

A Critical Study on the Attempt to use the Methodology of Natural Sciences in the Social Sciences

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As we already know science refers to a system of acquiring knowledge. This system uses observation and experimentation to describe and explain natural phenomena. The term science also refers to the organized body of knowledge people have gained using that system. Less formally, the word science often describes any systematic field of study or the knowledge gained from it. Science is a thought process combined with data and it is a methodology used to understand our world. Furthermore, Sciences are the process of gaining knowledge through experimentation.

Human knowledge can be divided into a number of areas and fields, and every science represents the systematic collection and study of data in one of these areas, which can be grouped roughly into two major fields as natural science and social science. Natural sciences and social sciences are different only in what they study. Each of these fields is subdivided into a number of specialized sciences or disciplines to facilitate more intensive study and deeper understanding. Natural science is concerned with the natural environment in which human being exist. Social science is the field of human knowledge that deals with all aspects of the life of human beings. “The natural and social sciences are all part of the same human endeavor, namely systematic and critical investigations aimed at acquiring the best possible understanding of the workings of nature, man, and

human society”.¹ Therefore, different research processes are there for both the kinds. Fields of science are commonly classified along two major lines:

- Natural sciences, the study of the natural world, and
- Social sciences, the systematic study of human behavior and society.

Moreover, it can thus be concluded that Social science is based on rules while natural science is based on laws. However, here it is important to show whether the attempt to use the same methodologies which are used in natural sciences is successful or not in social sciences.

Natural Sciences

Natural sciences are sometimes called the hard sciences. We define ‘natural sciences’ as the disciplines which study objects or processes of the physical nature by means of scientific methods. The Oxford English Dictionary defines the scientific method as “a method or procedure that has characterized natural science since the 17th century, consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses.” These are subjects such as chemistry, physics, astronomy, biology, earth science, atmospheric science, materials science, and oceanography for natural sciences. These fields all study the world and how it works. In many aspects, chemistry is rather central in natural sciences. As chemistry and biology or life science are rather central in natural sciences today, mathematics is no longer the central method of natural sciences.²

In general, natural sciences develop theories for anticipating natural phenomena and challenge them with empirical observations. Only the achievements of the all-round geniuses Da Vinci (1452-1519), Copernicus (1473-1543), and Galileo (1564-1642) brought along a reconciliation of the theoretical, natural-philosophical interest with the practical craft-technical endeavor to study nature in experiments and transform the physical world for the sake of human interests. Newton’s (1642-1727) work, which finally paved the way for the “scientific revolution”, still coins our prevalent modern view

¹ Hansson, S.O. Science and Pseudo-Science. In E. N. Zalta, (ed.) *The Stanford Encyclopedia of Philosophy*. (2008). Available at: <<http://plato.stanford.edu/entries/pseudo-science/>>

² Kemsley, J. “Philosophizing Chemistry, Philosophers delve into the central science”, *C&EN (Chemistry and Engineering News)*, Vol. 87, No. 40, (2009). p.p. 41– 42.

of science. Anyhow, there are two major tests that are used in science to gain knowledge. They are,

- Observation
- Experiment

To observe natural incidences with the intention of solving problems that arisen in natural phenomena is known as observation. In other words “If the observation is done without controlling evidences of the natural phenomena by the scientist and keeping the natural phenomena as it is, those tests are introduced as observation.”³ For instance to observe the going of the moon, scientist cannot control either the rotation of the earth or the going of the orbit. What he can only do is to record how that going is observed and thus, he is unable to control any variable of it. This is how an observation is done in science.

Not like in the observation, there can be seen controlling variables in an experiment as the scientist wishes. Further the test is done with controlling the evidences which affect for the phenomena according to the intention of experimenter. “Today, even in the common usage the experiment is taken as the main part of the scientific method. It is not like the observation; the experiment can often be maintained according to the scientist’s wish.”⁴ For example, in the history of science an experiment was done by Louis Pasteur for spontaneous generation of beings. There, Pasteur heated a glass and avoided it from bacteria. Later on, he enabled bacteria to enter to the glass. Thus he has done an experiment by controlling its variables as he wished. Several kinds of tests can be seen in natural sciences like Case Study, Control Group Method, Crucial Tests and so on and some of them are also used in social science too.

