



Research Methodology

Chapter Two: Scientific Investigation

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- Advantages of knowledge about scientific investigation
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Scientific Research

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- Scientific research focuses on solving problems and pursues a step-by-step logical, organized, and rigorous method to identify the problems, gather data, analyze them, and draw valid conclusions.
- Scientific research is not based on hunches, experience, and intuition (though these may play a part in final decision making).

Scientific Research cont.

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- Do organizations always follow the rigorous step-by-step process?
 - ▣ No.
- Sometimes the problem may be so simple that it does not call for elaborate research.
- However, the probability of making wrong decisions in such cases is high.

Advantages of knowledge about scientific investigation

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- Scientific research helps managers understand and accept the need for good research.
- Scientific research helps researchers to state their findings with accuracy and confidence.
- Scientific investigation tends to be more objective than subjective.

Hallmarks of Scientific Research

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The main characteristics of scientific research may be listed as follows:

1. Purposiveness
2. Rigor
3. Testability
4. Replicability
5. Precision and Confidence
6. Objectivity
7. Generalizability
8. Parsimony

1. Purposiveness

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- **Example:** Consider the case of a manager who is interested in investigating how employees' commitment to the organization can be increased.
- The manager has started the research with a definite aim or purpose.
- The focus is on increasing the commitment of employees to the organization

2. Rigor

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- Scientific research must be carried out with good theoretical base and proper thought-out methodology.
- Rigor in research involves:
 - ▣ Carefulness
 - ▣ Thoroughness
 - ▣ Degree of exactitude

2. Rigor cont.

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- **In our example**, let us say the manager of an organization asks 10 to 12 of its employees to indicate what would increase their level of commitment to it.
- If, solely on the basis of their responses, the manager reaches several conclusions on how employee commitment can be increased, the whole approach to the investigation would be **unscientific**.
- It would lack rigor for the following reasons:

2. Rigor cont.

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- 1) The conclusions would be incorrectly drawn because they are based on the responses of just a few employees whose opinions may not be representative of those of the entire workforce.
- 2) The manner of framing and addressing the questions could have introduced bias or incorrectness in the responses.
- 3) There might be many other important influences on organizational commitment that this small sample of respondents did not or could not verbalize during the interviews, and the researcher would have failed to include them.

3. Testability

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- Scientific research must be based on testable hypotheses developed after a careful study of the problems involved.
- **In our example,** the researcher might hypothesize that those employees who perceive greater opportunities for participation in decision making would have a higher level of commitment.
- This is a hypothesis that can be tested when the data are collected.

4. Replicability

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- Scientific research must be replicable as the research results which are replicable have more acceptability and confidence as being scientific.
- Replicability means that if we use similar methods and procedures of data collection and analysis as compared to the previous study, the other research studies must also come out with similar results.

5. Precision and Confidence

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- **Precision** refers to the closeness of the findings to reality based on a sample.
- In other words, precision reflects the degree of accuracy or exactitude of the results on the basis of the sample, to what really exists in the universe.

5. Precision and Confidence cont.

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- **Confidence** refers to the probability that our estimations are correct.
- That is, it is not merely enough to be precise, but it is also important that we can confidently claim that 95% of the time our results would be true and there is only a 5% chance of our being wrong.

6. Objectivity

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- The conclusions drawn through the interpretation of the results of data analysis should be objective; that is, they should be based on the facts of the findings derived from actual data, and not on our own subjective or emotional values.

7. Generalizability

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- Generalizability refers to the scope of applicability of the research findings in one organizational setting to other settings.
- Obviously, the wider the range of applicability of the solutions generated by research, the more useful the research is to the users.

8. Parsimony

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- Simplicity in explaining the phenomena or problems that occur, and in generating solutions for the problems, is always preferred to complex research frameworks that consider an unmanageable number of factors.

