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<td>Author(s)</td>
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The Logic Of Social Science Research

By

Yogesh Atal
THE LOGIC OF SOCIAL SCIENCE RESEARCH

By Yogesh Atal

I. From Impression to Observation

The index of the maturity of discipline is its departure from impression and journey towards observation. This is the path of science. Any discipline which claims its candidature for being designated as science has to tread this path.

Disciplines engaged in the analysis of social phenomena have, at one point or another in their chronology, begun undertaking this journey. Some, of course, started a little earlier; others joined the race rather late. A common concern for facts -- the data of real life situations -- has established a bondage between the so-called behavioral sciences. Watertight compartments of individual disciplines are now characterized by useful apertures allowing adequate ventilation of ideas from outside. Such interaction between the disciplines cannot be called an intrusion of another's territory; it is a mutual invitation to jointly mobilise resources to explore the hitherto unearthed mine of information.

Both growing scientism and interdisciplinarity among social science disciplines have been the result of several factors. Let these be listed:

i) Increasing complexity of the social organization;
ii) Growth of positivism in natural sciences;
iii) Disturbing gap between "philosophy" and "fact";
iv) Concern for pragmatic realities of life; and
v) Introduction of a "machine culture" in research, which makes it possible to handle a wide variety of variables.

The onset of the scientific age opened up many avenues. Improved transportation and communication facilities brought to light a wide variety...
of data drawn from a multitude of societies scattered round the world — data that refused to fit into the neat, simplistic, culture-bound categorizations. The taxonomies failed. Theoretical Procrustes could not manage to accommodate the heterogenous data into their inflexible beds. Even in the context of one’s own society the analyst found an amazing hiatus between the "things said" and "things done" categories. These disturbing challenges required a redefinition of his role. Was he simply to philosophise and brood over the prescription-prone or utopia-building masterpieces and add a bit to already burgeoning piles of commentaries? Was he to take the responsibility of describing the "is"? Or, was he just to analyse the "musts" and "shoulds"?

II. The Scientific Method

The "is" can also, no doubt, be described impressionistically. Of course, reliable knowledge did exist prior to the advent of modern science and rigorous use of its methods. It would, however, be facile to equate common sense with science. The obvious limitations of common sense vis-a-vis science as summarized by Ernest Nagel are mentioned below:

i) Though the knowledge claimed by common sense may be accurate it seldom is aware of the limits within which its beliefs are valid;

ii) Much that passes as common sense knowledge certainly is about the effects familiar things have upon matters that men value; the relation of events to one another, independent of their incidence upon specific human concerns, are not systematically noticed and explored.

iii) Common sense beliefs survive as they do not give exact connotation to the words they use. Concern for precise definition of words does not exist;

iv) Common sense knowledge is largely concerned with the impact of events upon matters of special value to men, theoretical science in general is not so provincial; and

v) Method is not necessarily empirical in case of common sense to determine the accuracy of the statement.
What is known as scientific method is characterized by objectivity. Science is empirical (based on observation and not on impression) and is ethically neutral. To the extent any discipline pursues these objectives, it has a right to claim the status of a science. The scientific method may be used in dealing with all kinds of phenomena -- social and non-social. With due regard to the canons of science, special approaches may be evolved to deal with special kinds of problems and phenomena. Selection of the approach depends upon the type of question raised and the type of answer sought. Techniques are to be viewed as "instrumentalities". As such, they are not the province of any particular discipline. Selection of techniques depends upon strategy of attack: the strategy is devised keeping in view (i) the aims of research; (ii) the characteristics of the Universe; and (iii) the availability of the resources -- men, money, and machines.

Scientific Method
a. Empiricism
b. Value-neutrality

Social Sciences, Natural Sciences

Approaches
Structural-Functional
Historical
Comparative
Cross-Cultural
Experimental

Techniques
of selection
i. problem
ii. field

of collection
i. observation
ii. questionnaire
iii. interview etc.

of analysis and presentation
i. coding
ii. tabulation
iii. case study
iv. content analysis
III. The Research Process

Research may appropriately be described as a journey from Q (Question) to A (Answer). The pre-occupation of the common man has been mainly with A, irrespective of the method through which it has been obtained, or whether he had asked the proper question in the first place. The criterion of a good answer is not its truism; for the common man an appealing, aesthetically pleasing, and convincing answer has a higher value. Such an answer helps him to willingly suspend his disbeliefs.

