

**Science, Social Research and Scientific Approach**Ahmed Abubakar Magaji<sup>1\*</sup>, Musa Hadiza SA'ced<sup>2</sup><sup>1</sup>Department of Sociology Usmanu Danfodiyo University, Sokoto, Nigeria<sup>2</sup>Department of Sociology Ahmadu Bello University, Zaria, Nigeria**\*Corresponding author**

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**Article History**

Received: 11.02.2018

Accepted: 23.02.2018

Published: 30.03.2018

**DOI:**

10.21276/sjhss.2018.3.3.9



**Abstract:** The paper looked at science as a systematic or step-by-step procedure requires in acquiring or obtaining knowledge that is objective, empirical and rational. The paper talked about the elements of scientific inquiry such as concepts variables, hypotheses, measurements and theories. It further highlighted the characteristics of sciences like objectivity, empiricism, universal applicability, systematic, predictability, verifiability, testability, logicity, experimentation and cumulative knowledge. Various conceptions of science were treated which includes realist conception, conventionalist conception, and traditional conception (a theory, operationalization and observation). Social research is viewed as a systematic way of search for knowledge of understanding social reality. Some types of research were identified as descriptive, analytical, applied, fundamental, quantitative, qualitative, conceptual, empirical, longitudinal, exploratory, and clinical among others. One of the scientific approach, the paper viewed quantitative research and qualitative research as having step-by-step procedures in the collection and the analysis of data collected in the field. The paper concludes that both quantitative and qualitative data are scientific with quantitative research being more rigorous related to positivist science and qualitative to non-positivist conception. The paper further suggests the need for mixed method in social research in order to overcome the shortcomings of both quantitative and qualitative approaches.

**Keywords:** Science, Research, Social Research and Scientific Approach.

**INTRODUCTION**

Science, social research and scientific approach goes hand in hand. The application of scientific methods which is usually done using scientific approach is what makes social science discipline systematic. Although natural science procedures and approaches may not yield hundred percent results as did by natural science. This is because in social sciences, we deal with multi causality while in social science we deal with mono-causality. For example, if the ball falls to the ground, science assumes that there must be a natural explanation for why the ball move downward once released. Right now scientists can describe gravity in great details, but exactly what gravity is remains elusive [1].

The scientific procedure used in acquiring knowledge made sociology a social science discipline which involves step-step systematic procedures in collecting, analyzing and interpreting information gathered in the field. The use of research instruments in gathering this information is what made social research scientific enterprises. This paper will look at the definition, types and approaches to science, the conceptualization of social research and the scientific approach to the explanation, understanding, control and production of social reality.

**Science**

Science is ordinarily derives from the Latin *scientia* which means knowledge. Applied to disciplines, it is thus knowledge attained through study - knowledge covering general truth of the operation of general laws as obtained and tested through scientific method and concerned with the physical world. Further, science is system of acquiring knowledge using observation and experimentation to describe, explain and to predict. The purpose of every science (natural or social) is to produce a useful knowledge in understanding natural or social reality. Science is broadly divided into two: natural sciences which is the study of natural world involving the study of mono-causality i.e natural phenomena while social sciences involves the study of social world which is very complex and involves the study of multi causality involving the systematic study of human behaviour and society [2].

Science is sometimes confused with technology where the two are difference. Technology involves the application of science to perform various tasks. Science has to do with the ways questions are formulated and answered; it is a set of rule and forms of inquiry created by people who wants reliable answers [3]. Science is a mode of inquiry that is common to all

human beings, It is one of the many ways of claiming or saying we know something.

According to Olurode and Soyombo [4], the element of scientific inquiry includes concepts, variables, hypotheses, measurement and theories. The way in which they are joined or combined together constitutes a scientific method or strategy, concepts allows the mind to grasp reality. Concept are names for observed events, they are abstractions summarizing similar events observed events that set a like. Concepts do not explain, describe but they represent only names. Science is a way of checking on the formulation of concepts and testing the possible linkages between them through references to observable phenomenon [5].

Variable is any concept that has capacity to acquire more than one value for one unit at two different time or the two units at the same time. As variable is a name of something that is thought to influence a particular stake of being in something else, Age has been established as an important variable in voting, a variable is a special kind of concept that content within it a notion of differentiation [5].

