Lecture 1
GEN330

Define Research

- ***Research refers to a search for knowledge and is define research as a scientific and systematic search for pertinent information on a specific topic.***
- **It is the finding of truth with the help of study, observation, comparison and experiment.**
- **Research is an original contribution to the existing stock of knowledge making for its advancement.**
- **The search for knowledge through objective and systematic method of finding solution to a problem is research.**
- **The systematic approach concerning generalization and the formulation of a theory is also research.**

OBJECTIVES OF RESEARCH

The purpose of research is to discover answers to questions through the application of scientific procedures. The main aim of research is to find out the truth which is hidden and which has not been discovered as yet. Though each research study has its own specific purpose, we may think of research objectives as falling into a number of following broad groupings:

1. To gain familiarity with a phenomenon or to achieve new insights into it (studies with this object in view are termed as exploratory or formulate research studies);
2. To portray accurately the characteristics of a particular individual, situation or a group(studies with this object in view are known as descriptive research studies);
3. To determine the frequency with which something occurs or with which it is associated with something else (studies with this object in view are known as diagnostic research studies);
4. To test a hypothesis of a causal relationship between variables (such studies are known as hypothesis-testing research studies).

MOTIVATION IN RESEARCH

1. Desire to get a research degree along with its consequential benefits;
2. Desire to face the challenge in solving the unsolved problems, i.e., concern over practical problems initiates research;
3. Desire to get intellectual joy of doing some creative work;
4. Desire to be of service to society;
5. Desire to get respectability

TYPES OF RESEARCH

Descriptive vs. Analytical

- *Descriptive research* includes surveys and fact- finding enquiries of different kinds
- The major purpose of descriptive research is description of the state of affairs as it exists at present
- In *analytical research*, on the other hand, the researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material

DESCRIPTIVE	ANALYTICAL
•Descriptive research includes surveys and fact-finding enquiries of different kinds. •The major purpose of descriptive research is description of the state of affairs as it exists at present. •The main characteristic of this method is that the researcher has no control over the variables; he can only report what has happened or what is happening. •Example 1: Examining the fluctuations of U. S. international trade balance during 1974-1995. •2.Starting from late 1986, the value of U.S. dollar value has steadily increased against the Japanese yen and German Mark. Examining the magnitude of this trend in the value of U.S. dollar is another example of descriptive research;	•In analytical research, on the other hand, the researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material. •Analytical research attempts to explain why and how. It usually concerns itself with cause–effect relationships among variables. •Example1:Explaining why and how U.S. trade balance move in a particular way over time. •2. While explaining *how* and *why* this surge in the value of U.S. dollar is going to affect the U.S. Is analytical research.

DESCRIPTIVE versus ANALYTIC STUDY DESIGNS

DESCRIPTIVE	ANALYTICAL
Profiles characteristics of group	Analyzes why group has characteristics
Focuses on "what"	Focuses on "why"
Assumes no hypothesis	Assumes a hypothesis
Does not require comparisons between groups or over time	Requires comparisons between groups over time

Applied vs. Fundamental

- *Applied research* aims at finding a solution for an immediate problem facing a society or an industrial/business organization, whereas
- *Fundamental research* is mainly concerned with generalizations and with the formulation of a theory
- Research concerning some natural phenomenon or relating to pure mathematics are examples of fundamental research
- Similarly, research studies, concerning human behavior carried on with a view to make generalizations about human behavior, are also examples of fundamental research

Fundamental Research	Applied Research
1. Tries to expand the already existing scientific knowledge base.	1. Applied research focuses on solving real-life problems.
2. Fundamental research is purely theoretical.	2. Applied research has a practical approach.
3. Primary concern is to develop scientific knowledge and predictions.	3. Primary concern is to stress on the development of technology and technique with the help of basic science.