To a researcher, however, Q and A mean quite different things. The source of the Q does not bother him. Q's may be hurled at the analyst from any quarter -- his discipline, a politician, the intelligentsia, a common man, a prophet, or even a mad man. The task of the analyst is to first refashion the question into a manageable research problem. Possible answers to the Q can also, likewise, come from any of these quarters. To be sure, all suggested answers are not real answers; they may be partial or no answer at all. These are, in fact, hypotheses, trying to indicate a plausible causal link between certain variables. These hypotheses are like impressions; they lead to observation.

The scientific quest begins with an unresolved problem. The apparently unrelated facts begin to bother a scientist and he tries to establish an order connecting the facts. In this exercise, our previous knowledge helps in picking out certain elements in the subject matter that appear to be significant. The hypothesis is a statement of possible relationship between facts. A hypothesis, thus directs our "search for order among the facts."

There are three conditions which a hypothesis ought to fulfil:
1. it should lead to deductions;
2. it should provide the answer to the problem which generated the inquiry; and
3. it should have the quality of predictability.
The research process begins with the raising of issues and provision of plausible answers in the form of hypotheses. Hypotheses thus indicate the kind of data that are needed and also the manner of their analysis. Verification of the hypotheses may result either in the acceptance of the hypothesis or its rejection. Its acceptance qualifies it to become part of a general rule, or a theory.

Let us take a simple example: 'x' causes 'y'. In this case we are regarding 'x' as the cause of 'y'. An empiricist would like to see whether this relationship obtains or not in actual life situations. To test this hypothesis he will have to undertake a number of exercises. There are certain rules of the game. Since Mill listed them first they are known as his canons. We may discuss them now:

1. First Canon: The Method of Agreement: "If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon".

   Shown diagrammatically: \[ A \quad B \quad x \longrightarrow y \] (Therefore \( x \) causes \( y \))

2. Second Canon: The Method of Difference: "If an instance in which the phenomenon under investigation occurs, and in instance in which it does not occur, have every circumstance in common save one, that one occurring in the former; the circumstance in which alone the two instances differ, is the effect, or the cause, or an indispensable part of the cause, of the phenomenon".

   Diagrammatically shown:
   \[ A \quad B \quad x \longrightarrow y \] therefore 'x' cause 'y'
   \[ A \quad B \quad \text{non-}x \longrightarrow \text{non-}y \]

3. Third Canon: The Joint Method of Agreement and Difference:

   "If two or more instances in which the phenomenon occur have only one circumstance in common, while two or more instance:
in which it does not occur have nothing in common save the absence of that circumstance; the circumstance in which alone the two sets of instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon.

Diagrammatically shown:

\[
\begin{array}{c|c|c}
A & B & x \\ 
\hline
A & B & non-x \\ 
C & D & x \rightarrow y & (\text{therefore 'x' causes 'y'} ) \\ 
C & D & non-x & non-y \\
\end{array}
\]

This can be presented in a four-fold table thus:

\[
\begin{array}{c|c|c|c}
A & B & y & non-y \\ 
\hline
C & D & y & non-y \\
\end{array}
\]

The relationship between these two variables 'x' and 'y' can logically be of four types as shown below:

\[
\begin{array}{c|c|c}
\text{y(+) } & \text{non-y(-) } \\ 
\hline
X(+) & + (1) & + - (2) \\ 
non-x(-) & - + (3) & - - (4) \\
\end{array}
\]

1. Where both x and y are present (+ +)
2. Where x is present but y is absent (+ -)
3. Where x is absent but y is present (- +)
4. Where both x and y are absent (- -)

The hypothesis x causes y will be proved if all causes fall in either box No.1 or box No.4, and the other two boxes (2,3) remain empty.
If somehow we consider that the relationship is not clear and probably a third factor 't' is needed to explain then this table can be further broken down:

<table>
<thead>
<tr>
<th></th>
<th>t(+)</th>
<th>non-t(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>non-x</td>
<td>x</td>
</tr>
<tr>
<td>(+)</td>
<td>(-)</td>
<td>(+)</td>
</tr>
<tr>
<td>y</td>
<td>y + x</td>
<td>y, t, non-x</td>
</tr>
<tr>
<td>(+)</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>y</td>
<td>non-y, t, x</td>
<td>non-y, t, non-x</td>
</tr>
<tr>
<td>(-)</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Introduction of 't' factor gives us thirteen possibilities to be explored, as shown below:

1) x → y → t  2) x → t → y  3) t → x → y
4) x ← y    5) x → t ← y    6) x → y
7) x → t    8) x → y    9) x → y
10) x ← t   11) x ← t   12) x ← t
13) x ← t

4. Fourth CANON: The Method of Concomitant Variation:
"Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation".
Diagrammatically, it may be shown thus:

\[
\begin{align*}
\text{A} & \rightarrow \text{B} \\
\text{A} & \rightarrow \text{B} \\
\text{C} & \rightarrow \text{D} \\
\text{C} & \rightarrow \text{D}
\end{align*}
\]

A research may be carried out to test one or more of the hypotheses that suggest possible relationships between two or more variables. The major steps in the research process are thus: Fashioning of a research problem, formulation of hypotheses, collection of data to test the hypotheses, testing of hypotheses, evaluation of results, and writing of report.

It is possible that what comes out as a result of such an elaborate exercise may in some cases be trivial. This should not be a matter of concern. What is important is the validity of one’s statement. When Lazarsfeld and his associates came out with THE PEOPLE'S CHOICE it was received in political science circles with mixed feelings. "A number of observers (most notably Ostrogorski and Graham Wallas) had seen that this was so before Lazarsfeld; but it is Lazarsfeld who had shown how it is possible to answer the question how far, in what way, and under what conditions the conclusion holds, and who has arrived at answers which have been largely confirmed by his successors" (Runciman, 1968 : 567)

The illustration should suggest that it is possible to be value free even in as delicate and highly value-laden terrain as political behavior. There is no taboo to the analysis of values. Values -- a subjective phenomenon -- can be studied through the method of science. Biases of the scholar -- as a citizen -- are likely to play down his enthusiasm for science. Rigour of scientific discipline helps in insulating the scholar against these biases. Even to recognize the presence of a bias and its source is a step towards science.
IV. Analysis of Social Science Data

In all social science research one either gathers data afresh, or analyses data already available. There is a common structure of social science data, consisting of three parts: (i) the elements or units of analysis (individuals, groups, or nations); (ii) the dimensions, or variables (which may be a set of conditions, or a set of stimuli; and (iii) values of the units on the variables studied. This tripartite form of data is easily represented through a data matrix. "In technical language, the data matrix is the mapping of the cartesian product $O \times S$ or $R$ or in other words: the idea is simply that there shall be one value $R$ for each combination $(O,X)$" (See Galtung).

The Data Matrix

$$
M = \begin{array}{cccccc}
S_1 & S_2 & S_3 & \ldots & S_1 & \ldots & S_n \\
O_1 & R_{11} & R_{12} & R_{13} & \ldots & R_{1j} & \ldots & R_{1n} \\
O_2 & R_{21} & R_{22} & R_{23} & \ldots & R_{2j} & \ldots & R_{2n} \\
O_3 & R_{31} & R_{32} & R_{33} & \ldots & R_{3j} & \ldots & R_{3n} \\
O_m & R_{m1} & R_{m2} & R_{m3} & \ldots & R_{mj} & \ldots & R_{mn}
\end{array}
$$

Galtung, who introduced the concept of data matrix, suggests that the matrix yields six principles of data collection:

1. Principle of comparability:
   The Statement '$(O_i, S_j)$ is mapped on $R$' must be either true or false for all $i$, $j$ and $R$ included in $R_j$.

2. Principle of classification:
   For each stimulus $S_j$ the set of response categories $R_j$ shall yield a classification of all pairs $(O_i, S_j)$ $(i = 1, \ldots, m)$. 
(3) Principle of completeness:
For each pair \( (O_1, S_j) \) a value \( R_{ij} \) must be found empirically.

