



Tips and Tools for Sociologists
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Notes on the Logic of Inquiry

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Table of Contents

1. INTRODUCTION	1
2. EXPLANATIONS	1
3. STATEMENTS, PROPOSITIONS AND CONCEPTS	2
4. EXAMPLES	3
4.1. General	3
4.2. EXAMPLE - Section 1.	3
4.3. EXAMPLE - Section 2.	4
4.4. EXAMPLE - Proposition	4
4.5. EXAMPLE - Explanation	5
5. ASSUMPTIONS	8
6. THE QUESTION OF SUPPORT	9
6.1. Measurement	10
6.2. Variables	11
6.3. Hypothesis	11
6.4. Research Design	12
6.5. Analysis	13
7. PROBLEM AREAS	15

1. INTRODUCTION

In one way or another sociologists are largely interested in *EXPLANATIONS* for social phenomenon. Descriptions provide the raw materials for those *explanations*, data collection permits one to evaluate the reasonableness of the *explanations*, and social theories stand as the more formal expression of the *explanations*. Our discussion of the logic of inquiry, then, will necessarily focus on the recognition, construction and evaluation of *explanations* of social phenomena.

We will explore the structure of *explanations* used by sociologists as an aid to their recognition. Terms such as "*proposition*", "*concept*", "*hypothesis*" and "*variable*" will be discussed in order to facilitate this recognition and you will be asked to analyze some examples of current research in order to develop a familiarity with them.

We will then turn to the topic of theory construction in order to develop skills in the generation of *explanations*. You will be encouraged to try your hand at developing *explanations*, to clarify them and to elaborate their implications. It is at this point that imagination and creativity will be most beneficial. Problems encountered in the transformation of *explanations* into researchable designs will be discussed as a basis for a more detailed examination at a later point.

In order to develop your skills in the identification, construction and criticism of *explanations*, we will emphasize the use of examples and practical experience. Hopefully, by the end of this discussion, you will be able to easily recognize explanations, you will have developed some ability and flexibility in the generation of *explanations*, and you will be able to adequately evaluate *explanations*, both those of others and your own.

2. EXPLANATIONS

Explanations are all around us. They are found in the public media, conversation, and gossip, as well as in the more formal social organizations devoted to the development of *explanations* such as schools, religious groups, political groups and some professional associations. In most cases, all we have to do is to ask the question "why?" or "how?" and we will receive an *explanation*.

Under most circumstances, we do not consciously recognize an *explanation* as such. We learn how to develop and use them as young children, but we are seldom called upon to examine their structure or to evaluate their reasonableness in a conscious manner. In sociology, however, as in most other academic disciplines, this is precisely the demand placed upon us.

Explanations may be simple or complex. When asked why she hit her brother, my daughter may reply "...because I wanted to." - a relatively simple *explanation*. At the same time, however, I may explain the same action as a reaction to his advantages, the result of misdirected anger at her teacher, or at me, or the result of frustration because of social discrimination since she was not permitted to join the local hockey team: all relatively complex *explanations*.

Explanations are answers to puzzles or mysteries about why or how things happen the way they do. As such, they are subject to our state of knowledge, both in the identification of the mysteries and in the *explanations* we can offer. To us, the flicking of a light switch and the

concurrent illumination of a light bulb is not considered a puzzle. Our familiarity with the process and its relative dependability leads us to take it as a matter of course: one which doesn't require an *explanation*. If we were pressed for an *explanation* of the process, we would likely be satisfied with an account such as "...the switch turns on the electricity which flows to the bulb and lights it.". To a physicist, however, such an *explanation* would be inadequate. First of all, it represents electricity as a liquid; a representation which is inappropriate for much of the available data on electrical properties. Secondly, it glosses over a number of puzzles which have yet to be resolved by theorists of electricity. The physicist's familiarity with electricity leads him or her to see puzzles where most persons do not, and to seek *explanations* using very different *concepts* than the non-physicist.

A similar example can be found for events related to our own discipline. The failure of an individual to find a job is not likely to present a puzzle in most circumstances although it may lead to anger or frustration. When asked to provide an *explanation* for the failure, one will often hear that it is because the person involved did not try hard enough to find a job; a rather simple (and incidentally, tautological) *explanation*. A sociologist, however, is likely to be dissatisfied with such a response because of his or her additional knowledge. Since we know that it is more difficult for women to find jobs than men, for native indians to find them than non-native, and for just about anyone to find them during periods of economic decline, the location of the *explanation* in the motivation of the individual is particularly unconvincing.

