

Topic 4. What is research: Definition. Methods. Types & Examples

Learning objectives

Meaning and Definition of Research

Stages of the research process

Purpose of research

Motivation in research in general and for your research in particular

Glossary of terms

Research Characteristics

Types of Research with Examples

Let's start from the question *What is research?*

The etymology and original meaning of the word "research" are interesting questions.

The fact is that the Latin prefix RE- usually implies repetition, whereas the meaning we have for research at the moment is that something new is being sought.

The word research is derived from the Middle French "recherche", which means "to go about seeking", the term itself being derived from the Old French term "recherchier" a compound word from "re-" + "cerchier", or "sercher", meaning 'search'. The earliest recorded use of the term was in 1577.

Definition of research

We currently view research as not just a repetitive search, but as scientific research using scientific methods.

So, research is defined as careful consideration or study regarding a particular concern or problem using scientific methods [1-4].

Research is a systematic inquiry to describe, explain, predict, and control the observed phenomenon. It involves inductive and deductive methods". This definition was given by the American sociologist Earl Robert Babbie, in 1998.

According to Clifford Woody (Kothari 1988), research comprises of "Defining and redefining problems, formulating hypothesis or suggested solutions; evaluating data; making collecting, organizing and deductions and reaching conclusions; and at last, carefully testing the conclusions to determine whether they fit the formulating hypothesis".

According to Redman and Mory (1923), research is a "systematized effort to gain new knowledge".

In the Encyclopedia of Social Sciences, D. Slesinger and M. Stephenson (1930) defined research as "the manipulation of things, concept or symbols for the

purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in practice of an art" [2].

Meaning of research

To summarize we can say -research means a search for knowledge.

It aims at finding out the truth.

It is a way of thinking that involves a critical examination of aspects of everyday life.

It is a fact-finding process. Moving from the known to the unknown.

Research is an organized and systematic way to find answers to questions

All of the above is the *meaning of the research*.

One more time, let's answer the question What does research mean?

To research is to purposely and methodically search for new knowledge and practical solutions in the form of answers to questions formulated beforehand

Research is also defined as a systematic inquiry that investigates hypotheses, suggests new interpretations of data or texts, and poses new questions for future research to explore.

There are a variety of approaches to research in any field of investigation. Each particular research study will be unique in some ways because of the particular time, setting, environment, and place in which it is being undertaken.

8 stages of the research process

Thus, research is not just a repetitive search, although it does have certain iterative stages of the process, as shown in this cycle diagram.

Nevertheless, all research endeavors share a common goal of furthering our understanding of the problem. Ideally, each research hypothesis goes through these 8 stages of the research process (Fig 1).

These 8 stages in the research process are:

1. Identifying the problem.
2. Reviewing literature.
3. Setting research questions, objectives, and hypotheses.
4. Choosing the study design.
5. Deciding on the sample design.
6. Collecting data.
7. Processing and analyzing data.
8. Writing the report.



Figure 1 – Eight stages of the research process

The research process outlined above is, in essence, part of a research proposal (yours Master's thesis). It is an outline of your commitment that you intend to follow in executing a research study.

A close examination of the above stages reveals that each of these stages is dependent upon the others.

One cannot analyze data (step 7) unless he has collected data (step 6). It is also true that one cannot write a report (step 8) unless he has collected and analyzed data (step 7).

Research then is a system of interdependent related stages. Violation of this sequence can cause irreparable harm to the study.

Motivation in research

What makes people to undertake research?

This is a question of fundamental importance. The possible motives for doing research may be either one or more of the following:

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.

However, this is not an exhaustive list of factors motivating people to undertake research studies. Many more factors such as directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening, and the like may as well motivate (or at times compel) people to perform research operations.

Usually Research consists of:

- Asking a question that nobody has asked before;
- Doing the necessary work to find the answer; and
- Communicating the knowledge you have acquired to a larger audience.

Research is not a solitary activity –but an act of community. As a member of the research community, you are building on the knowledge that others have acquired before you and providing a road map for those who come after you. You are adding to a body of work that will never be complete.