Quantitative vs. Qualitative

VS

Basis for Comparison	Qualitative Data	Quantitative Data
Definition	Qualitative data is information that can't be expressed as a number	Quantitative data is data that can be expressed as a number or can be quantified
Can data be counted?	NO	YES
Data type	Words, objects, pictures, observations, and symbols	Number and statistics

Examples

Quantitative Data ("Numerical")

- Height of 1st graders
- Weight of sumo wrestlers
- Duration of red lights
- Age of Olympians
- Distance of planets
- Money in 401k plans
- Temperature of coffee (200 F)

Qualitative Data ("Categorical")

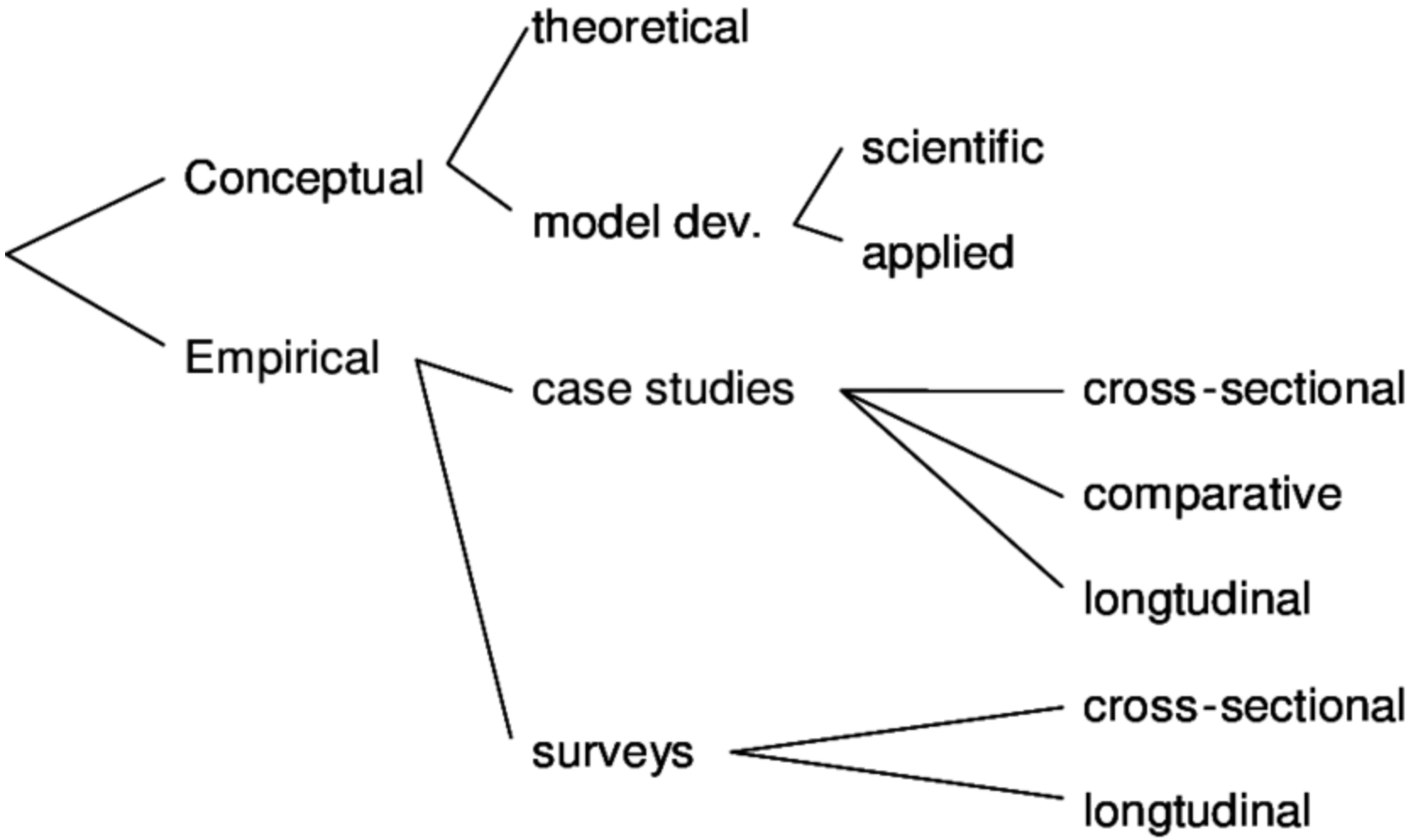
- Happiness rating
- Gender
- Pass/Fail
- Eye Color
- Interview transcript
- Categories of plants
- Descriptive temperature of coffee ("very hot"