Whether *explanations* are simple or complex, however, they all consist of STATEMENTS or claims about some aspect of the world. It is for this reason that our first focus of attention will be on the structure of statements and on the generation of a certain type of statement about social phenomenon.

3. STATEMENTS, PROPOSITIONS AND CONCEPTS

A *STATEMENT* consists of a claim about something: and in sociology, about social relations. "I don't like pickles.", "women earn less than men.", "This object is a chair.", are all statements. The first two are different than the third, however, in that they propose a relation between two phenomenon whereas the third labels the existence of a particular object. Although we will be making considerable use of such labelling (or existence) statements when it comes to the design of research, we will focus primarily on relational statements for the time being. For this reason we will use the term "*proposition*" in referring to relational statements throughout our discussion.

PROPOSITIONS make a claim about the relationship between two or more ideas. In the first example above, a claim was made between my preference and pickles, in the second example, the claim was about the relationship between gender and income. Although both of the examples above propose a relationship between relatively concrete phenomenon, this is by no means a characteristic of *propositions* in general. Indeed, all *propositions* are abstract in the sense that they do not involve existence claims. What they do is to make claims about the relationship between two or more *concepts*.

CONCEPTS are the basic ideas expressed in the *proposition*. Being ideas, they "exist" only in our mind, and they may or may not bear any relationship to observable phenomenon. Just

as "my preference", "pickles", "gender" and "income" are *concepts* so are "social class", "God", "unicorns", and "quasars", even though they have no clear concrete representation.

It is for this reason that *propositions* are abstract statements or claims; they need not have any concrete representations. In turn, we can conclude that *explanations* are also abstract, since they are composed of *propositions*. In summary, we have identified the following points.

- *explanations* consist of *propositions*
- *propositions* are claims about the relationship between two or more *concepts*.
- *concepts* are abstract ideas.

4. EXAMPLES

4.1. General

In order to develop familiarity in the recognition and assessment of *propositions* and *explanations*, it is necessary to spend some time with actual examples. To this end we will focus on a specific empirical and theoretical piece of work - and in the process of identifying *propositions*, will introduce a number of other critical terms which can be used in the analysis of sociological material.

As a framework for the discussion, we will examine each section of an article by P. Marchak. Our objective will be to identify the main point, and the nature of the support presented (cf. Marchak, P., "The Canadian Labour Farce: Jobs for Women", Pp. 202-212 in M. Stephenson, *Women in Canada*, Toronto: New Press, 1973.). At appropriate places, the discussion will be diverted to introduce new *concepts*.

4.2. EXAMPLE - Section 1.

In this section, the author sets up the problem for the reader. In doing so, there are a number of claims made:

- women are not noticed in Porter's book
- the percentage of women working is increasing in Canada
- the wages of women are lower than men.

In presenting the problem, the author at the same time gives us an indication of her *FRAME OF REFERENCE* or perspective on the topic. By implication, we are invited to join in the same concerns as the author: that the difference in gender is important, and that the difference in wages, opportunities and participation in the work force which is related to gender is important. These and other aspects of the *FRAME OF REFERENCE* will become important at later stages in our analysis. It is sufficient at this point merely to mention them and in the process to introduce the term for later elaboration.

4.3. EXAMPLE - Section 2.

The author now turns to a description of the survey which forms the basic source of data for her analysis. We discover early in the article then, that "job control measures" are somehow important to the discussion, and we can isolate a number of further *propositions* which the author makes:

- women lack control on the job
- women do not have the same income levels as men, and
- even when we eliminate differences in job control, men still earn more than women.

Along with each of these *propositions*, we find that the author has provided data from her survey in support of the claims made. It is really not until the following section, however, that we can see the MAJOR *proposition* which she has been developing throughout the second section:

ie. "Women are underrepresented in positions of authority and responsibility."

4.4. EXAMPLE - Proposition

At this point, we will stop and take a closer look at the *proposition* above. It will give us a chance to clarify the elements of Marchak's logic and at the same time, to introduce a number of new terms.

Looking back at the previous discussion, we can see that the statement above, is indeed a *proposition* as considered. It is a statement which relates at least two *concepts*. As with most *propositions*, we have some degree of choice over the exact *concepts* used, but additional reading of the article will help us to determine the way in which Marchak uses them. "Women", although formally a *concept* in this *proposition*, is really used as part of a broader *concept*; "gender". We find this to be the case since Marchak is constantly evaluating the position of women as it compares to that of men.