A hypothesis is a sentence with a particular well- articulated proposition, a hypothesis proposes a relationship between two more variables. For example there is a relationship between poverty and unemployment. It will direct the researcher to relevant information so he does not waste time and effort. The relationship proposed between the variables suggests the measurement tools and standard for evaluation to be use. The results of the hypotheses test are the substance of the conclusion. Once the relationship between variables has been established through hypotheses formulation and testing, these relationships can be expressed as generalization [5].

According to Ogunbemeru [1], sciences are divided into two broad areas, namely, natural sciences and social sciences. Examples of the disciplines in the natural sciences include astronomy, biology, chemistry, geology and physics. Similarly, example of the disciplines in social sciences includes psychology, sociology, economics, political sciences and anthropology. Besides, other categories of science have emerged from each of the aforementioned sciences. Researchers have expressed their benefits that one science encompasses other sciences [6]. This means that one science cannot be totally isolated from other sciences. It has been discovered that linkages can be established between the social sciences and natural sciences as well as other sciences [6].

According to Temitola [5], science has the following characteristics;

1. **Objectivity:** scientific inquiry must not be biased, value-laden or emotionally determined. It must be

purely based on empirical facts or evidences. Science is objective because it must have verifiable proofs beyond reasonable doubt.

2. **Empiricism:** it is the cornerstone of the scientific method but it is not the only means of discovering truth. Empiricism emphasizes the role of experience and evidence especially sensory experience, in the formation of ideas over the notion of innate, ideas or tradition. In the philosophy of science, empiricism is a theory of knowledge which emphasizes those aspects of scientific knowledge that are closely related to experience, especially as discovered through experiments or observations.
3. **Universal applicability:** findings of any scientific research or inquiry must have the valid characteristics that will make it universal acceptable and applicable. In an ideal situation, to test hypothesis, one must sample the entire population, the key to generalization is to understand how much the results can be applied to represents a similar people elsewhere with the same socio-demographic and economic conditions as a whole population.
4. **Systematic arrangement:** there must be established procedure to follow by a researcher scientific inquiry should be conducted by logical principles to avoid subjectivity or emotional outburst.
5. **Predictability:** the ideal of predictability means reproducibility. In order for an experiment or observation to be accepted as scientific evidence, the experiment must be reproducible and repeatable. But since experiment or observation results are never exact, results within the "error bars" it is very essential in research and sometimes refers to hypothetic deductive-experimental-observation.
6. **Verifiability:** the result of scientific inquiry must be subjected to the confirmation by other individuals or groups considered as authorities in the field. It also means that the selected method of measurement has been used without error or bias.
7. **Testability:** testability is the separating aspect or a divide that separate science from theology, mathematics and philosophy. It is the important aspect of any scientific research outcomes, or statement or claim that it is testable.
8. **Logicity:** science is logical as it consists of rationally related events. Rationality and logicity are distinct feature of science. Logic is based on earlier or otherwise known statements, events or conditions.
9. **Experimentation:** this refers to the use of experiments as the method of obtaining knowledge of natural or social word. Though more common in the natural sciences because it studies natural phenomena. It is stut applicable in social

sciences especially while dealing with control population or groups. It is the orderly procedure carried out with a goal of verifying, reputing or establishing the validity of the hypotheses. the experiment is the foundation of the scientific method which is a systematic means of exploring the word around us.

10. **Cumulative knowledge:** science is dynamic and self-updating, future inquiry must be able to build from the previous research outputs, it involves the cumulative process as scientific paradigms replace earlier paradigms and bring forth new theories. The process continues and brings about accumulation of knowledge conceptions of science.

Basically, there are three (3) conceptions of science which include among others the following;

- Realist conception of science: Realist shares the positivist view that science is empirically based, rational and objective. They also believed in its explanatory and predictive powers. While positivist believes the appearance in reality, the realist argued otherwise that appearance is not reality [5].
- Conventionalist conception of science: the conventionalist rejects the shared attitude of the positivists and realist. They claimed that science cannot provide thorough description or explanation of external reality through objectively tested theories, observation and experiments; they criticized social research methods as not adequate in the explanation and understanding of social reality.
- Theory operationalization and observation are the three (3) basic elements of traditional model
  - a. A theory is a generalized and coherent body of ideas which explain the length of variations of the empirical world in terms of generalized principles. Theories are build up as hypotheses are tested and hew relationships emerged.
  - b. Operationalization: this is the means of specifying empirical indicators (i.e measures) of a latent phenomenon which is not directly measurable but its existence is indicated by other things, it involves defining fuzzy concepts so as to make it clearly distinguishable empirically or quantitatively.
  - c. Observation: this is the fundamental way of finding out about the world around us. Human beings are naturally equip with the potentialities of picking up detailed information about their environment, observation has some beyond looking and listening to the levels of careful planning of an object, or event or situation under observation. Observation may be direct when it involves face to face interaction with events or process as they occur. While indirect observation is when one watch the results of interaction, processes or behaviour. Similarly, observation may be overt (everyone knows they are being observed) or covert (no one knows he is being observed).