Conceptual vs. Empirical

Conceptual vs. Empirical

- Conceptual research is that related to some abstract idea(s) or theory
- It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones.
- On the other hand, empirical research relies on experience or observation for gaining knowledge.
- It is data-based research, coming up with conclusions which are capable of being verified by observation or experiment

	Conceptual Research	Empirical Research
1)	Similar to Basic Research	Similar to experimental type of research
2)	Related to some abstract idea or theory	Empirical research relies on experience or observation alone
3)	Develop new concepts or to reinterpret the existing ones	Empirical research is appropriate when proof is sought that certain variables affect other variables in some way.
4)	It doesn't involve any practical experimental.	based on experience or observation alone


theoretical
Conceptual
scientific
model dev.
applied
Empirical
case studies
cross-sectional
comparative
longtudinal
surveys
cross-sectional
longtudinal

Some Other Types of Research: All other types of research are variations of one or more of the above stated approaches, based on either the purpose of research, or the time required to accomplish research, on the environment in which research is done, or on the basis of some other similar factor.

Form the point of view of time, we can think of research either as one-time research or longitudinal research. In the former case the research is confined to a single time-period, whereas in the latter case the research is carried on over several time-periods. Research can be field-setting research or laboratory research or simulation research, depending upon the environment in which it is to be carried out.

What is Research Design?

- RD is the general plan of how you will answer your research question(s)
- The plan should state clearly the following issues:
  - The purpose of the study
  - The strategies
  - The time dimension
  - The research environment
  - Unit of analysis
  - Sampling design*
  - Data collection method*
  - Measurement*
  - Data Analysis*
- *= 2nd part of RD→Methodology

Research design is basically the answer of the following questions.

(i) What is the study about?

(ii) Why is the study being made?

(iii) Where will the study be carried out?

(iv) What type of data is required?

(v) Where can the required data be found?

(vi) What periods of time will the study include?

(vii) What will be the sample design?

(viii) What techniques of data collection will be used?

(ix) How will the data be analysed?

(x) In what style will the report be prepared?

Research design is split up into the following parts:

(a) *the sampling design* which deals with the method of selecting items to be observed for the given study;

(b) *the observational design* which relates to the conditions under which the observations are to be made;

(c) *the statistical design* which concerns with the question of how many items are to be observed and how the information and data gathered are to be analyzed; and

(d) *the operational design* which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

In brief, research design must, at least, contain

(***a) a clear statement of the research problem; (b) procedures and techniques to be used for gathering information; (c) the population to be studied; and (d) methods to be used in processing and analysing data.***

FEATURES OF A GOOD DESIGN

- A good design is often characterized by adjectives like flexible, appropriate, efficient, economical and so on.
- Accuracy becomes a major consideration of a research design so that design has minimum bias and maxim the reliability of the data collected and analyzed is considered a good design.
- The design which gives the smallest experimental error is supposed to be the best design in many investigations.
- a design which yields maximal information and provides an opportunity for considering many different aspects of a problem is considered most appropriate and efficient design in respect of many research problems.
- If the research study happens to be an exploratory or a formulative one. Studies involving the testing of a hypothesis of a causal relationship between variables require a design which will permit inferences about causality in addition to the minimization of bias and maximisation of reliability.