The other *concepts*; "underrepresentation", "positions", "authority", and "responsibility" can be considered likewise. Although they are formally *concepts* which can stand alone, in this *proposition*, they are combined in a particular way by the author to refer to a more abstract *concept*: "positions of authority and responsibility". Even this combination is somewhat indeterminate since we could separate it into two other *concepts*: "positions of authority" and "positions of responsibility". Each of these units are *concepts* from a formal point of view, but our objective is to identify the major *concepts* as used by the author of the *proposition*.

To this end, we must consider the use of the terms in the article as a whole. Looking at the second section, we find that the author did not really differentiate positions of authority from those of responsibility. On this basis, we can feel confident that the *concept* of "positions of authority and responsibility" is the most appropriate one, and it can be used in our analysis without distorting the intention of the author.

We now are in a position to identify the *proposition* as one which relates two main *concepts*: "gender" and "positions of authority and responsibility". These two *concepts* are related in a particular manner specified by a third: ie. "underrepresentation". In order to specify the way in which "gender" and "positions of authority and responsibility" are related, Marchak has claimed that it is women who are "underrepresented". This identifies "underrepresentation" as the third element of the *proposition* - that is, the RELATION. It should also be clear that the author's use of

the term "women" in the original formulation was merely necessary to indicate the specific type of relationship proposed between the two main *concepts*.

4.5. EXAMPLE - Explanation

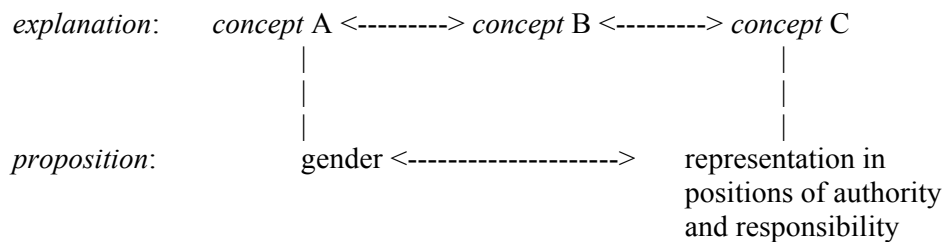
Having identified the main *proposition*, we will now ask a second question, "How can we EXPLAIN the relationship which is proposed?" The importance of this question should be apparent from the earlier emphasis we have placed on *explanations* for sociological inquiry. Through the development and analysis of *explanations* we substantially increase our understanding of social phenomenon, we can identify the underlying patterns for social events, and we increase our ability to anticipate or predict the outcome of social behaviour. For all of these objectives, description is not sufficient. It is necessary to explain what we see and experience before we can know how one event affects another.

Marchak provides us with a number of answers to our question. She starts by providing four *explanations* which are "usual reasons" given for why women are underrepresented in positions of authority and responsibility.

"(1) women are less well educated then (sic) men, and so cannot perform creative and complex tasks; (2) women are not committed to their jobs, and tend to leave the labour force to have families; (3) women have higher absentee rates then (sic) men because they are inclined to stay home when children are ill; and (4) women do not wish to take on more responsible jobs." (19:204-205)

By analyzing the first of these four, we will illustrate the logical relationship between *propositions* and *explanations*. It is necessary to understand clearly this relationship since it plays a part in both the development of theory and in the testing of *propositions* through empirical research.

Marchak proposes that gender is related to representation in positions of authority and responsibility. In order to construct an *explanation* for that *proposition* it is necessary to link the two *concepts* in the *proposition* by a series of logically interrelated statements. One can conceive of the process as the construction of a logical chain between the two *concepts*. Each link consists in turn of a statement linking at least two *concepts*. At least one of the chain links must contain the first *concept* and at least one must contain the second. Visually it may appear as the following:



where <-----> indicates a relationship of influence
and | indicates a logical relationship

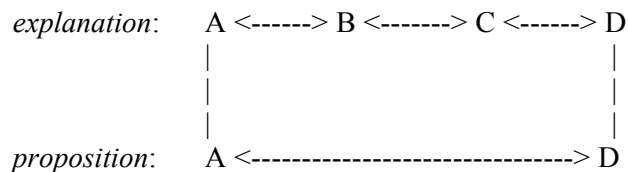
The number of links in the *explanation* will depend on the level of detail which the researcher provides, and the number of chains will depend on the number of *explanations*.