### Social Research

According to Kothari [7], research is an academic activity as such the term should be used in a technical sense. He viewed it as a search for knowledge. According to him, it is an act of scientific investigation, Slesinger and Stephenson in the Encyclopedia of Social Science defined research as:

*The manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art [7].*

Research is therefore, an original and practical contribution to the existing stock of knowledge making for its advancement. In short, a search for knowledge using objective and systematic procedures of finding solutions to research problems through observation, comparison and experimentation. Therefore, research refers to the systematic method consisting of enunciating problems, formulating hypothesis, collecting the facts or data, analyzing the facts and reaching certain conclusions either in the form of solution(s) towards the concerned problem or in certain generalization for some theoretical formulation [7].

The purpose of research is to discover or find answers through application of scientific methods of data collection, analysis and interpretations. Although, each research has its own purpose, the following are the general objectives of every research:

- To gain familiarity with a phenomenon or to achieve new insights into object in view are termed as exploratory or formulate research studies
- To portray accurately the characteristics of a particular individual situation or a group. Studies with this object are view as descriptive research studies.
- To determine the frequency with which something occurs or with which it is associated with something else (studies with this object are referred to as diagnostic research studies).
- To test hypotheses of a causal relationship between variables. Such studies are known as hypothesis-testing research studies.

### Types of Research

Kothari [7] identified the following types of research

- i. **Descriptive vs. Analytical:** descriptive research includes surveys and fact-finding enquiries of different kinds. The major purpose of descriptive research is the description of the state of affairs as it exists at present. In analytical research on the other hand, the researcher has to use fact or other information already available, and analyze these to make a critical evaluation of the material.
- ii. **Applied vs. Fundamental:** applied research aim at finding a solution for an immediate problem facing

a society or an industrial/business organization. Whereas fundamental research is mainly concerned with generalization and with the formulation of a theory. Gathering knowledge for knowledge's sake is called fundamental research.

- iii. **Quantitative vs. Qualitative:** quantitative research is based on quantitative measurement of some characteristics. It is applicable to phenomena that can be expressed in terms of quantities. Qualitative research, on the other hand is concerned with qualitative phenomena, i.e involving quality or kind. For instance, while investigating the reasons for human behaviour. This type of research aims at discovering the underlying motives and desires using in-depth interviews for the purpose.
- iv. **Conceptual vs. Empirical:** conceptual research is related to some abstract ideas or theory. It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones on the other hand, empirical research relies on experience or observation alone, often without due regard for system and theory.
- v. Some other types of research Kothari [7] identified other types of research apart from the above mentioned ones to include; one time research vs longitudinal research one-time research is a research confined to a single time-period. Whereas longitudinal research is carried on over several time period other types of research includes; field setting research or laboratory research; clinical or diagnostic research, exploratory research; historical research, conclusion oriented and decision oriented researches.

### Research Approaches or Procedures

According to Akinwale [8], there are two basically distinct research approaches or procedures in social sciences which according to him requires different designs. These research approaches are:

- **Quantitative study:** quantitative study usually focuses on questions starting with the following prefix: what, when, where, who, and how. This process necessitate quantifiable responses that suit quantitative research instruments such as structured questionnaire and census, which can be used to study, a relatively large population within a short period. It is important to take into consideration the following features of a good questionnaire: simplicity, clarity, organization, sequence, suitability, relevance, brevity and courtesy. Like other quantitative techniques, the use of questionnaire was developed based on the literature and an assessment of reliability. This use of questionnaire provides an opportunity for the establishment of reliability, validity and verification of statistical analysis of information in a study, although they are not suitable for the exploration of hidden issues. Validity deals with accuracy while reliability deals with constancy. It

is important to understand the types of validity and reliability applied to a study. Different dimensions of validity such as criterion validity, content validity, construct validity and face validity are crucial in the assessment of the validity of research instrument.

