

Experimental vs Non-Experimental Research

What is Experimental Research?

- Experimental research is the type of research that uses a scientific approach towards manipulating one or more control variables of the research subject(s) and measuring the effect of this manipulation on the subject. It is known for the fact that it allows the manipulation of control variables.
- This research method is widely used in various physical and social science fields, even though it may be quite difficult to execute. Within the information field, they are much more common in information systems research than in library and information management research.

- Experimental research is usually undertaken when the goal of the research is to trace cause-and-effect relationships between defined variables.
- However, the type of experimental research chosen has a significant influence on the results of the experiment.
- Therefore bringing us to the different types of experimental research.
- There are 3 main types of experimental research, namely;
 - pre-experimental,
 - quasi-experimental, and
 - true experimental research.

- **Pre-experimental Research**

- Pre-experimental research is the simplest form of research, and is carried out by observing a group or groups of dependent variables after the treatment of an independent variable which is presumed to cause change on the group(s).
- It is further divided into three types.
- One-shot case study research
- One-group pretest-posttest research
- Static-group comparison

- **Quasi-experimental Research**

- The Quasi type of experimental research is similar to true experimental research, but uses carefully selected rather than randomized subjects.
- The following are examples of quasi-experimental research:
 - **Time series**
 - **No equivalent control group design**
 - Counterbalanced design.

- **True Experimental Research**

- True experimental research is the most accurate type, and may simply be called experimental research.
- It manipulates a control group towards a group of randomly selected subjects and records the effect of this manipulation.
- True experimental research can be further classified into the following groups:
 - The posttest-only control group
 - The pretest-posttest control group
 - Solomon four-group

- **Pros of True Experimental Research**

- Researchers can have control over variables.
- It can be combined with other research methods.
- The research process is usually well structured.
- It provides specific conclusions.
- The results of experimental research can be easily duplicated.

- **Cons of True Experimental Research**

- It is highly prone to human error.
- Exerting control over extraneous variables may lead to the personal bias of the researcher.
- It is time-consuming.
- It is expensive.
- Manipulating control variables may have ethical implications.
- It produces artificial results.

- **What is Non-Experimental Research?**

- Non-experimental research is the type of research that does not involve the manipulation of control or independent variable.
- In non-experimental research, researchers measure variables as they naturally occur without any further manipulation.
- This type of research is used when the researcher has no specific research question about a causal relationship between 2 different variables, and manipulation of the independent variable is impossible.

- They are also used when:
- subjects cannot be randomly assigned to conditions.
- the research subject is about a causal relationship but the independent variable cannot be manipulated.
- the research is broad and exploratory
- the research pertains to a non-causal relationship between variables.
- limited information can be accessed about the research subject.
- There are 3 main types of non-experimental research, namely;
 - cross-sectional research,
 - correlation research, and
 - observational research

- **Cross-sectional Research**

- Cross-sectional research involves the comparison of two or more pre-existing groups of people under the same criteria.
- This approach is classified as non-experimental because the groups are not randomly selected and the independent variable is not manipulated.
- For example, an academic institution may want to reward its first-class students with a scholarship for their academic excellence.
- Therefore, each faculty places students in the eligible and ineligible group according to their class of degree.
- In this case, the student's class of degree cannot be manipulated to qualify him or her for a scholarship because it is an unethical thing to do. Therefore, the placement is cross-sectional.

- **Correlational Research**

- Correlational type of research compares the statistical relationship between two variables.
- Correlational research is classified as non-experimental because it does not manipulate the independent variables.
- For example, a researcher may wish to investigate the relationship between the class of family students come from and their grades in school.
- A questionnaire may be given to students to know the average income of their family, then compare it with CGPAs.
- The researcher will discover whether these two factors are positively correlated, negatively corrected, or have zero correlation at the end of the research.

- **Observational Research**

- Observational research focuses on observing the behavior of a research subject in a natural or laboratory setting. It is classified as non-experimental because it does not involve the manipulation of independent variables.
- A good example of observational research is an investigation of the crowd effect or psychology in a particular group of people. Imagine a situation where there are 2 ATMs at a place, and only one of the ATMs is filled with a queue, while the other is abandoned.
- The crowd effect infers that the majority of newcomers will also abandon the other ATM.
- You will notice that each of these non-experimental research is descriptive in nature. It then suffices to say that descriptive research is an example of non-experimental research.