In Marchak's first *explanation*, for example, she alludes to the role of education in creating the difference proposed. She also mentions that the performance of creative and complex tasks is somehow involved. The details of this involvement are not explicitly provided, but by using our own awareness of such an argument, we can construct the details of the *explanation* in a way which satisfies the framework above.

Starting with the *concept* of gender, we would propose that the implicit argument is something like the following.

- (a) women are less well educated than men. (ie: gender is related to education)
- (b) The more education one has, the more one is able to perform creative and complex tasks. (ie: education is related to ability to perform creative and complex tasks)
- (c) The more able one is to perform creative and complex tasks, the more likely one will be chosen for positions of authority and responsibility. (ie: ability to perform creative and complex tasks is related to representation in positions of authority and responsibility)

This set of statements then constitutes a logically adequate *explanation* according to the criteria we have proposed. Each statement links at least two *concepts*, and each *concept* is found in at least two statements, thus linking the statements together. In addition, the two *concepts* found in the original *proposition* are found in two of the statements. If we represent the *concepts* as letters our general representation can appear as:



where:

- A represents gender
- B represents education
- C represents ability to perform creative and complex tasks
- D represents being in positions of authority and responsibility.

We will use this representation of the logical relationship between *propositions* and *explanations*, but with variations on the number of relations proposed in the *explanation*. For example, Marchak's third *explanation* can be represented in the following manner;

The recognition and identification of assumptions is one of the most difficult yet necessary elements in sociological research. At this point, we will not deal in detail with the strategy and process of such criticism, but leave it for a later point in our discussion. As we come to locations in the logical and practical design of research where assumptions are necessarily made, however, we will be sure to identify them. It is for this reason that we have dwelt on the importance of clarifying the logical structure of *explanations*.

A final note must be made regarding the structure of *propositions* and *explanations* which we are proposing here. Although the structure proposed is relatively simply and its elements distinct, one will find that many research projects are not presented in such a concise manner. In some cases, the *concepts* are not clear; in others, the logical relationships proposed are ambiguous; in many, the details of each link in the *explanation* are not given. Often the reasons for this are justifiable. Details might be omitted in the interests of style, or in order to emphasize a more important element of the research. On the other hand, one often finds the lack of clarity to be the result of an oversight or unclarity in the conceptualization itself. For these reasons, the analysis of someone else's research is often as difficult as the formulation of one's own. The purpose of discussing the logical structure of a research design is to help do both, by outlining a model in terms of which the material may be compared.

Before turning to other matters, we can provide an illustration relevant to the above comments by looking at Marchak's first proposed *explanation* for the *proposition* being investigated. In that *explanation* she simply states that "women are less well educated [than] men, and so cannot perform creative and complex tasks". In order to clarify the logical relations according to our model we had to "translate" this *explanation* into three *propositions*. In order to understand how it might relate to the representation of women in positions of authority and responsibility we assumed that some kind of choice process was involved. That is, we assumed that people got into positions of authority and responsibility by being CHOSEN for such positions by those who are in more powerful positions.

Marchak did not state in her account of the *explanation*, whether this was the process she had in mind. Indeed, one can think of other ways in which the selection might take place. For example, she might have felt that those persons who can perform creative and complex tasks are more able to manipulate others. In that way, they are more likely to secure for themselves or create for themselves, positions of authority and responsibility. Which of these accounts (or possibly others) Marchak had in mind is not available to us. As such, we must treat them as assumptions and ambiguities in her position which cannot be resolved on the basis of her presentation. If we feel that they are significant enough issues to undermine the main arguments she is making, we can justifiably use that as a basis to challenge the results of the research. It is up to us as critics, then, to show how these issues are significant to her arguments. On the other hand, we may feel that the ambiguity is not a critical element of this particular research. In this case we might ignore it or treat it as an area for further research should the issue become important.

6. THE QUESTION OF SUPPORT

We are now in a position to ask a third major question: "How does the author support her claim?". This is a question which arises from both the philosophical and practical roots of our discipline. For one reason or another, sociologists have always been concerned with the question of support for claims which are made. The establishment of support for a *proposition* is not at all a

simple matter, for it involves issues of logic, philosophical position and empirical data. Rather than get into these issues at this point, however, we will concentrate on the issue of data, and the logic which can get us there, leaving the more complicated elaboration until we are familiar with the basic terms and operations.