A research design appropriate for a particular research problem, usually involves the consideration of the following factors:

(i) the means of obtaining information;

(ii) the availability and skills of the researcher

(iii) the objective of the problem to be studied;

(iv) the nature of the problem to be studied; and

(v) the availability of time and money for the research work.

IMPORTANT CONCEPTS RELATING TO RESEARCH DESIGN

Dependent and independent variables:

Age is an example of continuous variable, but the number of children is an example of non-continuous variable(discrete) . If one variable depends upon or is a consequence of the other variable is dependent. For instance, if we say that height depends upon age. Height is dependent variable and age is independent .

Extraneous variable

In an experiment, an extraneous variable is any variable that you're not investigating that can potentially affect the outcomes of your research study. If left uncontrolled, extraneous variables can lead to inaccurate conclusions about the relationship between independent and dependent variables. There is study about age and height of the person and Weight gain an extraneous variable

Confounded relationship:

When the dependent variable is not free from the influence of extraneous variable(s), the relationship between the dependent and independent variables is said to be confounded by an extraneous variable(s).

Research hypothesis:
When a prediction or a hypothesized relationship is to be tested by scientific methods, it is termed as research hypothesis. The research hypothesis is a predictive statement that relates an independent variable to a dependent variable. Usually a research hypothesis must contain, at least, one independent and one dependent variable.

Experimental and non-experimental hypothesis-testing research:

Experimental and control groups: In an experimental hypothesis-testing research when a group is exposed to usual conditions, it is termed a 'control group', but when the group is exposed to some novel or special condition, it is termed an 'experimental group'. In the above illustration, the Group A can be called a control group and the Group B an experimental group. If both groups A and B are exposed to special studies programmes, then both groups would be termed 'experimental groups.' It is possible to design studies which include only experimental groups or studies which include both experimental and control groups.

Experimental unit(s): The pre-determined plots or the blocks, where different treatments are used, are known as experimental units. Such experimental units must be selected (defined) very carefully.

A variable is any variable that you're not investigating that can potentially affect the outcomes of your research study

A. Extraneous variable
B. Independent variable
C. Dependent variable
D. Constant

Which of the following is an independent variable in teaching-learning process?

1. Student
2. Institution
3. Teacher
4. Parents

A researcher conducted a study to have initial idea of scope and magnitude of the problem under study and to test the feasibility of more extensive research. Such a study is called:

1. Explanatory study
2. Confirmatory study
3. Descriptive study
4. Exploratory study

Additional Information

Confirmatory research are research that **test the validity of already made hypothesis, known as a priori hypothesis**. This means that possibly some previous studies have been carried out on the subject matter and some results have been presented.
Descriptive research is a type of research **that is used to describe the characteristics of a population.** It collects data that are used to answer a wide range of what, when, and how questions pertaining to a particular population or group.
Explanatory research is a research method that explores why something occurs when limited information is available.

Exploratory research is qualitative which becomes useful in formulating hypotheses or testing hypotheses and theories. In this research, the assumption is that the researcher has little or no knowledge of the problem or situation under study, or is unfamiliar with the structure of the group under study.

Testing research when a group is exposed to usual conditions, it is termed

A. **Control group**
B. **Experimental Group**

When the dependent variable is not free from the influence of extraneous variable(s) such relation between independent and dependent variable is called

