



## DILEMMA OF SCIENTIFIC ARTIFACT: CONTROL OF HUMAN FACTOR VARIABLE IN RESEARCH PROTOCOL FOR OBJECTIVITY AND RELIABILITY.

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### *Abstract*

The issue of reducing bias in research is an important one, and demand special attention and discussion in any research method in the social

**KEY WORDS:** Science, Belief, Bias, Objectivity, Subjectivity, Method and Social.

sciences. This paper looked at possible areas of the researcher's subjectivity in designing and conducting qualitative research, as well as the biases associated with participants' responses to

research questions. While researcher bias and subjectivity are commonly understood as inevitable and important, it is generally not comfortable to have a qualitative research that is value neutral. A researcher's approach to any study is derived from his personal orientation and values; just as a participant responses are dependent on his values and beliefs. A researcher's personal beliefs and values are reflected not only in the choice of methodology and interpretation of findings, but

### INTRODUCTION

A voyage into the nature of ourselves and the world which we live in, began many generations back. It is a voyage with a particular focus – science (Raya, 2003). Science is defined by the BBC English Dictionary (1992, as the study of the nature and behavior of natural things and the knowledge we obtain through them. While the Webster New Collegiate Dictionary defines it as; 'knowledge attained through study or practice' or 'knowledge covering general truths of the operation of general laws, especially obtained and tested through scientific method and concern with physical world. Science offers us a new way of viewing the world. Learning about science, like learning about anything new, offers added perspective, which can in turn lead to an expansion of our consciousness. The development of science entails the gradual replacement of ignorance by reliable knowledge (Popper, 1972). This is done through the successful replication of procedures of others (Ray, 2003). Progress is said to occur when an inadequate theory is replaced by one

also in the choice of topic. This is applicable to the responses of participants in a research. How then can we ever control this human factor variable in research protocol for objectivity and reliability?

This is the question the paper is out to address. It starts with an introduction, then preview of the method of science, sources of bias and some few approaches to control some. The last aspect, addressed the

issue of the method of science and personal values while the concluding part attempts to suggest how such factors (values) can be managed.

**m**ore adequate or rather, in some instances, by one less adequate. Such replacement is triggered by the acquisition of some 'reliable' new facts. (Dyer, 2006).

If the development of science involves the progressive replication of procedures and replacing, rejecting or uploading theories on the basis of more reliable facts, it then means that reliability in science is relative. Popper (1972), sees the development of knowledge as a gradual and cumulative process in which the explanation of a natural phenomenon, expressed in a theory is gradually refined and extended in scope. By this, it means there is always something missing, which must be furthered discovered by other researchers or through the use of new participants and may be in a different setting. Would we be wrong then to query the objectivity of science, most especially issues having to do with personal value.

Science, above all, is a human activity, and humans, being what they are, carry into all their activities, their values, culture, religious and political beliefs, ideologies, prejudices, stereotypes and many other affiliations. Ray (2003), sees science as only but one way of examining human nature, there are other ways, such as art, philosophy, religion, and literature; which are all fruitful ways or channels through which we gain new ideas about human behaviour and experience. However, having a fruitful and reliable source of such information is the concern of the method of science. Ray (2003), posit that, an important aspect of learning about psychology is the process of determining whether a new idea is accurate, and in contrast to other ways of knowing, science offers, not only a fertile source of new ideas but is also a powerful method for evaluating the ideas we have about reality.

From the above we can deduce that the purpose of science is to produce useful and reliable models of reality. But the question that comes to mind is, how well can the scientific method control for the complex human factor variables (values, beliefs, prejudices, stereotypes, etc) that we carry into the method of science. Is there a way of controlling for these factors in response to research protocols in the social sciences? This is the question this paper is out to address. In doing so the paper starts by defining the method of science, its history and processes. In the concluding part, the paper looked at the concept, personal values, and how they compound the quality of data in the method of science and how they can be reduced or checked, if we must have that truth or objectivity in the data generated by the method of science. Suffice it here to look at a brief history and method of science.

#### **THE METHOD OF SCIENCE**

The method of science as defined by Dyer (2006), is that process by which scientists, collectively and over time, endeavor to construct an accurate (i.e. reliable, consistent, and non-arbitrary) representation of the world. Recognizing the fact that, cultural and personal beliefs influence both our perceptions and our interpretations of natural phenomena, the method of science aims

through the use of standard procedures and criteria to minimize such influences. In short, the scientific method attempts to minimize the influence of bias and prejudice in the processes.