(4) Principle of intrasubjectivity or reliability:
Repeated observation of the same responses by the same observer shall yield the same data.

(5) Principle of intersubjectivity:
Repeated observation of the same responses by different observers shall yield the same data.

(6) Principle of validity:
Data shall be obtained of such a kind and in such a way that legitimate inferences can be made from the manifest level to the latent level.

Thus a "typical survey study starts out with the confrontation of \( m \) respondents \( (O) \) with \( n \) questions \( (S) \) ... so that for each question \( S_j \) and each respondent \( O_1 \) there are \( r_j \) different possible responses, \( R_j \)."

Different studies and disciplines differ either in the number of units \( (m) \) studied, or the number of dimensions \( (n) \) covered. Combining these two variables one can roughly locate the position of different social science disciplines, as is done by Galtung in the following diagram.

The combinations of values of \( m \) and \( n \)

<table>
<thead>
<tr>
<th>( n ) = number of dimensions</th>
<th>intensive research</th>
<th>psychology, case studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>many</td>
<td>(depth psychology, case studies)</td>
<td>Sociology</td>
</tr>
<tr>
<td>few</td>
<td>Journalism</td>
<td>ENQUETE</td>
</tr>
<tr>
<td>one</td>
<td></td>
<td></td>
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</tbody>
</table>

\( m = \) number of units

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Whatever may be the discipline, the essential character of its research is to investigate a select number of units and measure their values on a select number of dimensions or variables.

As a first step social science analysis, particularly survey analysis, begins with the examination of relationship between two variables. These relationships may be:

1. Asymmetrical: One of the variables may influence the other;
2. Symmetrical: Neither variable may influence the other; or
3. Reciprocal: Both variables may influence one another.

Most sociological analysis consists of the analysis of asymmetrical relationships. The direction of the influence is indicated by the (i) time order, and (ii) the fixity or alterability of the variables.

There are several types of asymmetrical relationships:

(i) Association between a stimulus and response;
(ii) Association between a disposition and a response. Dispositions included attitudes, abilities, reflexes, habits, values, drives, and personality traits;
(iii) A property of the individual as the independent variable and a disposition as dependent variable. (e.g. race and alienation, age and conservation, sex and vote);
(iv) Where an independent variable is essentially a necessary pre-condition for a given effect;
(v) Involving an immanent relationship between the two variables (red tape is immanent in bureaucracy); and
(vi) An association between ends and means.

Situations also exist where it is not possible to specify which is the independent and which is the dependent variable. Sometimes they mutually affect each other. It can be called an example of alternating asymmetry. Symbolically this may be expressed thus:

\[ X_{t0} \rightarrow Y_{t1} \rightarrow X_{t2} \rightarrow Y_{t3} \rightarrow X_{t4} \rightarrow \ldots \]
Symmetrical relationships can be of several types:

(i) Where both variables are viewed as alternative indicators of the same concept;
(ii) The two variables are effect of a common cause;
(iii) Involving functional interdependence of the elements of a unit;
(iv) Elements are associated as parts of a common ('System') or ('Complex') (non-functional relationship); and
(v) Fortuitous relationships.

To Conclude

The logic of Social science research is essentially the same as that of natural science. Of course, the adjectives ('social') and ('natural') indicate the specific character of the phenomena being studied and suggests the extent to which the twin conditions of objectivity and empiricism can be satisfied. Compared to natural phenomena, social phenomena are far more complex; added to this is the fact that the researcher also belongs to the same species as his objects of study. This introduces the element of inter-subjectivity and demands extra care to ensure ethical neutrality that the research may remain value free.

It may be said that a researcher is confronted with four sets of values: (i) values of his discipline; (ii) values of his society; (iii) values of the society he is studying; and (iv) his personal, idiosyncratic values. All these impinge on a social scientist's work, and threaten his value neutrality. That is why many scholars question the claim of a value-free social science.

There is another limitation of social science, namely, the degree to which it can predict. Here it is necessary to understand the logic that governs prophesies. It may operate to self-fulfil a prophesy, or to self-cancel it.
Despite these limitations social sciences do qualify as science in that they are empirical, theoretically cumulative, and ethically neutral.

SUGGESTED READINGS

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Read specially:
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