We can see that there are some limitations in the field of natural science. As a common denominator of all sciences relying on inductive approaches, natural sciences face the difficulty of generalizability, which is the question of how one can conclude general validity of a formalism and coherence with the deducted world view from a finite number of experiments. While Popper argues that the justification of a belief would only lead to a scientific truth if the underlying hypothesis, that is the justification for the belief,

³ ගුණරත්න, ආර්. ඩී. “විද්‍යාත්මක ක්‍රමය.” කර්තෘ ප්‍රකාශනයකි, 2000. පිටුව 39.

⁴ එම, 43.

was infallible. Further natural sciences use inductive generation of theories whereas they use empirical verification through quantitative results.

Social Sciences

The origin of social sciences can be traced back to the Age of Enlightenment that is in the eighteenth century. Auguste Comte (1789-1857) was the first to introduce the notion of sociology and to establish the positivist philosophy of science. Auguste Comte, Emile Durkheim (1858-1917), Karl Marx (1818-1883) and Max Weber (1884-1920) are regarded as further famous thinkers that contributed significantly to the evolution of modern social sciences. In the beginning of the 20th century, quantitative approaches with a high emphasis on statistics became very popular, but the interests have shifted and an increase in qualitative research forms is observed from the mid-20th century on.⁵ Whereas social sciences use inductive generation of theories, they use empirical verification through quantitative and qualitative results (interviews, surveys, case studies). Since social science today is such a vast complex that no one student can hope to master all of it. Thus, social science itself has been broken up into anthropology, sociology, history, geography, economics, political science and psychology, etcetera. This list of social science disciplines is both too broad and too narrow. It is too broad because parts of the fields of history, geography, and psychology should not be included as social sciences.

In contrast to the natural science, this studies the physical part of nature. Social sciences are defined as the disciplines “which try to understand phenomena which arise from the social interaction of [mainly] human beings” It is important to mention that social sciences do not intend to explain actions of individuals but recognize patterns of collective action to which individuals contribute by their independent actions⁶. Similar to the natural sciences the approaches in the social sciences strongly depend on the respective research question and therefore vary greatly. Frequently used approaches are surveys, experiments, observations, content-analysis and interviews.⁷ Generally, the method of inquiry can be described as synthetic as the social scholar tries to shed light on patterns of social action through observations on the level of individuals.

⁵ Creswell, J. *Research Design - Qualitative, Quantitative and Mixed Methods Approaches* 3rd ed. V. Knight & S. Connelly, eds., Thousand Oaks: SAGE Publications, Inc. (2009). 15.

⁶ Von Hayek, F.A., The Individualist and “Compositive” Method of the Social Sciences. In *The Counter-Revolution of Science Studies on the Abuse of Reason*. Indianapolis: Liberty Fund Inc., (1979). p.p. 65.

⁷ Babbie, E. *The Practice of Social Research* 12th ed., Belmont, CA: Wadsworth. 2010. p. 21.

Do Social Sciences use the same Methodologies which used in Natural Sciences?

In fact, Social sciences still use the same methodologies as natural sciences. Data is found and analyzed. The biggest difference for social sciences is, however, that social sciences deal with people. Therefore the area is bigger than laboratory settings. Though social sciences use the same methodologies that used by natural sciences, observation is the major methodology that social sciences use. The problem that arises not only in social sciences but in natural sciences also is that which kind of units should be used for their study. For instance, studying the collective behavior of a herd of elephants or studying the behavior of each elephant can be stated. However, although any kind of unit is chosen for social science tests or theories, social scientist does not have sufficient space or conveniences as natural sciences have.