Research is an ongoing, collaborative process with no finish line in sight.

So, according to Collis & Hussey, 2003, the purpose of research is to

- Review or synthesize existing knowledge
- Investigate existing situations or problems
- Provide solutions to problems
- Explore and analyze more general issues
- Construct or create new procedures or systems
- Explain new phenomenon
- Generate new knowledge
- ...or a combination of any of the above!

All of this applies to Your research as well

Research can be one of the most interesting features of any degree course as it offers you a measure of control and autonomy over what you learn.

It gives you an opportunity to confirm, clarify, pursue – or even discover – new aspects of a subject or topic you are interested in.

To sum up, RESEARCH is a process of inquiry and investigation; if it is systematic, methodological and ethical, research can help solve practical problems and expand knowledge.

There is a *glossary of terms* to characterize research.

Inquiry - an act of asking for information

Research Characteristics: controlled, rigorous, systematic, valid and verifiable, empirical and critical, ethical

Reproducibility -the ability to be reproduced or copied

Primary research, Secondary research

Basic Research, Applied Research

Quantitative and Qualitative Research

Inductive and Deductive Research

Experimental/Simulation approaches

Characteristics of Research

Certain terms are commonly used in research and the success of any research depends on them. These terms determine whether a research is scientifically and ethically correct. They are called the characteristics of research. These characteristics are represented here in simplest terms to understand and to implement. The real understanding of these characteristics is only possible when you practically conduct a research.

So, we have defined research as the process of collecting, analyzing and interpreting information to answer questions. analyzing and interpreting information to answer questions.

To qualify as research, a process must have certain characteristics: it must be *controlled, rigorous, systematic, valid and verifiable, empirical and critical* (Fig.2)



Figure 2 - Characteristics of Research

Controlled - in real life there are many factors that affect an outcome. The concept of control implies that, in exploring causality in relation to two variables (factors), you set up your study in a way that minimizes the effects of other factors affecting their relationship. So, some factors are taken as controlled factors while others are tested for a possible effect.

Rigorous - you must be scrupulous in ensuring that the procedures followed to find answers to questions are relevant, appropriate and justified.

Systematic - this implies that the procedure adopted to undertake an investigation follow a certain logical sequence. The different steps cannot be taken in a haphazard way. *Some procedures must follow others.*

Valid and verifiable - this concept implies that whatever you conclude on the basis of your findings is correct and can be verified by you and others (including reproducibility of experiment).

Empirical - this means that any conclusions drawn are based upon hard evidence gathered from information collected from real life experiences or observations.

Critical - critical scrutiny of the procedures used and the methods employed is crucial to a research enquiry. The process of investigation must be foolproof and free from drawbacks. The process adopted and the procedures used must be able to withstand critical scrutiny.

Ethical, i.e. the research has to comply with accepted moral principles.

For a process to be called research, it is imperative that it has the above characteristics [5].

Types of research methods or approaches

There are different types of research methods which use different tools for data collection:

Primary and Secondary research

Quantitative and Qualitative research

Applied and Basic research

Deductive and Inductive Research

Primary vs Secondary research

You can find out the difference between primary and secondary research, in the following points in detail.

Research conducted to gather first-hand information, for the current problem is called Primary Research. Secondary Research is one that involves the use of information obtained originally by primary research.

Primary Research is based on raw data, whereas secondary research is based on analyzed and interpreted information.

For the primary research, the data is collected by the researcher himself or by the person hired by him. As against this, for the secondary research, the data collection is performed by someone else.

The primary research process explores the topic deeply. The secondary research process aims at gaining broad understanding about the subject.

In primary research, the data collected is always specific to the needs of the researcher. Primary research is an expensive process; it consumes a lot of time as the research is done from scratch. However, in the case of secondary research, the collection of data is already done, the research takes comparatively less time and the low cost.

Quantitative vs Qualitative research

Qualitative research and quantitative research differ in many ways, including approaches, goals, settings, sampling, data collection and analysis. You can learn more about these approaches using the diagram in Fig.3.