In contract, qualitative study is suitable for an exploration of why and how some events occurred. The exploration is possible through different research tools such as interviews, focus group discussions and life histories. Observation is the process of generating data through sense including sight, hearing, tasting, smelling, and touching. Each of the senses requires the use of the brain observation can be conducted to any visible aspect of the society. It requires close inspection and thorough investigation. Observation is generally divided into two; participant and non-participant observation. Participant observation is a process by which researchers live among their study population in order to acquire rich knowledge of the subject under investigation. This requires the ability to share the culture of the study population. Although, some social research ethics may require the violation of social science research ethics like hidden the identity and so on.

Non-participant observation on the hand is a process by which a research work is carried out without direct identification with the study population. In this technique, a research may act like a spy in order to get useful information about the study population. A major shortcoming of participant is the data or knowledge gathered from it may be shallow. It also has the problem of communication gap between the researcher and the study population.

Interview is another useful instrument of qualitative research. It involves the face-to-face method of obtaining data from the population under study. Basically, there are two types of interview: in-depth interviews and key informant interviews. Interviews may be structured or unstructured depending on the choice of the researchers. Key informant interviews are usually conducted to a group of individuals or people who have relevant expertise or knowledge about a given phenomenon. Example, in a study of homosexuality, a gay may be relevant and key informant. Not all in-depth interviews are key informant interviews but all key informant interviews are in-depth interview.

Generally, qualitative research instrument in the social sciences can be used to generate comprehensive information about different issue such as reasons, implications and remedies for a given social problem, information collected from qualitative data are based on phenomenological evidence unlike quantitative research which is based on the principle of

positivism. In a nutshell, the weaknesses of qualitative research are the strength of qualitative research and vice versa. These weaknesses can be minimized when the both methods are combined in a mixed method of a

single research. This tends to be effective and efficient method of social research that is used to avoid the inadequacies of quantitative and qualitative researches.

**Table-1: some common contrast between quantitative and qualitative research**

Quantitative	Qualitative
Numbers	Words
Point of view of the researcher	Point view of the participants
Researcher distant	Researcher Close
Theory testing	Theory emergent
Static	Process
Structured	Unstructured
Generalization	Contextual understanding
Hard reliable data	Rich deep data
Macro	Micro
Artificial setting	Natural setting

Source: Alan Bryman, 2008: 393

### Scientific Approach

Abdulrahman [9] identified the following research process that emerged from the methodological assumptions. These according to him include:

Deductive approach (hypothetic-deductive or deductive-nomological) is the approach most people are familiar with and one that is often regarded as the scientific approach. It is the one to which most students are exposed. It is often described as moving from the general to the particular. It entails the use of logical rules or law-like or universal generalizations to arrive at a set of premise from which certain conclusions must be follow in other words, it begins with theory and then tests the hypothesis via observation.

The steps in the deductive approach include the following:

- i. Identification of a problem: a research problem has been defined as an intellectual stimulus calling for an answer in the form of scientific enquiry [10]. The first step in scientific method is to come up with a problem or question that is to be investigated. That is being curious, having questions about what is observed in society. For example, why are the Young people prone to criminality than the older ones [5].
- ii. Literature review: after formulating the problems and specifying the objectives of study comes the review of literature relevant to the topic of study. This is more thorough and specific than the one under identification of the research problem. Literature review helps to further clarify the important dimensions of the topic, to identify the types of research design appropriate to the study of the problem, to suggest ways of dealing with relevant concepts and, above all, to avoid the mistakes that others have made either in the selection of their research design, collection and

analysis of data or even the interpretation of the findings [9].

- iii. Selection of a theory/hypotheses formulation: after reviewing the relevant literature, the researcher select an appropriate theory of the problem and derives his/her hypothesis from the theory selecting an appropriate theory entails:
  - a. Identifying all the relevant theories that can be used to study the problem
  - b. Highlighting the strengths and the weakness of each one in relation to the research problem
  - c. Identifying in what ways the selected theory is superior to the others in terms of its explanatory and/or predictive power,
  - d. Stating he major assumptions and propositions of the theory as they apply t the current research efforts
- iv. Research Design: a research design involves the specific procedures to be used in collecting, analyzing and interpretation of data in a way that enables the researcher to answer the research questions and, thus suggest solution to the research problem. The objective of every research deign is to enable the researcher to answer the research questions as validity, as objectively, as accurately and as economically a possible. This requires that the design be appropriate to the problem and the researcher's conception of reality.

