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**What is Research: Definition?**

A careful consideration of study regarding a particular concern or problem using scientific methods. According to the American sociologist Earl Robert Babbie, “Research is a systematic inquiry to describe, explain, predict, and control the observed phenomenon. Research involves inductive and deductive methods.”

Inductive research methods are used to analyze an observed event. Deductive methods are used to verify the observed event. Inductive approaches are associated with [qualitative research](https://www.questionpro.com/blog/qualitative-market-research/) and deductive methods are more commonly associated with [quantitative research.](https://www.questionpro.com/blog/quantitative-market-research/)

Research is conducted with a purpose to understand:

* What do organizations or businesses really want to find out?
* What are the processes that need to be followed to chase the idea?
* What are the arguments that need to be built around a concept?
* What is the evidence that will be required for people to believe in the idea or concept?

**Characteristics of research**

1. A systematic approach must be followed for accurate data. Rules and procedures are an integral part of the process that set the objective. Researchers need to practice ethics and a code of conduct while making observations or drawing conclusions.
2. Research is based on logical reasoning and involves both inductive and deductive methods.
3. The data or knowledge that is derived is in real time from actual observations in natural settings.
4. There is an in-depth analysis of all data collected so that there are no anomalies associated with it.
5. Research creates a path for generating new questions. Existing data helps create more opportunities for research.
6. Research is analytical in nature. It makes use of all the available data so that there is no ambiguity in inference.
7. Accuracy is one of the most important aspects of research. The information that is obtained should be accurate and true to its nature. For example, laboratories provide a controlled environment to collect data. Accuracy is measured in the instruments used, the calibrations of instruments or tools, and the final result of the experiment.

**What are the types of research?**

Following are the types of research methods:

**Basic research:**A basic research definition is data collected to enhance knowledge. The main motivation is knowledge expansion. It is a non-commercial research that doesn’t facilitate in creating or inventing anything. For example: an experiment to determine a simple fact.

**Applied research:**Applied research focuses on analyzing and solving real-life problems. This type refers to the study that helps solve practical problems using scientific methods. Studies play an important role in solving issues that impact the overall well-being of humans. For example: finding a specific cure for a disease.

**Problem oriented research:**As the name suggests, problem-oriented research is conducted to understand the exact nature of a problem to find out relevant solutions. The term “problem” refers to multiple choices or issues when analyzing a situation.

For example, revenue of a car company has decreased by 12% in the last year. The following could be the probable causes: there is no optimum production, poor quality of a product, no advertising, or economic conditions.

**Problem solving research**: This type of research is conducted by companies to understand and resolve their own problems. The problem-solving method uses applied research to find solutions to the existing problems.

**Qualitative research:** [Qualitative research](https://www.questionpro.com/blog/qualitative-market-research/)is a process that is about inquiry. It helps create in-depth understanding of problems or issues in their natural settings. This is a non-statistical method.

Qualitative research is heavily dependent on the experience of the researchers and the questions used to probe the sample. The [sample size](https://www.questionpro.com/blog/determining-sample-size/) is usually restricted to 6-10 people. [Open-ended questions](https://www.questionpro.com/open-ended-questions.html) are asked in a manner that encourages answers that lead to another question or group of questions. The purpose of asking open-ended questions is to gather as much information as possible from the sample.

The following are the methods used for qualitative research:

1. One-to-one interview
2. Focus groups
3. Ethnographic research
4. Content/Text Analysis
5. Case study research

**Quantitative research:** [Qualitative research](https://www.questionpro.com/blog/quantitative-research/) is a structured way of collecting data and analyzing it to draw conclusions. Unlike qualitative methods, this method uses a computational and statistical process to collect and analyze data. Quantitative data is all about numbers.

Quantitative research involves a larger population — more people mean more data. With more data to analyze, you can obtain more accurate results. This method uses [close-ended questions](https://www.questionpro.com/close-ended-questions.html)because the researchers are typically looking to gather statistical data.

[Online surveys](https://www.questionpro.com/tour/), [questionnaires](https://www.questionpro.com/tour/sample-questions.html), and [polls](https://www.questionpro.com/poll-software.html) are preferable data collection tools used in quantitative research. There are various methods of deploying surveys or questionnaires.