- **Pros of Observational Research**

- The research process is very close to a real-life situation.
- It does not allow for the manipulation of variables due to ethical reasons.
- Human characteristics are not subject to experimental manipulation.

- **Cons of Observational Research**

- The groups may be dissimilar and nonhomogeneous because they are not randomly selected, affecting the authenticity and generalizability of the study results.
- The results obtained cannot be absolutely clear and error-free.

- **What Are The Differences Between Experimental and Non-Experimental Research?**

- **Definitions**

- Experimental research is the type of research that uses a scientific approach towards manipulating one or more control variables and measuring their effect on the dependent variables, while non-experimental research is the type of research that does not involve the manipulation of control variables.
- The main distinction in these 2 types of research is their attitude towards the manipulation of control variables.
- Experimental allows for the manipulation of control variables while non-experimental research doesn't.

- **Examples**

- Examples of experimental research are laboratory experiments that involve mixing different chemical elements together to see the effect of one element on the other while non-experimental research examples are investigations into the characteristics of different chemical elements.
- Consider a researcher carrying out a laboratory test to determine the effect of adding Nitrogen gas to Hydrogen gas.
- It may be discovered that using the Haber process, one can create Nitrogen gas.
- Non-experimental research may further be carried out on Ammonia, to determine its characteristics, behaviour, and nature.

- **Types**

- There are 3 types of experimental research, namely; experimental research, quasi-experimental research, and true experimental research.
- Although also 3 in number, non-experimental research can be classified into cross-sectional research, correlational research, and observational research.
- The different types of experimental research are further divided into different parts, while non-experimental research types are not further divided.
- Clearly, these divisions are not the same in experimental and non-experimental research.

- **Characteristics**

- Experimental research is usually quantitative, controlled, and multivariable. Non-experimental [research can be both quantitative and qualitative](#), has an uncontrolled variable, and also a cross-sectional research problem.
- The characteristics of experimental research are the direct opposite of that of non-experimental research. The most distinct characteristic element is the ability to control or manipulate independent variables in experimental research and not in non-experimental research.
- In experimental research, a level of control is usually exerted on extraneous variables, therefore tampering with the natural research setting. Experimental research settings are usually more natural with no tampering with the extraneous variables.

- **Data Collection/Tools**

- The [data used during experimental research](#) is collected through observational study, simulations, and surveys while non-experimental data is collected through observations, surveys, and case studies. The main distinction between these data collection tools is case studies and simulations.
- Even at that, similar tools are used differently. For example, an observational study may be used during a laboratory experiment that tests how the effect of a control variable manifests over a period of time in experimental research.
- However, when used in non-experimental research, data is collected based on the researcher's discretion and not through a clear scientific reaction. In this case, we see a difference in the level of objectivity.

- **Goal**

- The goal of experimental research is to measure the causes and effects of variables present in research,
- while non-experimental research provides very little to no information about causal agents.
- Experimental research answers the question of *why* something is happening. T
- his is quite different in non-experimental research, as they are more descriptive in nature with the end goal being to describe *what*.

- **Uses**

- Experimental research is mostly used to make scientific innovations and find major solutions to problems while non-experimental research is used to define subject characteristics, measure data trends, compare situations and validate existing conditions.
- For example, if experimental research results in an innovative discovery or solution, non-experimental research will be conducted to validate this discovery.
- This research is done for a period of time in order to properly study the subject of research.

- **Advantage**

- Experimental research process is usually well structured and as such produces results with very little to no errors, while non-experimental research helps to create real-life related experiments.

- There

are a lot more advantages of experimental and non-experimental research

, with the absence of each of these advantages in the other leaving it at a disadvantage.

- For example, the lack of a random selection process in non-experimental research leads to the inability to arrive at a generalizable result.
- Similarly, the ability to manipulate control variables in experimental research may lead to the personal bias of the researcher.

