Freedom to carry out social reforms (R);
8) Freedom from economic exploitation (X);
9) Ability to survive the pressures of modernization and globalization (G).
The dependent variable TD can thus be expressed mathematically as:-

\[ TD = \sum (F, S, P, H, E, A, R, X, G) \]

Other sub-variables too may qualify to be the sub-variables of development of indigenous communities in India but the literature review has specifically identified the ones taken into account for the present study. TD is hypothetically dependent on IL and therefore the sub variables F, S, P, H, E, A, R, X and G of TD shall also be dependent on IL.

**The Null Hypothesis \( H_0 \):**

For the research study at hand the null hypothesis \( H_0 \) can be stated as follows:-

\( H_0 \): There is no significant effect of the *role of indigenous leadership* (IL) on the *development of Tribal Communities in India* (TD);

The null hypothesis can be broken down into a set of nine hypothetical statements \( H_{0-1} \) to \( H_{0-9} \) to connect each of the sub-variables (constituents) of the dependent variable Tribal Development (TD) to the independent variable Indigenous Leadership (IL). These hypothetical statements together forming the null hypothesis are listed below:-

\( H_{0-1} \): There is no significant effect of the *role of indigenous leadership* (IL) on the Indian tribal communities’ *freedom to exist in and to use their ancestral habitat and forests* (F);

\( H_{0-2} \): There is no significant effect of the *role of indigenous leadership* (IL) on the Indian tribal communities’ *freedom from social exclusion* (S);

\( H_{0-3} \): There is no significant effect of the *role of indigenous leadership* (IL) on the Indian tribal communities’ *alleviation of poverty* (P);

\( H_{0-4} \): There is no significant effect of the *role of indigenous leadership* (IL) on the Indian tribal communities’ *ability to stay healthy and live in hygienic conditions* (H);

\( H_{0-5} \): There is no significant effect of the *role of indigenous leadership* (IL) on the Indian tribal communities’ *freedom to pursue traditional education with appropriate modern education* (E);
Ho-6- There is no significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom from pressures of assimilation (A);

Ho-7- There is no significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom to carry out social reforms (R);

Ho-8- There is no significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom from economic exploitation (X);

Ho-9- There is no significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ ability to survive the pressures of modernization and globalization (G);

The Alternative Hypothesis H1:

The Alternative corresponding to the null hypothesis stated above shall be as follows:-

H1-1. There is a significant effect of the role of indigenous leadership (IL) on the development of Tribal Communities in India (D);

The alternative hypothesis can also be broken down into a set of nine hypothetical statements H1-1 to H1-9 to connect each of the sub-variables (constituents) of the dependent variable Development (D) to the independent variable Indigenous Leadership (IL). These hypothetical statements together forming the alternative hypothesis are listed below:

H1-1- There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom to exist in and to use their ancestral habitat and forests (F);

H1-2- There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom from social exclusion (S);

H1-3- There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ alleviation of poverty (P);

H1-4- There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ ability to stay healthy and live in hygienic conditions (H);
H1·5-There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom to pursue traditional education with appropriate modern education (E);

H1·6- There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom from pressures of assimilation (A);

H1·7- There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom to carry out social reforms (R);

H1·8-There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ freedom from economic exploitation (X);

H1·9-There is a significant effect of the role of indigenous leadership (IL) on the Indian tribal communities’ ability to survive the pressures of modernization and globalization (G);

The research question Does indigenous leadership have a role in the development of the tribal communities in India? shall get answered in denial if H₀ gets accepted conversely the answer to the research question shall be in the affirmative if the H₀ gets rejected and consequently the alternative hypothesis H₁ gets accepted.