

# THE PROCESS OF RESEARCH

# INTRODUCTION

Generally, research is understood as systematic, controlled, empiric and critical investigation of hypothetic statements on supposed relationships among phenomenon. It is a process in which thinking is dominant. Characteristic features of research are:

- Systematic solving of scientific problems
- Using scientific methods
- System of interconnecting stages and steps

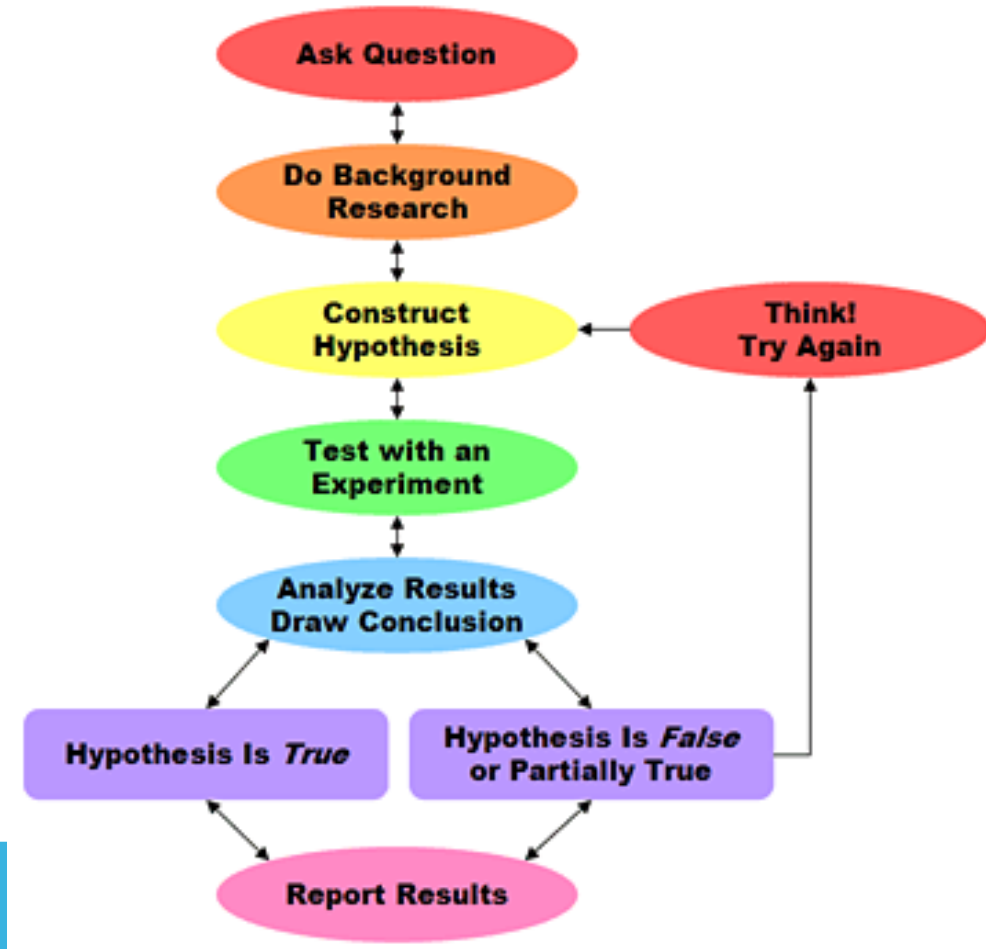
The research process should be understood as one of ongoing planning, searching, discovery, reflection, synthesis, revision, and learning.

# STAGES OF RESEARCH

Research is composed of a certain stages and steps. Step order may vary depending on the subject matter and researcher. Taking into account different guidelines one can distinguish different number of stages/steps in research process.