- **Disadvantage**

- Experimental research is highly prone to human error while the major disadvantage of non-experimental research is that the results obtained cannot be absolutely clear and error-free.
- In the long run, the error obtained due to human error may affect the results of the experimental research.
- Some other disadvantages of experimental research include the following; extraneous variables cannot always be controlled, human responses can be difficult to measure, and participants may also cause bias.

- **Variables**

- In experimental research, researchers can control and manipulate control variables, while in non-experimental research, researchers cannot manipulate these variables. This cannot be done due to ethical reasons.
- For example, when promoting employees due to how well they did in their annual performance review, it will be [unethical to manipulate the results of the performance review](#) (independent variable). That way, we can get impartial results of those who deserve a promotion and those who don't.
- Experimental researchers may also decide to eliminate extraneous variables so as to have enough control over the research process. Once again, this is something that cannot be done in non-experimental research because it relates more to real-life situations.

- **Setting**

- Experimental research is carried out in an unnatural setting because most of the factors that influence the setting are controlled while the non-experimental research setting remains natural and uncontrolled. One of the things usually tampered with during research is extraneous variables.
- In a bid to get a perfect and well-structured research process and results, researchers sometimes eliminate extraneous variables. Although sometimes seen as insignificant, the elimination of these variables may affect the research results.
- Consider the optimization problem whose aim is to minimize the cost of production of a car, with the constraints being the number of workers and the number of hours they spend working per day.
- In this problem, extraneous variables like machine failure rates or accidents are eliminated. In the long run, these things may occur and may invalidate the result.

- **Cause-Effect Relationship**

- The relationship between cause and effect is established in experimental research while it cannot be established in non-experimental research.
- Rather than establish a cause-effect relationship, non-experimental research focuses on providing descriptive results.
- Although it acknowledges the causal variable and its effect on the dependent variables, it does not measure how or the extent to which these dependent variables change.
- It, however, observes these changes, compares the changes in 2 variables, and describes them.

- **Comparison**

- Experimental research does not compare variables while non-experimental research does. It compares 2 variables and describes the relationship between them.
- The relationship between these variables can be positively correlated, negatively correlated or not correlated at all. For example, consider a case whereby the subject of research is a drum, and the control or independent variable is the drumstick.
- Experimental research will measure the effect of hitting the drumstick on the drum, where the result of this research will be sound. That is, when you hit a drumstick on a drum, it makes a sound.
- Non-experimental research, on the other hand, will investigate the correlation between how hard the drum is hit and the loudness of the sound that comes out.
- That is, if the sound will be higher with a harder bang, lower with a harder bang, or will remain the same no matter how hard we hit the drum.

- **Quantitativeness**

- Experimental research is a [quantitative research method](#) while non-experimental research can be both quantitative and qualitative depending on the time and the situation where it is been used.
- An example of a non-experimental quantitative research method is [correlational research](#).
- Researchers use it to correlate two or more variables using mathematical analysis methods.
- The original patterns, relationships, and trends between variables are observed, then the impact of one of these variables on the other is recorded along with how it changes the relationship between the two variables.
- Observational research is an example of non-experimental research, which is classified as a qualitative research method.

- **Cross-section**

- Experimental research is usually single-sectional while non-experimental research is cross-sectional. That is, when evaluating the research subjects in experimental research, each group is evaluated as an entity.
- For example, let us consider a medical research process investigating the prevalence of breast cancer in a certain community. In this community, we will find people of different ages, ethnicities, and social backgrounds.
- If a significant amount of women from a particular age are found to be more prone to have the disease, the researcher can conduct further studies to understand the reason behind it. A further study into this will be experimental and the subject won't be a cross-sectional group.

- **Conclusion**

- A lot of researchers consider the distinction between experimental and non-experimental research to be an extremely important one.
- This is partly due to the fact that experimental research can accommodate the manipulation of independent variables, which is something non-experimental research can not.
- Therefore, as a researcher who is interested in using any one of experimental and non-experimental research, it is important to understand the distinction between these two.
- This helps in deciding which method is better for carrying out particular research.