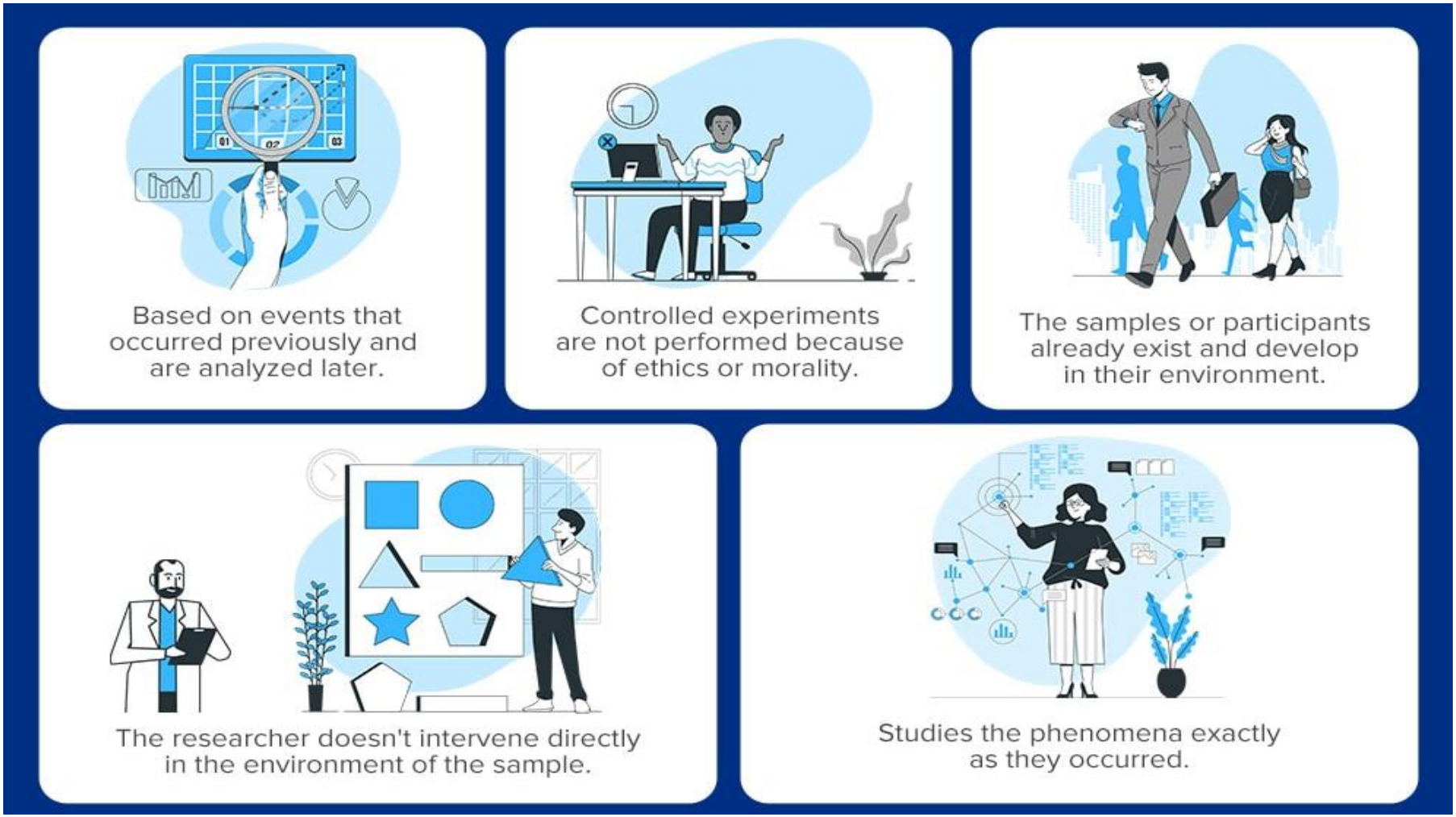
A. Explicit relation
B. Implicit relation
C. Confounded relation
D. Simple relation

Research Study Design

iEduNote.com

Experimental Study

Non-experimental Study



Which one is true for above?

A. **Experimental research design**
B. **Non Experimental research design**

Which one is true for above?