The following five stages outline a simple and effective strategy for conducting effective research:

- I. The conceptual stage
- II. Stage of construction of research design
- III. Empiric stage
- IV. Analytic stage
- V. Disseminative stage



# THE CONCEPTUAL STAGE

This stage of research involves activities with a strong conceptual element. Conceptualisation refers to the process of developing refining abstract ideas. During this stage, the researcher categorises and labels his/her impressions. Thus, the activities include thinking, rethinking, theorising, making decision, and reviewing ideas with colleagues, research partners or mentors/supervisors. The researcher also needs to draw on the skills and abilities of creativity, analysis and insight, as well as on the firm grounding of existing research on the topic of interest.

Stage of conception is the first stage of original research. In this stage are created content and structure of the planned research. Creation of conception of new research project is structured process. It can be divided into 4 stages as follows:

- 1) Formulation of research problem or research questions, set bounds of them, determine the purpose of the study
- 2) Searching and review the literature relating to the regarding research problem and develop a framework
- 3) Development of the theoretical construction of the future research
- 4) Creation of hypothesis which should be verified/falsified in future research

# THE CONCEPTUAL STAGE

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Formulation of research problem and set bounds of it.

The first step of the research work is to state the scientific problem. It is important to clearly state what your problem is to avoid any confusion later. Formulation of scientific problem is frequently recognized as the most difficult and the most important part of research project. At the beginning the scientific problem is usually not well defined. There are not clear limit, its bounds are not set well. So, you may need to narrow it, to identify a more specific topic within the broader one (refinement of research question/problem).

Searching and review the literature relating to the regarding research problem and development a framework.

It is regular rule that research projects begins with conducting literature, which means to identify related research, to set the current research project within a conceptual and theoretical context. When conducting the literature review it's important to concentrate on the scientific literature, start with the most valuable research journals in your topical area, use a blind or juried review system on the research journals and do the review early in the research process. In the literature review you might be able to find a study that is quite similar to the one you are thinking of doing and the literature review will help you to find and select appropriate measurement instruments and it will also help you to anticipate common problems in your research context and will help you to avoid common traps.

# THE CONCEPTUAL STAGE

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Development of the theoretical construction of the future research.

Before the real research will start it is necessary to create its theoretical construction (abstract construction, virtual model). The main aim of this step is thinking on the content of presumed research, on its timing (date of beginning, duration of individual stages, duration whole research, date of supposed finish), on its structure (division to stages, steps), on conditions which should be created for successful run of research (persons, money, material, place). This step give a chance to researcher to think about each detail related to presumed research, to find out very early „weak links of chain“ in the planned research, to think on alternative ways in research protocol if some non assumed condition will influence the research process. Creation of good virtual model of the future research will save the time, money and decrease probability of stressful situations during running research.

Formulation of hypothesis.

A stabile step in research is formulation of a research question. A research question is a statement that identifies the phenomenon to be studied. A well-thought-out and focused research question leads directly into your hypotheses. Normally, no more than three primary hypotheses should be proposed for a research study. Hypothesis is the result of researcher's creativity. It is a rational assumption on the possible cause(s) of the observed phenomenon. Hypothesis is a source of questions focused to the core of the research problem.

# STAGE OF CONSTRUCTION OF RESEARCH DESIGN

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The aim of this stage of research is to prepare general plan of real research. This stage is composed of following parts:

1) Identification of variables

- dependent variables (responses, outcome, or criterion variables)
- independent variables (explanatory or predictor variables)
- control variables
- intervening variables


2) Construction of operational definitions for variables

3) Selection of design for data analysis

# STAGE OF CONSTRUCTION OF RESEARCH DESIGN

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In the process of the design creation should be involved following steps:

- a) selection of research objects
  - b) selection the methods which are planned to be used in proposed research
  - c) Selection of technology
  - d) protocol of research should be constructed
  - e) the control methods should be stated: to control whether the research procedures are correct or not
  - f) creation of pilot study
  - g) to define the statistical methods used for evaluation of the obtained results
  - h) to define the financial, material and personal needs to secure success in the research
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# EMPIRIC STAGE

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In this stage, the researcher implements all the plans that he/she made in First stage, step 3, to collect the data. In many studies empirical stage is the most time-consuming part of the investigation. The amount of time spent, however, varies from study to study.