The emphasis of Quantitative research is on *collecting and analyzing numerical data; it concentrates on measuring the scale, range, frequency etc. of phenomena.*

This type of research, although harder to design initially, is usually highly detailed and structured and results can be easily collated and presented statistically.

Quantitative research involves examining and reflecting on the less tangible aspects of a research subject, as *values, attitudes, perceptions.*

Although this type of research can be easier to start, it can be often difficult to interpret and present the findings; the findings can also be challenged more easily.

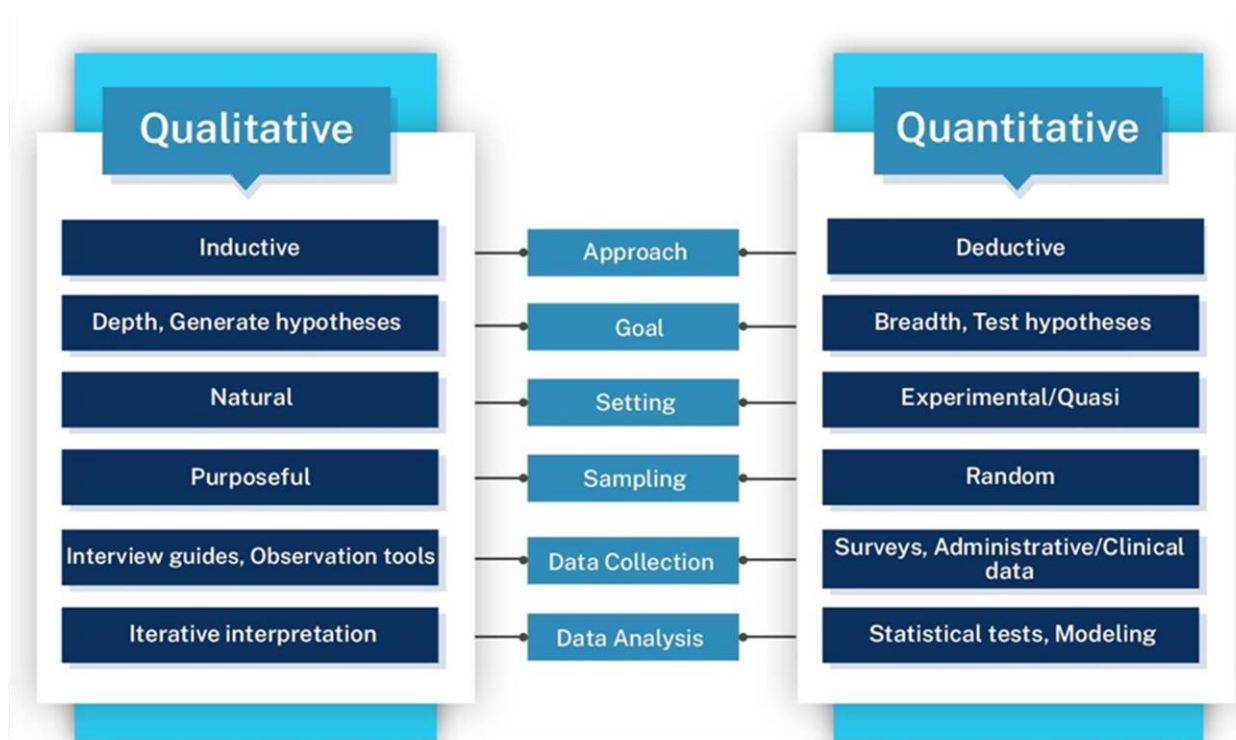


Figure 3 - Quantitative research versus qualitative research

Applied vs Basic research

Fundamental research, also known as basic research or pure research increase understanding of fundamental principles. It does not usually generate findings that have immediate applications in a practical level. Fundamental research is driven by curiosity and the desire to expand knowledge in specific research area.

This type of research mainly aims to answer the questions why, what or how, they tend to contribute the pool of fundamental knowledge in the research area.