Online surveys allow survey creators to reach large amounts of people or smaller focus groups for different types of research that meet different goals. Survey respondents can receive surveys on mobile phones, in emails, or can simply use the internet to access surveys.

**What Is the Purpose of Research?**

There are three purposes of research:

1. **Exploratory:** As the name suggests, exploratory research is conducted to explore a group of questions. The answers and analytics may not offer a final conclusion to the perceived problem. It is conducted to handle new problem areas which haven’t been explored before. This exploratory process lays the foundation for more conclusive research and data collection.
2. **Descriptive:**[Descriptive research](https://www.questionpro.com/blog/descriptive-research/) focuses on expanding knowledge on current issues through a process of data collection. Descriptive studies are used to describe the behavior of a sample population. In a descriptive study, only one variable is required to conduct the study. The three main purposes of descriptive research are describing, explaining, and validating the findings. For example, a study conducted to know if top-level management leaders in the 21st century possess the moral right to receive a huge sum of money from the company profit.
3. **Explanatory:** Explanatory research or causal research is conducted to understand the impact of certain changes in existing standard procedures. Conducting experiments is the most popular form of casual research. For example, a study conducted to understand the effect of rebranding on customer loyalty.

To understand the characteristic of research design using research purpose here is a comparative analysis:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Exploratory Research** | **Descriptive Research** | **Explanatory Research** |
| Research approach used  | Unstructured  | Structured  | Highly structured  |
| Research conducted through | Asking research questions  | Asking research questions  | By using research hypotheses.  |
| When is it conducted? | Early stages of decision making  | Later stages of decision making | Later stages of decision making |

Research method is defined as the tools or instruments used to accomplish the goals and attributes of a study. Think of the methodology as a systematic process in which the tools or instruments will be employed. There is no use of a tool if it is not being used efficiently.

Research begins by asking the right questions and choosing an appropriate method to investigate the problem. After collecting answers to your questions, you can analyze the findings or observations to draw appropriate conclusions.

When it comes to customers and market studies, the more thorough your questions, the better. By thoroughly collecting data from customers through surveys and questionnaires, you get important insights into brand perception and product needs. You can use this data to make smart decisions about your marketing strategies to position your business effectively.

**Types of research methods and research example**

Research methods are broadly classified as [Qualitative](https://www.questionpro.com/blog/qualitative-research-methods/) and [Quantitative](https://www.questionpro.com/blog/quantitative-research/).

Both methods have distinctive properties and data collection methods.

**Qualitative Methods**

[Qualitative research](https://www.questionpro.com/blog/qualitative-research-methods/) is a method that collects data using conversational methods. Participants are asked open-ended questions. The responses collected are essentially non-numerical. This method not only helps a researcher understand what participants think but also why they think in a particular way.

Types of qualitative methods include:

* One-to-one Interview: This interview is conducted with one participant at a given point in time. One-to-one interviews need a researcher to prepare questions in advance. The researcher asks only the most important questions to the participant. This type of interview lasts anywhere between 20 minutes to half an hour. During this time the researcher collects as many meaningful answers as possible from the participants to draw inferences.
* Focus Groups: Focus groups are small groups comprising of around 6-10 participants who are usually experts in the subject matter. A moderator is assigned to a focus group who facilitates the discussion amongst the group members. A moderator’s experience in conducting the focus group plays an important role. An experienced moderator can probe the participants by asking the correct questions that will help them collect a sizable amount of information related to the research.
* Ethnographic Research: Ethnographic research is an in-depth form of research where people are observed in their natural environment without .This method is demanding due to the necessity of a researcher entering a natural environment of other people. Geographic locations can be a constraint as well. Instead of conducting interviews, a researcher experiences the normal setting and daily life of a group of people.
* Text Analysis: [Text analysis](https://www.questionpro.com/tour/text-analysis.html) is a little different from other qualitative methods as it is used to analyze social constructs by decoding words through any available form of documentation. The researcher studies and understands the context in which the documents are written and then tries to draw meaningful inferences from it. Researchers today follow activities on a social media platform to try and understand patterns of thoughts.
* Case Study: Case study research is used to study an organization or an entity. This method is one of the most valuable options for modern research. This type of research is used in fields like the education sector, philosophical studies, and psychological studies. This method involves a deep dive into ongoing research and collecting data.

