



Research Methodology

Lesson - 2

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Research Design

- Research design is the framework of research methods and techniques chosen by a researcher. The design allows researchers to hone in on research methods that are suitable for the subject matter and set up their studies up for success. The function of a research design is to ensure that the evidence obtained enables you to effectively address the research problem as unambiguously as possible.

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Essential Elements of Research Design:

- The important features of Research Design may be outlined as follows:
 - i. It constitutes a plan that identifies the types and sources of information required for the research problem;
 - ii. It constitutes a strategy that specifies the methods of data collection and analysis which would be adopted; and
 - iii. It also specifies the time period of research and monetary budget involved in conducting the study, which comprise the two major constraints of undertaking any research

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Qualities of a Good Research Design

- Good research is systematic: It means that research is structured with specified steps to be taken in a specified sequence in accordance with the well defined set of rules. Systematic characteristic of the research does not rule out creative thinking but it certainly does reject the use of guessing and intuition in arriving at conclusions.
- Good research is logical: This implies that research is guided by the rules of logical reasoning and the logical process of induction and deduction are of great value in carrying out research. Induction is the process of reasoning from a part to the whole whereas deduction is the process of reasoning from some premise to a conclusion which follows from that very premise. In fact, logical reasoning makes research more meaningful in the context of decision making.
- Good research is empirical: It implies that research is related basically to one or more aspects of a real situation and deals with concrete data that provides a basis for external validity to research results.
- Good research is replicable: This characteristic allows research results to be verified by replicating the study and thereby building a sound basis for decisions.

Types of Research Design

Qualitative research design: Qualitative research determines relationships between collected data and observations based on mathematical calculations.

Quantitative research design: Quantitative research is for cases where statistical conclusions to collect actionable insights are essential.

Descriptive research design: In a descriptive design, a researcher is solely interested in describing the situation or case under their research study. It is a theory-based design method which is created by gathering, analyzing, and presenting collected data.

Experimental research design: Experimental research design establishes a relationship between the cause and effect of a situation. It is a causal design where one observes the impact caused by the independent variable on the dependent variable.

Correlational research design: Correlational research is a non-experimental research design technique that helps researchers establish a relationship between two closely connected variables. This type of research requires two different groups. There is no assumption while evaluating a relationship between two different variables, and statistical analysis techniques calculate the relationship between them.

Types of Research Design

Diagnostic research design: In diagnostic design, the researcher is looking to evaluate the underlying cause of a specific topic or phenomenon. This method helps one learn more about the factors that create troublesome situations.

This design has three parts of the research:

- Inception of the issue
- Diagnosis of the issue
- Solution for the issue

Explanatory research design: Explanatory design uses a researcher's ideas and thoughts on a subject to further explore their theories. The research explains unexplored aspects of a subject and details about what, how, and why of research questions.

Historical Design: The purpose of a historical research design is to collect, verify, and synthesize evidence from the past to establish facts that defend or refute your hypothesis. It uses secondary sources and a variety of primary documentary evidence, such as, logs, diaries, official records, reports, archives, and non-textual information [maps, pictures, audio and visual recordings]. The limitation is that the sources must be both authentic and valid.

Types of Research Design

Experimental Design: A blueprint of the procedure that enables the researcher to maintain control over all factors that may affect the result of an experiment. In doing this, the researcher attempts to determine or predict what may occur. Experimental Research is often used where there is time priority in a causal relationship (cause precedes effect), there is consistency in a causal relationship (a cause will always lead to the same effect), and the magnitude of the correlation is great. The classic experimental design specifies an experimental group and a control group. The independent variable is administered to the experimental group and not to the control group, and both groups are measured on the same dependent variable. Subsequent experimental designs have used more groups and more measurements over longer periods.

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Basic Principles of Experimental Design

- **Randomization:** This is the first principle of an experimental design. This process randomly assigns treatments to the experimental units. It implies that every allotment of treatments ends up with the same probability. When dividing research participants into the different groups, random assignment ensures that every participant has an equal chance of being assigned to both the experimental group and the control group. Randomizations purpose is to remove bias and other sources of extraneous variation, which are uncontrollable.
- **Replication:** This is the second principle of an experimental design. It is a repetition of the basic experiment. In all experiments, some variation exists because the experimental units, such as, individuals or plots of land, cannot be physically identical. This variation is removable by using a number of experimental units. Therefore, the basic experiment is performed repeatedly. Researchers repeat the same studies on different research participants to see if they produce the same statistically significant results each time. A replicate is an individual repetition. Its number, shape, and size are influenced by the nature of the experimental material. Replication helps in: obtaining an accurate estimate of the experimental error; decreasing the experimental error, thereby increasing precision; and obtaining a more precise estimate of the mean treatment effect.

Basic Principles of Experimental Design

- **Local Control:** Randomization and Replication do not remove all extraneous sources of variation. A more refined experimental technique is required for that. A design should be chosen such that all the extraneous sources of variation come under control. For this purpose, local control, which refers to the amount of balancing, blocking and grouping of the experimental units, is used. Balancing implies that the treatments should be assigned to the experimental units such that the result is a balanced arrangement of treatments. Blocking means that, similar experimental units should be collected together to form a relatively homogeneous group. The main purpose of local control is to increase the efficiency of an experimental design by minimizing the experimental error. In this case, local control should not be confused with the word control. Control in experimental design is used for a treatment. It does not receive any treatment, but the effectiveness of other treatments should be found through comparison.

Features of Research Design

- **Neutrality:** When you set up your study, you may have to make assumptions about the data you expect to collect. The results projected in the research design should be free from bias and neutral. Understand opinions about the final evaluated scores and conclusion from multiple individuals and consider those who agree with the derived results.
- **Reliability:** With regularly conducted research, the researcher involved expects similar results every time. Your design should indicate how to form research questions to ensure the standard of results. You'll only be able to reach the expected results if your design is reliable.
- **Validity:** There are multiple measuring tools available. However, the only correct measuring tools are those which help a researcher in gauging results according to the objective of the research. The questionnaire developed from this design will then be valid.
- **Generalization:** The outcome of your design should apply to a population and not just a restricted sample. A generalized design implies that your survey can be conducted on any part of a population with similar accuracy.



End of Lesson - 2

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