So, we can say that empiric stage is composed of the following activities: to do all activities related to gaining scientific results, to sort them, and to evaluate them its first step can be pilot study (to tune the research project).

For the gaining of valid results it is necessary to fulfil some essential conditions, e.g.

- researcher should be skilled in using research methods
  - researcher should be experienced
  - specification of environmental condition for out the research should be present
  - to use relevant and sensitive enough methods, technologies
  - precisely fulfil protocol of experiment
  - minimize possibility of subjective negative influence on production data
  - minimize of negative influence of environment to research
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# EMPIRIC STAGE

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## Key elements of the experimental procedure


If you use experiment as a method in your research than you should be familiar with its key elements. Here they are:

- description and size of all experimental and control groups, as applicable
- a step-by-step list of everything you must do to perform your experiment. Think about all the steps that you will need to go through to complete your experiment, and record exactly what will need to be done in each step
  - the experimental procedure must tell how you will change your one and only independent variable and how you will measure that change
  - the experimental procedure must explain how you will measure the resulting change in the dependent variable or variables
  - if applicable, the experimental procedure should explain how the controlled variables will be maintained at a constant value
  - the experimental procedure should specify how many times you intend to repeat your experiment, so that you can verify that your results are reproducible
  - a good experimental procedure enables someone else to duplicate your experiment exactly!

# ANALYTIC STAGE

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Once the data collection and surveying activities have yielded sufficient and relevant data, it is time to systematically organize the data so that it can be interpreted and analyzed by researcher. The data collected in the empirical stage are not reported in „raw“ form. They must be summarised and subjected to various types of analysis and interpretation. Before starting to analyse or process the data, the researcher must examine them for completeness and accuracy. Incomplete and inaccurate data can be discarded. Than data are organised in an orderly, coherent fashion so that he/she can discern patterns and relationships. So, the content of this stage can be summarising in the following processes:

- analysis of quantitative data and/or analysis of qualitative data
  - analysis of the data by statistical methods
  - interpretation of the results
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# ANALYTIC STAGE

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The steps used in analytic stage of research are:

- a) systemic processing of data: e.g. classification of data according characteristic properties/features
- b) correlation: looking for relationships among the two or more recorded data (parameters)


When we are looking for possible correlations our attention should be focused to:

- if qualitative and quantitative correlations do exist
  - find simple correlation – between two parameters
  - find complex correlation – among many parameter
  - if there is linear correlation – manifested as straight line
  - if there is non-linear correlation – manifested as variously shaped curve
  - if there is direct correlation – positive
  - if there is indirect correlation – negative
- c) comparison: comparison of the result obtained in our research with data obtained in similar research done by other researchers
  - d) induction – looking for generalised conclusion on the base of limited amount of results

# DISSEMINATION STAGE

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The job is not completed, however, until the researcher communicates the result of the study to others who may find it useful. So, dissemination means process when results of the research are presented or published as:

- final research report from research project
  - lectures and/or posters at the congresses and conferences
  - papers in journals
  - using the result in clinical practice
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# CONCLUSIONS

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The scientific research is not a single recipe: it requires intelligence, imagination, and creativity. In this sense, it is not a mindless set of standards and procedures to follow, but is rather an ongoing cycle, constantly developing more useful, accurate and comprehensive models and methods.

The linearized, pragmatic scheme of the stages of scientific research looks like this:

1. Define a question
2. Gather information and resources (observe)
3. Form an explanatory hypothesis
4. Test the hypothesis by performing an experiment and collecting data in a reproducible manner
5. Analyze the data
6. Interpret the data and draw conclusions that serve as a starting point for new hypothesis
7. Publish results
8. Retest (frequently done by other scientists)