**Quantitative Research Methods**

[Quantitative](https://www.questionpro.com/blog/quantitative-research/) methods deal with numbers and measurable forms. It uses a systematic way of investigating events or data. It is used to answer questions in terms of justifying relationships with measurable variables to either explain, predict, or control a phenomenon.

There are three methods that are often used by researchers:

* Survey Research — The ultimate goal of survey research is to learn about a large population by deploying a [survey](https://www.questionpro.com/tour/). Today, [online surveys](https://www.questionpro.com/tour/) are popular as they are convenient and can be sent in an email or made available on the internet. In this method, a researcher designs a survey with the most relevant [survey questions](https://www.questionpro.com/article/survey-question-answer-type.html) and distributes the survey. Once the researcher receives responses, they summarize them to tabulate meaningful findings and data.
* Descriptive Research — Descriptive research is a method which identifies the characteristics of an observed phenomenon and collects more information. This method is designed to depict the participants in a very systematic and accurate manner. In simple words, descriptive research is all about describing the phenomenon, observing it, and drawing conclusions from it.
* Correlational Research— [Correlational research](https://www.questionpro.com/blog/correlational-research/) examines the relationship between two or more variables. Consider a researcher is studying a correlation between cancer and married women have a negative correlation with cancer. In this example, there are two variables: cancer and married women. When we say negative correlation, it means women who are married are less likely to develop cancer. However, it doesn’t mean that marriage directly avoids cancer.

**Identifying Research Methodology**

To choose the appropriate types of research, you need to clearly identify the objectives. Some objectives to take into consideration for your business include:

* Find out the needs of your clients.
* Know their preferences and understand what is important to them.
* Find an appropriate way to make your customers aware of your products and services.
* Find ways to improve your products or services to suit the needs of your customers.

After identifying what you need to know, you should ask what research methods will offer you that information.

Organize your questions within the framework of the 7 Ps of marketing that influence your company – product, price, promotion, place, people, processes, and physical tests.

A well-organized [customer research](https://www.questionpro.com/survey-templates/customer-surveys/) process produces valid, accurate, reliable, timely, and complete results. Results that rigorously reflect the opinions and needs of your clients will help you grow your sales and improve your operations. To obtain the results, you need to establish and follow the processes that you have detailed out for your organization:

**Set your goals**

Consider the client’s objectives and define those that identify with yours. Make sure that you set [smart goals and objectives](https://www.questionpro.com/blog/smart-objectives-and-goals/). Do not presume the results of your surveys.

**Plan your research**

Good planning allows the use of creative and logical approaches to select the methods that gather the most accurate information. Your plan will be influenced by the type and complexity of the information you need, the skills of your market research team, and how soon you need the information. Your budget also plays a large role in your ability to collect data.

**Collect and collate your results**

Make a list of how you are going to carry out the research process, the data you need to collect, and collection methods. This will help you keep track of your processes and make sense of your findings. It will also allow you to verify that your research accurately reflects the opinions of your clients and your market. Create a record table with:

* The consumer research activity
* The necessary data
* The methods for data collection
* The steps to follow for data analysis.

Remember, research is only valuable and useful when it is valid, accurate, and reliable. Relying on imperfect research is dangerous. Incorrect results can lead to [customer churn](https://www.questionpro.com/blog/customer-churn/) and a decrease in sales.

It is important to obtain information about how the collection of customer information was carried out, and to ensure that your data is:

* Valid – founded, logical, rigorous, and impartial.
* Accurate – free of errors and including required details.
* Reliable – that can be reproduced by other people who investigate in the same way.
* Timely – current and collected within an appropriate time frame.
* Complete – includes all the data you need to support your business decisions.

**Analyze and understand your research**

Analysis of the data can vary from simple and direct steps to technical and complex processes. Adopt an approach, and choose the method of [data analysis](https://www.questionpro.com/blog/data-analysis-simple-and-complex-a-primer/) based on the methods you have carried out.

**Keep the findings ready**

Choose a spreadsheet that allows you to easily enter your data. If you do not have a large amount of data, you should be able to manage them with the use of basic tools available in survey software. If you have collected more complete and complex data, you may have to consider using specific programs or tools that will help you manage your data.