Specially, experiment is used in a very limited manner and social scientist cannot use this for any test because scientist will be unable to control variables in his test in the field of social science due to its vastness. For example, we can take the study of wild elephant’s behavior. We cannot use the experiment because we cannot control their behaviors and their living setting. If we do so it is no more a natural test. Only thing that we have to do is to observe their behaviors. But there is a room for experiment in social science as well. In the history of science we have examples of experiment that scientists had to use it. There are occasions in some parts of history, geography, and psychology both experiment and observation is used that is why sometimes psychology is considered as a natural as well as a social science. For instance, Ivan Pavlov who was a behaviorist and did an experiment using animals and it bears natural science aspects.

As well as there are occasions that other experiments can also be used such as control group method. This is often used by scientists in social sciences. Instead these kinds of tests give useful information; it should be considered that those tests do not give objective results having conclusions based on those of very tests.⁸ There are many reasons for the difficulty of having experiments in social sciences. One of them is that it is difficult to control evidences which are related to human beings such as natural sciences control physical elements, environment or animals. When it is considered people and the society and also due to complexity of social sciences there are many difficulties

⁸ ගුණරත්න, ආර්. ඩී. “විද්‍යාත්මක ක්‍රමය.” කර්තෘ ප්‍රකාශනයකි, 2000. පිටුව 123.

controlling evidences that scientists face. Therefore, observation thus becomes the main methodology in social sciences.

The impossibility of experimenting means concomitantly the impossibility of measurement. The physicist has to deal with magnitudes and numerical relations; because he has the right to assume that certain invariable relations between physical properties subsist. The experiment provides him with the numerical value to be assigned to them. In human behavior there are no such constant relations, there is no standard which could be used as a measure and there are no experiments which could establish uniformities of this type. We do not have the power to experiment with human actions. But we have, being human ourselves, a knowledge of what goes on within acting men.

Social science, however, is most concerned with those basic elements of culture that determines the general patterns of human behavior. Since a social scientist can come to any conclusion based on normative analysis alone it includes his prejudices about an issue. This may then be not a productive research in terms of enhancing our understanding about a social issue, because the presumption would be colored by his subjective and personal views. But then, there are no logical rules to bind a social scientist either. A social scientist's rationality has no strict paradigm to follow, and can easily switch points.

One challenge for researchers in the field arises from the difficulty to derive representative and objective data sources which necessitates clearly distinguishing between constitutive opinions and explanatory opinions of individuals. Due to the complexity of the phenomena, the researcher is only able to develop limited knowledge of the principle identified. Furthermore, since the principle is derived in an inductive and synthetic way, it cannot be verified by experiment.⁹

The preceding remarks justify the conclusion that there is a radical difference between the methods of the social sciences and those of the natural sciences. The social sciences owe their progress to the use of their particular methods and have to go further along the lines which the special character of their object requires. They do not have to adopt the methods of the natural sciences.

⁹ Von Hayek, F.A. The Individualist and "Compositive" Method of the Social Sciences. In *The Counter-Revolution of Science Studies on the Abuse of Reason*. Indianapolis: Liberty Fund Inc., (1979). p.p. 61-76.

Herein it lies the radical difference between the social sciences and the natural sciences. What makes natural science possible is the power to experiment; what makes social science possible is the power to grasp or to comprehend the meaning of human action. The reformers who wish to improve the social sciences by adopting the methods of the natural sciences sometimes try to justify their efforts by pointing to the backward state of the former. Conversely, the method of social sciences owes to humanities, natural sciences and technology. Social scientists learn some established knowledge of natural sciences from textbook but almost never collected the data through observations and experiments by themselves.

Basic Distinctions between Social and Natural Science

Since natural sciences deal with the tangible objects, hence its methodology is mainly empirical, and social sciences deal with intangible matters, hence its methodology is based more on reasoning out the observable facts. Both of these traditions have different areas of interests and focus on separate lines. For example, when conducting a research in natural sciences one has to be in a laboratory, but a social scientist does not have one, as his scale of concern is universal.