A brief overview of the history of science as given by Hoffman (2008), predates to the 1950's, where we have what he called the period of pre-modernism (1650's), modernism (1650's to 1950's) and postmodernism (1950's to current times).

**Pre Modernism** – The primary epistemology of pre-modern period, according to Hoffman, was based upon revealed knowledge from authoritative sources. In pre-modern times, it was believed that “Ultimate Truth” can be known through; direct revelation from God or a god. The sources of authority at this time, was the Church.

**Modernism** – Two approaches to knowing became dominant, empiricism (knowing through the senses) which evolved into ‘scientific empiricism’, with the development of the *methodology*. The second approach of this period was reasoning or logic, which worked hand in hand with each other or collaboratively.

**Post Modernism** – This period brought with it a questioning of the previous approaches (which is what we are still doing today, question the method of science). Instead of relying on one approach to knowing, this period is advocating for an *epistemological pluralism*, which utilizes multiple ways of knowing. This can include the pre-modern (revelation), and modern (science and reason) along with many other ways of knowing such as intuition, relational and spiritual. This period seeks to deconstruct previous authority sources and power. Because power is distrusted, they attempt to set up a less hierarchical approach in which authority sources are more diffused.

Binion (1988), in a paper he presented in a symposium, titled; ‘Evolution of Scientific Method’, believes that science began as a direct result of Divine endowment, which includes; i) *Curiosity* (the urge of discovery, or the drive of exploration), which is a basic attribute of the personality, and has given rise to the couples and convoluted triad of human endeavor. ii.) *Religion, Science and Philosophy*. As we know, religion delves into the spiritual realm, science into the physical realm, and philosophy unites the two in a pervasive search for universal reality.

Binion (1988), believes that science began on earth with the first human. He said, Adam, observed the sparking quality of flint and conceived the idea of making fire. Later, he and Fonta; ‘used the observation in a two – month – long experimental process to develop a method of producing fire, whenever they needed it’, With their actions, science and technology it sparks, were born.

Modern western science, had its beginning with the Greeks. However, the Greeks were using intellectual reasoning alone, the laws of the universe. Cultural/Religious barriers prevented them from conceiving experiments to verify their theories.

At about the same time or even earlier, a similar tradition pervaded the Eastern world. The *Vedic* writings of India, which are purported to predate the Greeks, also, described creating knowledge, through a purely cognitive process involving contemplation, meditation and six fold validation procedure, which in itself was a structured logic thought process (Binion, 1988).

Modern scientific thought, we are told, evolved from the Greek philosophers who were influenced by the Egyptians, Babylonians and Assyrians. The Greeks used *abstraction* and *generalization* (Russel, 1982).

The Renaissance thinkers, brought a fresh outlook to the method of science. Names like; Copernicus, Kepler, and the philosopher Bacon came to the fore of scientific activities. However, Galileo and Newton are often referred to as the greatest founder of modern science (Hulton, 1952; Russel, 1982). Then there was Rene Descartes (a 23 year old soldier, philosopher &

mathematician), who in 1619 published his thoughts, which crystalized the modern scientific method. (Binion, 1988).

The contributions of the above scientists cumulated to six steps in the 19<sup>th</sup> century, and into seven by the 20<sup>th</sup> century. Russel [1982], described the steps to include;

- [i] Pose a question about nature, not necessarily as a result of observation.
- [ii] Collect the pertinent, observable evidence.
- [iii] Formulate and explanatory hypothesis, defining relevant assumptions.
- [iv] Deduce its implications.
- [v] Test all the implications experimentally.
- [vi] Accept reject or modify the hypothesis based upon the experimental results.
- [vii] Define its range of applicability.

It is strongly held that with the perception of the steps above, holding some variables constant, we can arrive at the truth, which can be relied on (Russel, 1982).

The control of biases, or holding variables constant, is a complex and difficult process. It is important at this point, to look at some possible sources of bias in research protocol.

#### **SOURCES OF BIAS IN RESEARCH**

Bias affects the validity and reliability of research findings. Bias, distorts truth and also skews the data in research.