**Review and interpret the information to draw conclusions**

Once you have gathered all the data, you can scan your information and interpret it to draw conclusions and make informed decisions. You should review the data and then:

* Identify the main [trends](https://www.questionpro.com/features/trend-analysis.html) and issues, opportunities, and problems you observe. Write a sentence describing each one.
* Keep track of the frequency with which each of the main findings appears.
* Make a list of your findings from the most common to the least common.
* Evaluate a list of the strengths, weaknesses, opportunities, and threats that have been identified in a [SWOT analysis](https://www.questionpro.com/blog/swot-analysis-example/).
* Prepare conclusions and recommendations about your research.

Review your goals before making any conclusions about your research. Keep in mind how the process you have completed and the data you have gathered help answer your questions. Ask yourself if what your research revealed facilitates the identification of your conclusions and recommendations. Review your conclusions and, based on what you know now:

**Choose some strategies that will help you improve your business**

* Act on your strategies
* Look for gaps in the information, and consider doing additional research if necessary
* Plan to review the results of the research, and consider efficient strategies to analyze and dissect results for interpretation.

**APPLICATION OF RESEARCH METHODS IN VARIOUS AREAS OF STUDY**

1. **Humanities**

The humanities can be described as the study of how people process and document the human experiences. Since humans have been able, we have used philosophy, literature, religion, art, music, history and language to understand and record the world. Research in the domain of humanities examines and augments the cultural wealth of the society. A hallmark of humanistic study is that research is approached in humanities differently than in the natural and social sciences, where data and hard evidences are required to draw conclusions. Scholars engaged in the domain of humanities research are often posing questions about common assumptions, uncovering new meanings in artistic works, or finding new ways to understand cultural interactions. This type of inquiry can produce clearer pictures of the past, uncover the many insights that we can draw from our forbears, and in turn, help us better to prepare for the future. Few specialties of Humanities Research in terms of formulation of objectives and hypotheses are described hereunder. There are four roles literature plays in formulating Objectives and Hypotheses:

1. Sources of criticism – Even though researcher frequently find reading materials that are relevant to the chosen topic, but he often does not agree with the author’s position. Therefore, one way that he can use a source is to describe the counterargument, provide evidence from your review of the literature as to why the prevailing argument is unsatisfactory, and to discuss how our own view is more appropriate based upon your interpretation of the evidence.

 2. Sources of new ideas — It is certainly acceptable [and often encouraged] to read the literature and extend, modify, and refine ones’ own position in light of the ideas proposed by others. Just he has to make sure that he cites the sources!

 3. Sources for historical context — Another role related literature plays in helping researcher is to help decide to place issues and events in proper historical context. This can help demonstrate familiarity with developments in relevant topic; it provides a means of comparing historical versus contemporary issues and events; and it helps identifying key people, places, and things that had an important role related to the research problem.

4. Sources of interdisciplinary insight — A goal in reviewing related literature is to provide a means of approaching a topic from multiple perspectives rather than the perspective offered from just one discipline.

Objectives and Hypotheses in the subject areas of arts and humanities are largely derived from the day to day lives. Unlike scientists in other domains, humanists’ researchers are interested in raising questions, rather than providing absolute answers. Because the human experience cannot be adequately captured by facts and figures alone, humanities research employs methods that are historical, interpretive and analytical in nature. For example, about 10% of the human population is left-handed. Suppose a researcher wants to study that students in the College of Arts and Architecture are more likely to be left-handed than people found in the general population. They only have one sample since they will be comparing a population proportion based on a sample value to a known population value. In this context research related

* Research Question: Are artists more likely to be left-handed than people found in the general population?
* Response Variable: Classification of students as either right-handed or left handed
* Null Hypothesis: Students in the College of Arts and Architecture are no more likely to be left-handed than people in the general population (population percent of left-handed students in the College of Art and Architecture = 10% or p = .10).
* Alternate Hypothesis: Students in the College of Arts and Architecture are more likely to be left-handed than people in the general population (population percent of left-handed students in the College of Art and Architecture > 10% or p > .10).  This is a one-sided alternate hypothesis.
1. **Management Sciences**

Businesses and governments make decisions that will shape the life chances of workers, consumers, and citizens for decades to come. In order to shape these decisions to be rational and implementable these ought to be based on rigorous research. And to conduct such research, one should to make sure he knows the constituency that research output is going to serve. At the same time, it is long past time for the field to have a serious conversation where their data comes from, and the ethics of using data. Social life and the operation of organizations increasingly leave more or less permanent data traces. The most important part of any research is its application in the real world. Research process is not complete before decision making takes place. As mentioned in the preceding sections one of the important steps is defining the hypotheses, choosing an appropriate research method and then finally using statistical tools to validate the existing theories, predict new patterns and develop new postulates. Application of research methodology is equally important in the field of management. Most of the corporate and consulting firms have their in house data analytics centre. It is of utmost importance to understand how various statistical tools help the managers in making correct decisions.