Basically, two designs are used in deductive scientific approach, they are:

- a. Experiments: experimentation means the manipulation of one or more independent variables and the observation of variations, if any, in the independent variable concomitant to the manipulation [11]. Experiments are more common and effective in the natural sciences than the social and behavioural sciences. This is because of the inadequacy of the ability to control human

behaviour since it can be influenced by multiple causal factors

- b. Survey: the social survey is the most commonly employed design especially in the social sciences, when the goal is to describe the range and frequency of the occurrence of something or to test competing theories [12]. Survey can be cross-sectional in which data are collected over a long period of time at different points. The longitudinal type could also be trend study in which different samples of the same population are studied at various points i.e time or cohort studies in which same people of same population is observed over a period of time [1].

The most common instrument for collecting data in survey research is the questionnaire. This is also divided into open questionnaire and closed questionnaire.

- v. Data analysis: the next stage in the process of deductive research is data analysis. If data is collected, it is reduced into a form that makes the description, storage and presentation of results possible and easier. The researcher must make sure that the data collected are fully utilized and the errors are fully minimized. This is to ensure that the presentation and interpretation of results are not impaired.

- vi. Interpretation of results: the final and the most important stage for the deductive research process is the interpretation of results and the communication of the findings to others i.e the research report. The interpretation of results includes:

- a. All findings must be reported
- b. Conditions must be based on the evidence collected and must be justifiable from the hypotheses tested
- c. The interpretation must be related to the units of analysis selected for the research
- d. Over generalization must be avoided and
- e. Findings on each research element (question, objective, and hypothesis, variable) should be outlined and interpreted with reference to the theoretical framework.

### Inductive Research Process

This involves moving from the particular to the general i.e from particular observation to the making of empirical generalizations which then serves as the basis for the formulation of theories. The stage in inductive research process includes:

- i. Formulation/identification of a research problem: the inductive scientific approach begins with what was said earlier under the deductive approach applies. However, for inductive approach is the identification by the researcher first exploring and getting intimately acquainted with the sphere or area of life he/she wants to study.

- ii. Selection of qualitative methodology: the next stage in the inductive process is the selection of qualitative methodology. Qualitative research methods include narrative, grounded theory, case studies, ethnography etc. these include holism (studying the whole subject), induction (moving from facts to principles), naturalism (studying the subject in its natural environment) and involvement, i.e the immersion of the researcher in the subject so as to understand things from the subject point of view. In-depth interview, participants' observation and focus group discussion are usually the tools for collecting data.

- iii. Data analysis: after collecting data in the inductive research process comes the data analysis. Generally speaking qualitative researchers tend to use the term "mode of analysis" this is because for many there is no clear distinction between the collection of data on one hand and the analysis of data on the other hand. Rather, data are analyzed as they are collected. The researcher looks for meanings and patterns and collects new data to see if they will yield the same meanings and patterns in relation to the research questions.

- iv. Theory formation: the final stage is the formulation of theory, while many quantitative researchers do not see the formation of theories as their goal but seeking illumination and understanding, there are others who moved from the identification of meanings and patterns to extrapolation to similar situations and in so doing, develop new concepts or constructs and specify relationships between them. This theory may then be used to examine new situations.

### CONCLUSION

Based on the paper, science involves the systematic procedures of acquiring knowledge involving step-by-step procedures. These procedures made it possible to acquire objective and rational explanation, prediction and the analysis of social reality. The paper looked at science as dividing into two: natural sciences and social sciences. Social research involves the step-by-step systematic procedures in collecting, analyzing and the interpretation of the data gathered from the field. Basically, social science research are divided into two; the qualitative and quantitative research. The social research requires the application of the systematic procedures of natural sciences in understanding social reality. This started from the contributions of early founding fathers of sociology (Positivist) like Comte, Durkheim, among others. Qualitative research is also scientific and systematic as it involves step-by-step scientific procedure but not as rigorous as quantitative research. Both qualitative and quantitative researches are relevant and in recent times, there emerged for the

need of mixed method of both quantitative and quantitative research to complement each other in the best proper ways of having more sufficient, effective and efficient result. Therefore, conclusively, social science research is scientific research because they involved step-by-step procedures of understanding social phenomena or natural phenomena.

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