*Focus Group Tips.com* (2011), in marketing research said bias is inevitable. What we need to do is to recognize and reduce it, or at least be aware of it. They further categorize bias into five major areas. Viz;

- i.) Researchers' Bias
- ii.) Biased Questions
- iii.) Biased Answers
- iv.) Biased Samples
- v.) Biased Reporting

The group further explained how to control the above in research settings.

- a.) Researchers' Bias: The researcher collects data, and has a major impact on the quality of data. The researcher's facial expressions, body language, tone, manner of dress and style of language may introduce bias. In the same way, the researcher's age, social status, race and gender can produce bias.

While these influences are unavoidable, some of the physical influences can be controlled by remaining as neutral as possible in dress, tone, body language as well as not making opinions while moderating. This entails a task of years of learning and practice.

- b.) Biased Questions: Biased questions influences respondent's answers. The way a question is asked can bias it. This can be controlled by avoiding leading questions;
  - i. Misunderstood question bias: word, context, culture and different interpretations of words and sentences cause misunderstanding. Simple, clear and concrete questions reduce misunderstanding.

- ii. Answerable question bias: some respondents have difficulty answering questions because they don't have experience or reference points with a subject. It is

therefore better for only respondents who have experience are subjected to qualitative research.

iii. Question order bias: the order in which question items are presented can introduce this. It is suggested that

- General questions should be asked before specific questions.
- Unaided before aided negative questions.
- Positive questions before negative questions.
- Behavior questions before attitude questions.

The process of the above, involves some personal judgment.

c.) Biased Answer: This an untrue or partially true statement, which can be intentional or unintentional; and happens for various reasons. Common biased answers include;

- Consistency bias: an effort by the respondents to appear consistent in their answers. A respondents' previous statement influences, even though one of the statements may be untrue.
- Dominant respondent bias: in a focus group, dominant respondent influence other respondents. They dominate talk time, vocalizing their knowledge, expertise, energy, attractiveness and charisma to make them dominant. The only way out here I to keep such respondents under check, making sure other respondents have got equal 'talk time'.
- Hostility bias: here the respondents may be angry with the researcher, thus providing negative responses. The researcher in this circumstances, need to keep his cool, continue with his interview, but where the hostility persists, break of the interview.
- Moderator acceptance bias: this is where the respondents provide answers to please the researcher. The respondents interpret what they believe the researcher wants to hear, and provide some reasons, which may be fake or wrong.
- Mood bias: respondents may provide answers based on their mood. Angry or persistent respondents provide angry or pessimists answers. Busy executives may provide short, curt and harried answers. The researcher in this instance is expected to check for mood state and assess answers.

There are many other types of biases which includes;

- Overstatement bias.
- Concept test bias.
- Sensitivity bias.
- Social acceptance bias.
- Sponsor bias etc.

d.) Biased Sample: This result in interviewing the wrong group based on selection of a sample that does not represent the through population. Ensure random sampling procedure during recruiting respondent samples to avoid sample bias etc.

e.) Biased Reporting: Researchers and analyst are human as such, are prone to be influenced by experiences, beliefs, feeling, wishes, attitudes, cultures, views state of mind, reference, error and personality during analysis.

We are finally advised to be as objective as possible.

With the above effort, to control for biases in research, the question that remains to be answered is how we can control for our personal values (researcher and respondent) in the process of conducting research.

It is pertinent to understand at this point what personal values are and their implications in the research process.

#### **THE METHOD OF SCIENCE AND PERSONAL VALUES**

Values to my mind are the deposit beliefs and sentiments we subscribe to. The BBC English Dictionary (1992) defines value as 'moral principles and beliefs'. It went on to say that "value is a belief, a mission or a philosophy that is meaningful, whether we are consciously aware of them or not". Every individual has a core set of personal values.

Our personal values, and our personal attitudes appear quite similar. However, on closer analysis, we see a distinct difference. Attitudes reflect more of our vital behavior and action. Where as, our values reflect more of our mental beliefs, which may or may not express through our behavior. A value contains a conscious mental recognition of the things, whereas, an attitude is a less conscious vitalized opinion expressed through our behavior and actions. (Beakley and Ludlow, 2007)

Businessdictionary.com defines Values as; "important and enduring beliefs or ideals shared by the members of a culture about what is good or desirable and what is not". It went on to stress that values exert major influences on the behavior of an individual and serve as broad guidelines in all situations. It defines cultural values as; 'commonly held standards of what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable, etc. in a community or society' (Roy, Posner and MSS, [www.gurusoftware.com](http://www.gurusoftware.com), 2012).