Since we have the example in front of us, we can raise the question of support in very specific terms; ie. "how does Marchak support her claim that gender is related to positions of authority and responsibility?". It is to this question which we will now turn.

As we have discussed previously, the *proposition* includes two major *concepts*: "gender" and "positions of authority and responsibility". In order to support the *proposition*, therefore, we would expect that research on the topic would at least have to deal with these two *concepts*. If Marchak is claiming that they are related in fact, we would expect her to have to show us examples of this relationship.

To do this she refers to the results of a sample survey of white-collar workers in B.C. In this survey, men and women were asked questions about the nature of their work and the wages that they got for their work. As part of her discussion regarding the results, Marchak refers to the fact that:

"...while fifty-one per cent of the women had no control over the pacing of tasks, twenty-six percent of the men were in the same position; at the other end of the scale twenty-six per cent of the women had a fair to high amount of control, while fifty-seven percent of the men were in the same position." (Marchak, 203)

We will examine this rather concrete evidence with respect to the abstract *proposition* she first made, in order to identify the main logical relationship.

6.1. Measurement

Beginning with the first *concept* in the *proposition* (gender), we can ask whether it is represented in any way at the concrete level of the survey results. Turning to the quotation, we find that gender is indeed represented as part of her comparison between men and women. The data she reports is presented as a comparison between men and women with respect to job control. Specifying it even further, we can speculate that the way in which she MEASURED the gender *concept* was to ask the respondents to the survey to indicate their gender on the survey form. On the basis of their response, she was then able to classify them into one or the other of the gender categories: male or female.

The second *concept* is not quite so straight forward. The idea of "positions of authority and responsibility" is a rather abstract one, and one about which we are not likely to all agree. For example, although I might feel my job as university teacher to be a responsible one, to a corporate executive, it may be just the reverse. Similarly, although I may feel I don't have much authority, to the students in my class, it may appear that I have too much. Unlike gender, where there are very few problems in matching the abstract idea to concrete examples, "positions of authority and responsibility" is fraught with logical and empirical problems.

Marchak's solution to the problem is to measure the extent of responsibility and authority through the use of "job control measures". By asking the respondents questions about their "choice over task content, control over pacing and sequencing of tasks, control over quality and quantity of daily product, subjection to direct supervision, and amount of discretion over (their) time and spatial arrangements at work", and then combining them into a scale, she was able to construct an indicator of the extent of their job control. The details of this procedure are not reported in the article, and although we may have many questions about the exact procedures followed, for the purposes of this discussion, they are not crucial.

Marchak uses the "job control measures", as an indicator of the "extent of authority and responsibility" which each individual has on the job. It is important to note, that in doing so, she has made a number of assumptions regarding the relationship between the concrete measure of job control and the abstract conceptualization of responsibility and authority. She assumes, for example, that jobs with authority and responsibility are those jobs in which the worker has control over the pace and type of work. She also assumes that the reported extent of control expressed by the respondent to her survey, is indeed an accurate representation of that control. These types of assumptions are not unique to her study, however, but they are a feature of ANY research which relates abstract ideas to concrete (empirical) events, or characteristics.

In order to test or otherwise relate abstract ideas to empirical data, one must always make assumptions. Where the abstract idea is not particularly different than the more concrete data (as, for example with the notion of "gender"), the assumptions necessary are not likely to be particularly tenuous. Marchak, for example, only had to assume that her respondents were telling the truth about their gender. On the other hand, the more abstract the *concept* is (eg. "social class", "alienation", "role"), the more assumptions must be made in order to measure it.

6.2. Variables

The difference between the abstract representation of an idea and the concrete way in which it is measured is preserved in the difference between the term CONCEPT and VARIABLE. Sociologists by and large use the term "*concept*" to refer to the more abstract formulation of the idea, whereas the term "*variable*" refers to its concrete representation. The use of these terms in this manner is not strictly followed in the literature, but we will maintain the distinction between them throughout our discussion in order to preserve sensitivity to the important logical difference between the abstract and concrete representation of our ideas. The value of maintaining this distinction will be apparent, not only as we discuss the points at which assumptions must be introduced into empirical research, but when we turn to a discussion of research design as well.