A. **Experimental research design**
B. **Non Experimental research design**

Non experimental research

A non experimental research is one where independent variables can not be manipulated. The researcher does not have complete control over the conditions of the non experimental research studies. The non-experimental in nature because no cause-and-effect relationships of any type are being hypothesized. Researchers who do historical research often accomplish this goal through the use of primary sources and secondary sources

For example

- **The television-watching behavior of adolescents. This descriptive study provides information about their television-watching habits but says nothing about why they watch what they do. You are not in any way trying to have an impact on their television watching behavior or investigate why they might watch particular shows. Non experimental or descriptive research describes the characterististics of an existing phenomenon.**
- **Current unemployment rate of single parents who have children under age 5**

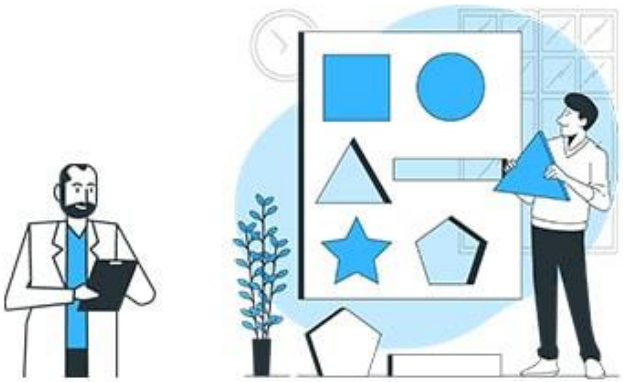
Characteristics of non-experimental research

No study samples are created

Based on events that occurred previously and are analyzed later.

Controlled experiments are not performed because of ethics or morality.

The samples or participants already exist and develop in their environment.



The researcher doesn't intervene directly in the environment of the sample.

Studies the phenomena exactly as they occurred.

Historical Research; Historical research relates past events to one another or to current events. Basically, historical research (or historiography) answers the question: what is the nature of events that have happened in the past.
For example, one might want to examine trends in treatment of mental illness or how attitudes toward work and families have changed

Descriptive Research: Descriptive research describes characteristics of an existing phenomenon. Descriptive research provides a broad picture of a phenomenon you might be interested in exploring. Current employment rates, census of any country,

Correlational Research: Correlational research uses a numerical index called the correlation coefficient as a measure of the strength of this relationship. For example, if you are interested to find out the relationship between the number of hours spent in studying and their achievement, then you would be doing correlational research,

Qualitative Research: The general purpose of qualitative research methods is to examine human behavior in the social, cultural, and political contexts in which they occur. This is done through a variety of tools, such as interviews, historical methods, case studies, and ethnography and usually results in qualitative (or non-numeric) primary data. In other words, the qualitative researcher is more (but not only) interested in the contents of an interviewee's speech than in the number of times (frequency) a particular comment is made.

Ex-Post Facto Research : In this kind of research, the independent variable or variables have already occurred in which the researcher starts with observation of a dependent variable or variables. He then studies the independent variables in retrospect for their possible relations to and effects on the dependent variable or variables.

Types of non-experimental research

Non-experimental research can take the following forms:

Cross-sectional research is used to observe and analyze the exact time of the research to cover various study groups or samples.

This type of research is divided into:

Descriptive: When values are observed where one or more variables are presented.

Causal: It is responsible for explaining the reasons and relationship that exists between variables in a given time.

Longitudinal research design: Researchers aim to analyze the changes and development of the relationships between variables over time. Longitudinal research can be divided into:

- **Trend:** When they study the changes faced by the study group in general. Same information from different groups
- **Group evolution(cohort):** When the study group is a smaller sample. Divide the group into subgroups based upon some characteristics
- **Panel:** It is in charge of analyzing individual and group changes to discover the factor that produces them. Same sample examine again and again

Types Longitudinal Study

Trend	Cohort	Panel
different samples	Samples are subgroups from a same population.	same samples

Require probability sampling from the same population, otherwise you can not compare the data collected at different times.

A cohort is a group of people who share a common characteristic or experience within a defined time period. (e.g. class of 1997, people that were born between 1990 to 1995.)

Sample size might be different over time (people moved, died…).

When to use non-experimental research?