Human factor can be seen as the environmental, organizational as well as human and individual characteristics which influence behavior. These factors could include; behavioral differences, emotions, values, etc. As complex and erotic beings, humans interacting in whatever situation, will inevitably produce variability and sometimes errors depending on their characteristics.

By taking a step back and refocusing our attention on the human elements, investigation will be far more efficient, and if the best results are to be achieved.

There are multiple approximations to the concept 'value'. Schwartz and Bilsky (1987 p. 551) suggests that in every definition in the literature, values are understood as concepts, beliefs, conditions or behaviors that transcend specific situations and guide the selection or evaluation of a situation or behavior. Such values exist within an individual's overall system.

A similar approach to the concept appears in Fritzsche's (1995), in which he defined values as the explicit or implicit conception of what is desirable that has an influence on behavior, based on appropriate behavior standards. So, in general, there seem to be common view, that value influence behavior. In this sense Kahle (1996) indicates, from the area of social adaptation theory, that values facilitate the adaptation of individuals to the environment, and that they are fundamental basis of acceptable attitude and behavior.

A number of articles in the areas (such as Perrow, 1986; Rescher, 1969; Rockeach, 1973; Roussau, 1985) argue that values are inherently complex and that classification can be approached from many angles; so research must distinguish between the different levels at which the values are held (e.g. individual, organizational, institutional, societal or even global). Craig and Douglas (2006), suggest, values could be examined at different levels: "the level of the individual; and the level of the society", where specific groups, organizations and people interact.

The value system of the individual is the group of personal values, arranged hierarchically on the basis of relative importance that each individual assigns them (Fritzsche, 1995). In other words, the value system can be understood as the arranged group of preferences and standards that



influence an individual's decision, actions, conflicts or conflict resolution and application for social relationship (Williams, 1979). Quite a number of literature has shown the relationship between individuals' values and person's behavior (Akaand and Lund, 1994; Singhapakdi and Vitell, 1993), their moral development (Weber, 1993) their job choice (Judge and Bretz, 1992) and or their behavior as a consumer (Beatly et al 1985; Manywa and Crawford, 2001).

The development of science entails the gradual replacement of ignorance by reliable knowledge (Popper, 1972). This is done through the successful replication of procedures of others (Ray, 2003). Progress is said to occur when an inadequate theory is replaced by one more adequate or rather by one less adequate. Such replacement is triggered by the acquisition of some 'reliable' new facts (data). (Dyer, 2006).

If the development of science involves the progressive replication of procedures and replacing, rejecting or upholding theories on the basis of more reliable facts (data), it then means that reliability is relative. If repeated procedures confirm a theory, then we say that the process/procedure was reliable, if on the contrary, we doubt the reliability of previous data. This raises the issue of subjectivity in the scientific process.

Popper, (1972) sees the development of knowledge as a gradual and cumulative process in which explanation of a natural phenomenon expressed in a theory is gradually refined and extended in scope. By this, there is always something missing which must be further discovered by other researchers or through the use of new set of participant, maybe in a different setting. Would we then not be right to say it is difficult to accept the reliability of procedures or rather, the data so generated? Even with scientific revolution or 'shared world view' – paradigms – there are changes in paradigm following the availability of more qualitative data.

## CONCLUSION

At the heart of the issue, is a failure to learn from the insight gained from behavioral studies over the years on the influence of values on all aspects of human behavior. The assumption of rationality, both on the part of the researcher and the researched, continue to prevail. Until such convenient assumptions is discarded, the conclusion of research should come with a 'health' warning. It is the believe of the writer that unless all research instruments have value items carefully embedded in them, and the most reliable types of statistics used to assess the value so embedded in the respondents responses, the reliability of research outcomes remain to be rather deceptive.

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**INTERNATIONAL JOURNAL OF INNOVATION RESEARCH & ADVANCED  
STUDIES (VOL. 22 NO.2) SEPTEMBER, 2023 EDITIONS**

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