It should be apparent from the Marchak example, that the difference between *concept* and *variable* is not an absolute difference, but a relative one. The *concept* "positions of authority and responsibility" is more abstract than "job control measures", but "job control measures" is in turn more abstract than the specific responses to the survey about control over task pacing, quantity of work, etc., which go to make up the basic data for the job control measures. This point should illustrate that the identification of *concepts* and *variables* is highly dependent on the use made of them in a particular research project. In addition, you will find that the identification of *concepts* and *variables* is not always an easy manner, sometimes because their status is not clearly identified by an author, and sometimes because they are used in various ways by different authors. The important point to remember, however, is that in any research project, there is an important

use in our research, we should have a good idea of the actual research situation in which we will collect our data. In fact the specification of a way to measure the *concept*, in most cases is done with a consideration of what data is available to us, and what resources we have available for the collection of the data. This means that we become involved in a whole series of pragmatic problems related to data collection, such as: "Where we can find people who will talk to us?", "How many should we speak to?", etc. There are no standard procedures by which these problems can be resolved, although there are some guidelines which one can use. In the end, however, the decisions are made on the basis of the nature of the problem being investigated, your own imagination and your resourcefulness. The overriding demand on the procedure, however, is that it be theoretically and logically justified in terms of your theory and *proposition*.

In Marchak's case, we must look to her description of her sample survey to discover how she went about collecting her data. Most of this information is contained in footnote number 4, where she discussed the details of her search for union and non-union firms and the procedures by which respondents were selected. She does not provide detail on how the respondents were approached, how the questions were asked and all the details of these questions, but she does refer us to her thesis in which this information is presumably available. This is a very common procedure in research articles; the constraints of space and style dictate that much of the research process is not reported. At such a point, the reader must fall back on his or her awareness of the typical procedures, and assume a minimum level of competence on the part of the researcher, search the references cited if the issue is felt to be an important one to the research, or contact the researcher to request the details. The extent to which one pursues these issues will be dependent on the importance of the research and of the measurement procedures to the reader.

From the article, we can presume that Marchak interviewed 307 white collar workers, asking them questions not only about their gender (one of the major *variables*), but about the extent of control which they had over their jobs (the second major *variable*). On the basis of the information about the job, she decided whether the respondent had "no" control over the pacing of their tasks, "some" control or whether the respondent had "a fair to high" amount of control. The actual procedure for making this decision is not available to us, but we do not need to know it in order to identify the basic logic involved.

6.5. Analysis

We are now in a position where we have some specific information on 307 white collar workers: we know their gender (male or female) and we know how much control they have over their asks ("none", "some" or fair to high"). What do we do now in order to draw some conclusions regarding our *hypothesis* that men are more likely to have higher scores on the job control measure than women?

If we were simply to look at the job control measure for one man and one woman, it is unlikely that we would be convinced by whatever results we found. If the woman chosen had more job control, we could explain that result, not in terms of Marchak's *explanation*, but in terms of the specific characteristics of the two individuals involved. For example, the man may have been new on the job, and the woman a long term employee. On the other hand, if the woman had a lower degree of job control than the man, this would still not be convincing evidence that women in general have lower job control. Since Marchak does not claim that every woman has a lower degree of job control than any man, the examination of one case is not sufficient evidence. What about the examination of two pairs, however, or three, or four? How many pairs of men and

women must we examine before we can come to a convincing conclusion regarding the *hypothesis*? This is not an easy question to answer, since it rests on the consideration of the reasons for the research, the importance of the test, the size of the population to which one would like to generalize, and many other features of the research design. We will not deal with the problem at this point in all its detail. Instead, we will merely point to it, and use it to make the case that a large number of pairs must be examined before we can come to a convincing conclusion. This is always the case with respect to *propositions* which refer to the "likelihood" of a relationship being found or the "tendency" for one factor to affect another. Such *propositions* are by far the predominant type found in sociological theory.

To continue our analysis, then, let us presume that we collected information on 100 pairs of individuals: one male and one female in each pair. If we found that 80 of the 100 men involved had high scores for job control, would that be sufficient evidence to support our *hypothesis*?

The answer is "no". Although such a figure seems to be in line with our *hypothesis*, it is misleading in that it has not been made in COMPARISON to the other state (value) of the gender *variable*. If, for example, we examined the number of women that had high job control and found that this was 90 out of the 100, we would have to come to the conclusion that women were more likely to have high job control than men. This would mean that the *hypothesis* was not supported.