Opposite to fundamental research is applied research that aims to solve specific problems; thus, findings of applied research do have immediate practical implications. It is important to note that although fundamental studies do not pursue

immediate commercial objectives, nevertheless, findings of fundamental studies may result in innovations, as well as in generating solutions to practical problems.

Deductive vs Inductive Research

In logic, we often refer to the two broad methods of reasoning as the deductive and inductive approaches.



Deductive reasoning works from the more general to the more specific. Sometimes this is informally called a “top-down” approach. We might begin with thinking up a theory about our topic of interest. We then narrow that down into more specific hypotheses that we can test. We narrow down even further when we collect observations to address the hypotheses. This ultimately leads us to be able to test the hypotheses with specific data – a confirmation (or not) of our original theories.

Inductive reasoning works the other way, moving from specific observations to broader generalizations and theories.

Deductive reasoning is more narrow in nature and is concerned with testing or confirming hypotheses.

Some examples. **Take a look at table 1.**

Table 1 Deductive Research versus Inductive Research

Deductive	Inductive
<p>General ideas  Particular Situation</p> <p>Deductive research moves from general ideas/theories to specific particular & situations: the particular is deduced from the general, e.g. broad theories.</p> <p>Deductive reasoning starts with a hypothesis that examines facts and then reaches a logical conclusion. In math terms, think of it this way: $A=B, B=C, \text{ therefore } A=C$.</p>	<p>Particular Situation  General ideas</p> <p>Inductive research moves from particular situations to make or infer broad general ideas/theories.</p> <p>Inductive reasoning starts with observations that produce generalizations and theories.</p>

We can clearly see the difference between these two types of research. For deductive methods, a general idea leads to a particular situation. On the contrary, for the inductive method, a specific situation leads to a general idea.

Deductive reasoning starts with a hypothesis, that examines facts and then reaches a logical conclusion. In math terms, think of it this way: $A=B, B=C, \text{ therefore } A=C$.

Inductive reasoning starts with observations that produce generalizations and theories

Now think what comes to our mind first when we hear about the science of deduction? That's right, the name of the brilliant detective Sherlock Holmes!

Look at the table 1 again and remember some of Holmes's cases. This is a contradiction, isn't it? And this was noticed by many readers of Conan Doyle's short stories. This is freshly confirmed in *The Power of Inductive Reasoning*, published in *The Daily Coach* on December 12, 2019: "Sherlock Holmes never uses deductive reasoning to assist him in solving a crime. Instead, he uses inductive reasoning" [6]

Indeed, police officers use the deductive method, but not Sherlock!

Many police officers have a suspect in mind based on previously available information that is not necessarily related to the case, and then they seek out evidence to prove the guilt of that suspect

Sherlock speaks directly about his method "From what I observe I deduce everything", but the correct phrase there "I utilize inductive reasoning to formulate probable solutions" [7], right? Hmm, that didn't turn out so catchy, did it?

It is a mystery why Sir Conan Doyle used the wrong method name. Hopefully this illustrative example will allow you to better grasp the essence of these two approaches.

Last but not least, I would like to clarify an experimental approach that also involves modeling. This can be confusing as the simulation approach is different from the usual physics experiment. However, it is an exploratory method where we experiment in an artificially created environment.

In general, the *Experimental approach* is characterized by control over the research environment and in this case some variables are manipulated to observe their effect on other variables.

Simulation approach or *Modelling* involves the construction of an artificial environment within which relevant information and data can be generated. This permits an observation of the dynamic behaviour of a system (or its sub-system) under controlled conditions.

The term 'simulation' refers to "the operation of a numerical model that represents the structure of a dynamic process. Given the values of initial conditions, parameters and exogenous variables, a simulation is run to represent the behaviour of the process over time." [5]

Simulation approach can also be useful in building models for understanding future conditions.

Learning outcomes

As a result of this lecture, you are able:

- to define what research is
- to list 8 stages of research process
- to define the motivation for your research

- to correctly use all the terms in the glossary for this lecture
- to identify different research approaches and types of research

References

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