Obstacles to Conducting Scientific Research

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- In the management and behavioral areas, it is not always possible to conduct investigations that are 100% scientific. That is because:
 - ▣ It is difficult to quantify human behaviors, such as feelings, emotions, attitudes, and perceptions.
 - ▣ It is difficult to obtain a representative sample, restricting the generalizability of the findings.
- Thus, it is not always possible to meet all the hallmarks of science in full.

The Building Blocks of Science in Research

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- Answers to issues can be found either by the process of deduction or the process of induction, or by a combination of the two.
- ***In deductive reasoning***, we start with a general theory and then apply this theory to a specific case.
- For example, we know that all high performers are highly proficient in their jobs. If John is a high performer, we then conclude that he is highly proficient in his job.

The Building Blocks of Science in Research cont.

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- ***Inductive reasoning*** works in the opposite direction. It is a process where we observe certain phenomena and on this basis arrive at general conclusions.
- For instance, the observation of a first, second, and third white swan may lead to conclusion that “all swans are white.”

The Hypothetico-deductive Method

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One of the primary methods of scientific investigation is the hypothetico-deductive method. It consists of seven steps as following:

1. Observation
2. Preliminary information gathering
3. Theory formulation
4. Hypothesizing
5. Further scientific data collection
6. Data analysis
7. Deduction

1. Observation

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- Observation is the first stage, in which one senses that certain changes are occurring, or that some new behaviors, attitudes, and feelings are emerging in one's environment (i.e., the workplace).
- **Example:** The Chief Information Officer (CIO) of a firm observes that the newly installed Management Information System (MIS) is not being used by middle managers as much as was originally expected.
- The managers often approach the CIO or some other computer expert for help, or worse still, make decisions without facts.

2. Preliminary information gathering

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- Preliminary information gathering involves the seeking of information in depth, of what is observed.
- **In our example:** talking to some of the middle-level managers, the CIO finds that many of them have very little idea as to what MIS is all about, what kinds of information it could provide, and how to access it and utilize the information.
- The CIO immediately uses the Internet to explore further information on the lack of use of MIS in organizations.

2. Preliminary information gathering cont.

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- The search indicates that many middle-level managers - especially the old-timers - are not familiar with operating personal computers and experience "computer anxiety."
- Lack of knowledge about what MIS offers is also found to be another main reason why some managers do not use it.

3. Theory formulation

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- Theory formulation is an attempt to integrate all the information in a logical manner, so that the factors responsible for the problem can be conceptualized and tested.
- **In our example:** based on information gathered, the CIO develops a theory incorporating all the relevant factors contributing to the lack of access to the MIS by managers in the organization.

4. Hypothesizing

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- From the theorized network of associations among the variables, certain testable hypotheses or educated conjectures can be generated.
- **In our example:** the CIO generates various hypotheses for testing, one among them being: Knowledge of the usefulness of MIS would help managers to put it to greater use.

5. Further Scientific Data Collection

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- After the development of the hypotheses, data with respect to each variable in the hypotheses need to be obtained.
- **In our example:** the CIO then develops a short questionnaire on the various factors theorized to influence the use of the MIS by managers, such as:
 - ▣ the extent of knowledge of what MIS is,
 - ▣ what kinds of information MIS provides,
 - ▣ how to gain access to the information, and the level of comfort felt by managers in using computers in general, and finally,
 - ▣ how often managers have used the MIS in the preceding 3 months.

6. Data Analysis

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- In the data analysis step, the data gathered are statistically analyzed to see if the hypotheses that were generated have been supported.
- **In our example:** the CIO then analyzes the data obtained through the questionnaire to see what factors prevent the managers from using the system.

7. Deduction

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- Deduction is the process of arriving at conclusions by interpreting the meaning of the results of the data analysis.
- **In our example:** based on the results, the manager concludes that managers do not use MIS due to certain factors.
- These deductions help the CIO to take necessary action to rectify the situation, which might include among other things, organizing seminars for training managers on the use of computers, and MIS and its usefulness.