This illustrates a rather fundamental feature of *hypothesis* testing, and one that is frequently overlooked in both academic and non-academic research. In order to come to some conclusion about the relationship between two *variables*, one must gather data on at least two of the values of those *variables*, that is, on at least two of the states which the *variable* might take. Since the *variable* "gender" has two states or VALUES (male and female) and "job control" has three ("none", "some" and "fair to high"), we must examine both males and females for at least two states of job control.

The necessity for such a comparison, is often forgotten or ignored in the more popular use of statistics. A rather recent example can be found in the claim that the election of the Parti Quebecois in Quebec has been responsible for the loss of many head offices from that province. The usual support cited for this claim is the number of head offices which have been moved since the election of the P.Q. However convincing that may be as a polemical claim, it is not sufficient from a scientific point of view. What is missing from the analysis is the comparison: in this case a comparison with the number of head offices which moved out of Quebec BEFORE the election of the P.Q. It may be that 300 head offices moved out of Quebec since the election, but if 500 had moved out in a similar time period under the previous Liberal government, the implications of the data would very different.

To return to the Marchak article with this new material, we find that she has indeed made the appropriate comparison. On page 203 she states that "while fifty-one per cent of the women had no control over the pacing of tasks, twenty-six percent of the men were in the same position".

If we were to represent this in a table, it would look like the following:

	Gender by Job Control (percentage)	
	Male	Female
No job control	26	51
Some job control	74	49
Total	100	100

Note that each value of the *variables* are represented. The use of percentages instead of raw figures is a procedure which is designed to get around the fact that the number of men and women in the same sample may not have been the same. It does not alter the logic of the procedure as we have presented it. Note also that we have collapsed two of the values for job control into one ("some" and "fair to high" into "some"). This also does not alter the logic, but makes the example a little easier to follow.

Looking at the data, we find that her data supports the *hypothesis* that women have less job control than men. It indicates that for every 100 women, 51 of them have no job control, while for every 100 men, only 26 of them have no control.

By implication, then, if her assumptions about the relationship between the *concepts* and *variables* are reasonable, she can also claim that the data supports her *proposition*. This is an example of a standard procedure in sociological research. Since we cannot test abstract ideas directly, we must first argue that they can be translated into concrete representations of a particular type. The test or examination is then carried out on those concrete representations. Only after the concrete test can we infer from those results that our abstract *proposition* has been supported or not, and only if we can successfully argue that the assumptions linking the abstract and concrete levels are reasonable. It is a rather circuitous route, but a necessary one if we are concerned that our claims are generalizable (and therefore abstract) and at the same time empirically supported (and therefore concrete).

7. PROBLEM AREAS

The discussion to this point has focussed on the basic logical structure of the relationship between sociological theory and research design. In covering this structure, we have glossed over a number of complex problems which occur at various points in the structure. In anticipation of our more detailed discussion of these problems, I will identify the major problem areas and the terms used to them in the literature on methodology.

1. The first set of problems occur in the relationship between the *proposition* and the *explanations* developed for the *proposition*. Within sociology, there are two major specialties which focus on such problems. The substance of the *propositions* and *explanations* are considered as issues of SOCIOLOGICAL THEORY. The second focus is on the structure of theory in general, its logic and its relationship to knowledge. Discussions of this sort take place within the context of the philosophy of social science, or THEORY CONSTRUCTION.

2. A second area of problems arises when we ask about the relationship between the *proposition* as an abstract statement and the *hypothesis* as a relatively concrete reformulation of the *proposition*. These problems most often focus on the operationalization of the *concepts*, and are referred to as problems of MEASUREMENT. "Does the *variable*, adequately represent the *concept* as proposed in our *proposition* and *explanation*?" is a typical question asked from this focus.

3. We can also ask "How can we collect information which is appropriate for a test of our *hypothesis*?" Such a question raises the question of the relationship between the *hypothesis* and the collection of data which is appropriate to that claim. In the jargon of the discipline, such a relationship is considered to be a problem of RESEARCH DESIGN.

4. The last major set of problems arises when we have gathered the data, and begin the process of analysis. The relationship between the data and the theoretical inferences which we wish to make from the data, are all a part of DATA ANALYSIS.

Each of these problem areas is not independent, since any research project is an integration of ideas, concrete events, financial circumstances, and above all, creativity. These are all necessary throughout the process if we are to remain confident about the *explanations* we propose.