**Objectives and Hypotheses**

The major area of concern for management science researchers is to know how to turn a business problem into a testable hypothesis. A hypothesis is an educated prediction that provides an explanation for an observed event. An observed event is a measurable result or condition. If researcher cannot measure it, then he cannot form a hypothesis about it because he cannot confirm or reject it. When one needs to make decisions such as how much one should spend on advertising, it is easy to make wild assumptions or get lost in analysis paralysis. A business hypothesis solves this problem, because, at the start, it is based on some foundational information. A hypothesis predicts the relationship between two variables. If researcher wants to study pricing and customer loyalty, he does not waste his time and resources studying tangential areas. For example if a financial analyst believes there might be a positive association between the change in a stock’s price and the amount of the stock purchased by non-management employees the previous day.

* Null Hypothesis is: The correlation between the daily stock price change and the daily stock purchases by non-management employees = 0.
* Alternate Hypothesis is:  The correlation between the daily stock price change and the daily stock purchases by non-management employees > 0.  This is a one-sided alternate hypothesis.

**Testing of Hypotheses** is a statistical procedure that is used to determine whether there is enough evidence in a sample of data to infer that a certain condition is true for the entire population. As most of the corporate work is time bound it is impossible to make decisions after studying the entire population. Therefore, a small sample is used to infer maximum information on population. Testing of hypotheses helps the decision maker to look at the mean sales of a particular market sample using one sample mean test. The researcher can either use a Z-test or a T-test depending upon the size of the sample and information about the population standard deviation. If the size of the sample is 30 or less than 30 t-test may be used and else z-test may be applied.

 **Example**: Vikram Auto limited wants to check whether their average sales are at least 200 units in a year. The manager took a random sample of 6 months and found the sales to be 210 on an average with a standard deviation of 6. Can you conclude that yearly average sales are 200 with 5 % level of significance? Similarly a marketing manager may be interested to know whether or not sales of his product have increased or decreased after a particular promotion or advertisement campaign? This is a clear case of manager using data statistics viz; paired t-test to check whether there is any difference in the mean sales figures before and after the advertisement campaign. Looking at the results the manager can easily decide whether the ad campaign has helped or not. Factor analysis is another important statistical tool which is widely used in the field of management. Factor analysis is a process in which the values of observed data are expressed as functions of a number of possible causes in order to find which are the most important. It is a dimension reduction technique whereby several factors are reduced to smaller number of factors. The factors are clubbed together on the basis of correlation. A manager might want his staff to use and rate the product on various parameters before it is launched to the general public. After getting the feedback from the staff the researcher may club the factors on the basis of factor scores and correlation and may again try to study smaller number of factors. This helps in reducing time and complexity of studying hundreds of factors affecting the product. A recent example of this is Reliance Jio. The services were given to all the reliance staff to test and were then launched to the general public. Other statistical techniques most commonly used in management decision making are Discriminant analysis and logistic regression. Both these techniques are used to predict categorical data. Discriminant analysis helps in differentiating between the people who like the advertisement campaign of the company and people who do not like the campaign. Logistic regression helps in prediction the probabilities of potential customer buying a particular product or not based on several independent parameters. There are numerous other statistical tools available for testing the given hypotheses supporting rational decisions.

1. **Physical and Life Sciences**

Physical science is concerned with the study of natural but inanimate objects. These sciences include astronomy, physics, chemistry, and earth science. Life science, on the other hand, is the scientific study of living organisms, including animals (and humans), plants, and microorganisms.