Non-experimental research can be applied in the following ways:

- When the research question may be about one variable rather than a statistical relationship about two variables.
- There is a non-causal statistical relationship between variables in the research question.
- The research question has a causal relationship, but the independent variable cannot be manipulated.
- In exploratory or broad research where a particular experience is confronted.

Advantages

- It is very flexible during the research process
- The cause of the phenomenon is known, and the effect it has is investigated.
- The researcher can define the characteristics of the study group.

Disadvantages

- The groups are not representative of the entire population.
- Errors in the methodology may occur, leading to biases.

 # Non-experimental research is based on the observation of phenomena in their natural environment. In this way, they can be studied later to reach a conclusion.

Experimental research

Experimental research is a scientific approach to research, where one or more independent variables are manipulated and applied to one or more dependent variables to measure their effect on the latter. The effect of the independent variables on the dependent variables is usually observed and recorded over some time, to aid researchers in drawing a reasonable conclusion regarding the relationship between these 2 variable types.

The experimental research method is widely used in physical and social sciences, psychology, and education. It is based on the comparison between two or more groups with a straightforward logic, which may, however, be difficult to execute.

Mostly related to a laboratory test procedure, experimental research designs involve collecting quantitative data and performing statistical analysis on them during research.

You can conduct experimental research in the following situations:

- Time is a vital factor in establishing a relationship between cause and effect.
- Invariable behavior between cause and effect.
- You wish to understand the importance of the cause and effect

Advantages of experimental research

1. Researchers have a stronger hold over variables to obtain desired results.

2. The subject or industry does not impact the effectiveness of experimental research. Any industry can implement it for research purposes.

3. The results are specific.

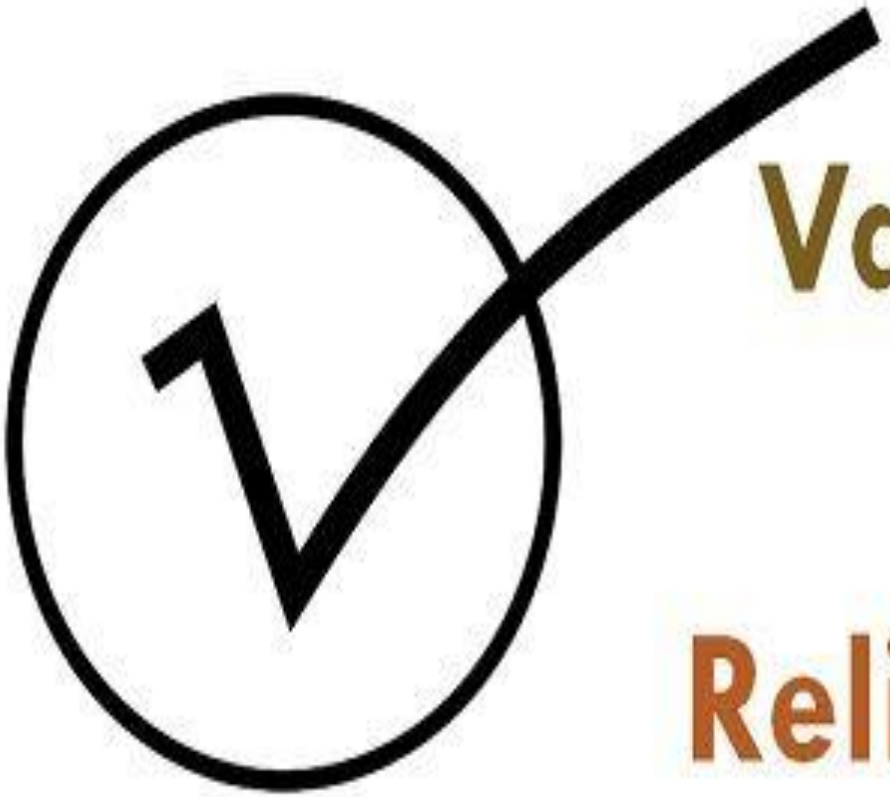
4. After analyzing the results, you can apply your findings to similar ideas or situations.