Empiricism is seen to be engulfing all the disciplines in natural sciences, whereas, the social sciences cannot depend on empirical data alone, as often the facts given as statistics are contrary to what is intended. Therefore, much involvement of normative analysis is found in any of the social sciences. The standards are set according to what is perceived as good or bad and right or wrong. The criteria rarely find any place in natural sciences. This elementary difference leads the resultant factors of varied research processes also.

The differences between natural sciences and social sciences are not merely in how the research is carried out in both, but more about the ethics which each pursues. As both of these major domains of study divert away from one another by basing their theories on distinct phenomena, namely natural sciences base theories on concrete structural forms, whereas, social sciences tend to apply speculations and predictions more. Further, it can be said that although natural sciences deal with material things and their processes, social sciences deal with psychological and intellectual things. Therefore,

the methodology of natural sciences' intention is to give explanations while the intention of social sciences is to give understanding.¹⁰

The social sciences in general and economics in particular cannot be based on experience in the sense in which this term is used by the natural sciences. Social experience is historical experience. Of course every experience is the experience of something passed. But what distinguishes social experience from that which forms the basis of the natural sciences is that it is always the experience of a complexity of phenomena. The experience to which the natural sciences owe all their success is the experience of the experiment. In the experiments the different elements of change are observed in isolation. The control of the conditions of change provides the experimenter with the means of assigning to each effect its sufficient cause. Without regard to the philosophical problem involved he proceeds to amass "facts." These facts are the bricks which the scientist uses in constructing his theories. They constitute the only material at his disposal. His theory must not be in contradiction with these facts. They are the ultimate things. As mentioned above the social sciences cannot make use of experiments. The experience with which they have to deal is the experience of complex phenomena. The social sciences never enjoy the advantage of observing the consequences of a change in one element only, other conditions being equal.

It follows that the social sciences can never use experience to verify their statements. Every fact and every experience with which they have to deal is open to various interpretations. Of course, the experience of a complexity of phenomena can never prove or disprove a statement in the way in which an experiment proves or disproves. We do not have any historical experience whose import is judged identically by all people. In the field of the natural sciences there are also differences of opinion concerning the interpretation of complex facts. But here freedom of explanation is limited by the necessity of not contradicting statements satisfactorily verified by experiments. In the interpretation of social facts no such limits exist.

This is in line with Kuhn's observation that there are many "[...] overt disagreements between social scientists about the nature of legitimate scientific problems and methods" while it seems that in the natural sciences, that is "[...] the practice of

¹⁰ Schutz, Alfred, "Concept and Theory Formation in the Social Sciences," in Fred R. Dallmayr & Mc Carthy, Thomas A. (Eds.), *Understanding and Social Inquiry*, Notre Dame and London: University of Notre Dame Press, (1977). pp.225-226.

astronomy, physics, chemistry, or biology normally fails to evoke the controversies over [these] fundamentals” even though there is “doubt that practitioners of the natural sciences possess firmer or more permanent answers to such questions than their colleagues in social science”¹¹.

However, it is important to state that “all natural science and social science disciplines use scientific methods”¹² meaning that they seek for empirical and measurable evidence to support or challenge a theoretical prediction. Research in both fields is traditionally characterized by the provision of hypotheses as functional explanations and the use of experiments to test them while being as objective as possible to allow for the scrutiny of other scientists.

In conclusion, one can say that both natural sciences and social sciences have their differences in their research processes arising from their different approaches. But, one thing must stand out clear that these differences are not to oppose each other, but to work separately for better functioning of their means to achieve their paradigms’ aims.

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¹¹ Kuhn, T.S. “*The Structure of Scientific Revolutions*”. University of Chicago Press. (1962). p.p. vii-viii.

¹² Ledoux, S.F. Defining Natural Sciences. “*Behaviorology Today*”, 5(1), (2002). p.p.34–36.

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