 **Objectives and Hypotheses**: A hypothesis is a suggested solution for an unexplained occurrence that does not fit into current accepted scientific theory. The basic idea of a hypothesis is that there is no pre-determined outcome. For a hypothesis to be termed a scientific hypothesis, it has to be something that can be supported or refuted through carefully crafted experimentation or observation. For example we can take the following question: ‘Does temperature cause the leaves to change their colour on the trees?’ Next, we can ask our self if this can be tested. If it can be tested, we will write a hypothesis that states what you expect to find. The hypothesis could be ‘If lower temperature causes leaves to change colour and the temperature surrounding a tree is decreased, then the leaves will change colour.’

**Testing of Hypothesis and Analytical Tools**: Statistics for the life sciences is almost synonymous with biostatistics. It incorporates quantitative modeling and methods of data analysis for clinical and epidemiological research (e.g. survival analysis), which in the past twenty years have become indispensable in medical research. It also includes statistical methods used in genetic research and genomics, which have a classical foundation (for instance in the work of Fisher, the founding father of statistics), but are rapidly developing in answer to present-day opportunities provided by data from new experimental platforms, such as micro-arrays or whole-genome scans. Usually smaller samples are taken in life sciences hence it is important to understand the use of t-test. Many times researchers are expecting some results but observe different results so use of chi square test is essential. Cause and effect relationship in physical science can be measured with the help of regression and correlation. In case of physical sciences also hypotheses are tested by using test statistics including t-test, z-test, and ANOVA. Correlation and regression techniques are commonly used analytical techniques.

1. **Engineering & Technology**

The engineering design process is a methodical series of steps that engineers use in creating functional products and processes. The process is highly iterative - parts of the process often need to be repeated many times before another can be entered. One framing of the engineering design process delineates the following stages: research, conceptualization, feasibility assessment, establishing design requirements, preliminary design, detailed design, production planning and tool design, and production. Analytics is a critical tool for robustness analysis, measurement system error analysis, test data analysis, probabilistic risk assessment, and many other fields in the engineering world. An engineer is someone who solves problems of interest to society by the efficient application of scientific principles. Engineers accomplish this by either refining an existing product or process or by designing a new product or process that meets customers ‘needs. The engineering, or scientific, method is the approach to formulating and solving these problems. The steps in the engineering method are as follows:

1. Develop a clear and concise description of the problem.

 2. Identify, at least tentatively, the important factors that affect this problem or that may play a role in its solution.

3. Propose a model for the problem, using scientific or engineering knowledge of the phenomenon being studied. Precisely state limitations and or assumptions of the model. 4. Conduct appropriate experiments and collect data to test or validate the tentative model or conclusions made in steps 2 and 3.

 5. Refine the model on the basis of the observed data.

6. Manipulate the model to assist in developing a solution to the problem.

 7. Conduct an appropriate experiment to confirm that the proposed solution to the problem is both effective and efficient.

 8. Draw conclusions or make recommendations based on the problem solution

**Objectives and Hypotheses**: Engineering researcher needs to understand something about how existing things work in order to be able to create something new. Hypotheses are suitable in engineering to clarify these preliminary things. But verifying these hypotheses is certainly not the key step in the research, and maybe it has already been done previously. That is why it is recommended not focusing on a hypothesis as the basis for engineering research.

**Testing of Hypothesis and Analytical Tools**: A plethora of models have been proposed in the field of engineering and technology to predict the nature and behavior of the system and predict the future development. Testing of hypotheses is used extensively in the field of engineering and technology with a variety of test statistic viz; Z-test, t- test, ANOVA etc. We can cite an example of computer science here; the numbers of faults removed in various stages of testing are homogeneous or not? This can be easily answered with the help of one way ANOVA. A distinction in the nature of faults and failures at various time of testing stages can be made. We can use several mathematical models and nonlinear regression to predict the nature and types of faults present in the software system. No software system is fault free and a lot of money and time is required in testing process. However, if we can predict the failure and fault it will solve a major problem. The most commonly used mathematical model in the industry is exponential model (given by Goel and Okumoto) is given as under:

m(t) = a (1 – exp (–bt))

Whereas,

 m(t): mean number of faults removed till time t.

a: Total number of faults present in the system.

B : rate at which faults are detected

T: testing time

The above research procedure can be used to predict the fault removal pattern in the software system. Discriminant Analysis is a good technique to predict the type of fault viz; input fault, output fault etc.