5. You can identify the cause and effect of a hypothesis. Researchers can further analyze this relationship to determine more in-depth ideas.

6. The data you collect is a foundation on which to build more ideas and conduct more research.

Difference between experimental and non-experimental research

- Experimental research involves changing variables and randomly assigning conditions to participants. As it can determine the cause, experimental research designs are used for research in medicine, biology, and social science.
- Experimental research designs have strict standards for control and establishing validity. Although they may need many resources, they can lead to very interesting results.
- Non-experimental research, on the other hand, is usually descriptive or correlational without any explicit changes done by the researcher. You simply describe the situation as it is, or describe a relationship between variables.
- Without any control, it is difficult to determine causal effects. The validity remains a concern in this type of research. However, it's more regarding the measurements instead of the effects.



Validity Vs Reliability

1. Which one is Reliable ?

2. Which one is Precise ?

1. Which one is Valid ?

2. Which one is accurate ?

Reliability VS Validity

In an experiment, you need to pay attention to many things. Arguably, two of the most important ones are reliability and validity; your experiment needs to be both reliable and valid, in order for it to make sense and provide you with quality results.

DEFINITION

RELIABILITY is the extent to which the outcomes are consistent when the experiment is repeated more than once.

DEFINITION

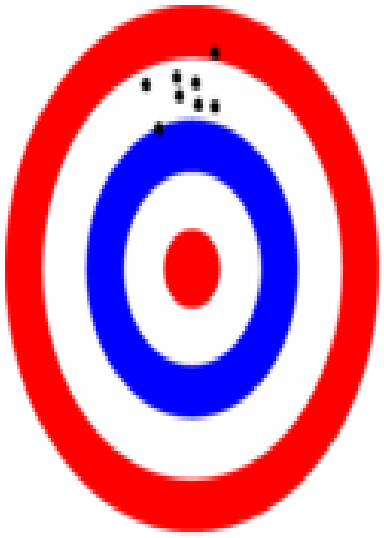
VALIDITY is the extent to which the instruments that are used in the experiment measure exactly what you want them to measure.

Reliable
Not Valid

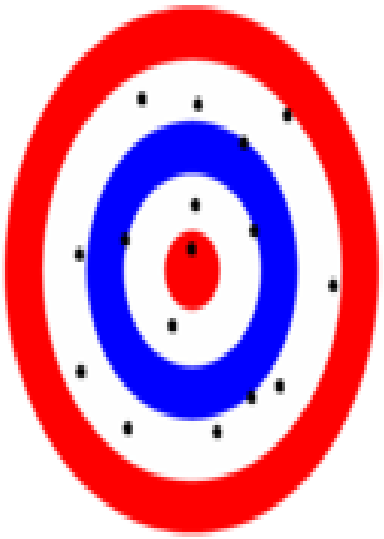
Low Reliability
Low Validity

Not Reliable
Not Valid

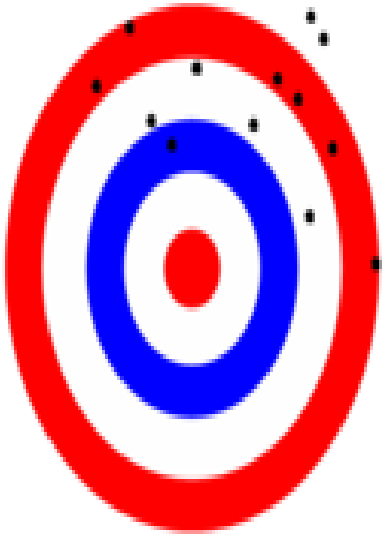
Reliable
Valid



Reliable not Valid
Precise not Accurate



Not Reliable but Valid
Not Precise but Accurate



Not Reliable and not Valid
Not Precise and not Accurate

Reliable and Valid
Precise and Accurate