NOVA IMS Information Management School

Research Methodologies

Master in Data Science and Advanced Analytics

Introduction to scientific research

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Scientific Paradigm

"The **scientific paradigm**, which dates back to Francis Bacon, is the process of **forming hypotheses** and **testing** them through **experiments**; successful hypotheses **become models** that **explain and predict phenomena** in the world."

(Denning, 2005)

Basic Science & Applied Science

- Applied research
  - research methodology that creates practical solutions for specific problems
  - solution-driven approach
- Basic research
  - research that seeks to expand knowledge in a field of study.
  - knowledge-specific approach

- Applied research is primarily concerned with creating solutions to problems by collecting and analysing empirical data to arrive at valid research outcomes.
- Basic research seeks to advance the frontiers of knowledge by creating new theories or modifying existing ones.

Basic Science & Applied Science examples

- Education
  - basic research
    - How does human memory work?
    - How do children acquire new math knowledge?
  - applied research
    - A study to build students' interests in science
    - A study to improve classroom interaction between teachers and students.
- Health
  - basic research
    - An investigation into the secondary symptoms of a certain disease.
  - applied research
    - An investigation to determine the side effects of alcohol consumption.

Research outputs in Master Programs

- RESEARCH (Master Thesis)
- PROJECT (Scientific Project)
- INTERNSHIP (Scientific Report)

- Concepts disambiguation:
  - Master Thesis (Master Program output)
  - Dissertation (PhD Program output)
  - In Portuguese language we use:
    - Dissertação (Master Program)
    - Tese (Doutoramento, PhD)

Research framework

		Research Activity			
		Design Science		Natural Science	
		Build	Evaluate	Theorize	Justify
Research Ouputs	Constructs				
	Model				
	Method				
	Instantiation				

(March & Smith, 1995)

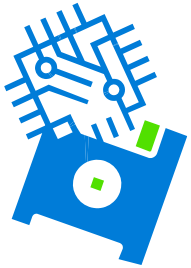
Research Approaches

Explain Phenomena (Theorise and Justifying theory)

Problem definition & Objectives → Literature Review → Metodology → Planning and Data Instruments collection → Data collection → Results Analysis

Literature Review since day one until D-Day (Master Thesis Presentation Day)

Develop Artifacts (Prototyping & Usability)

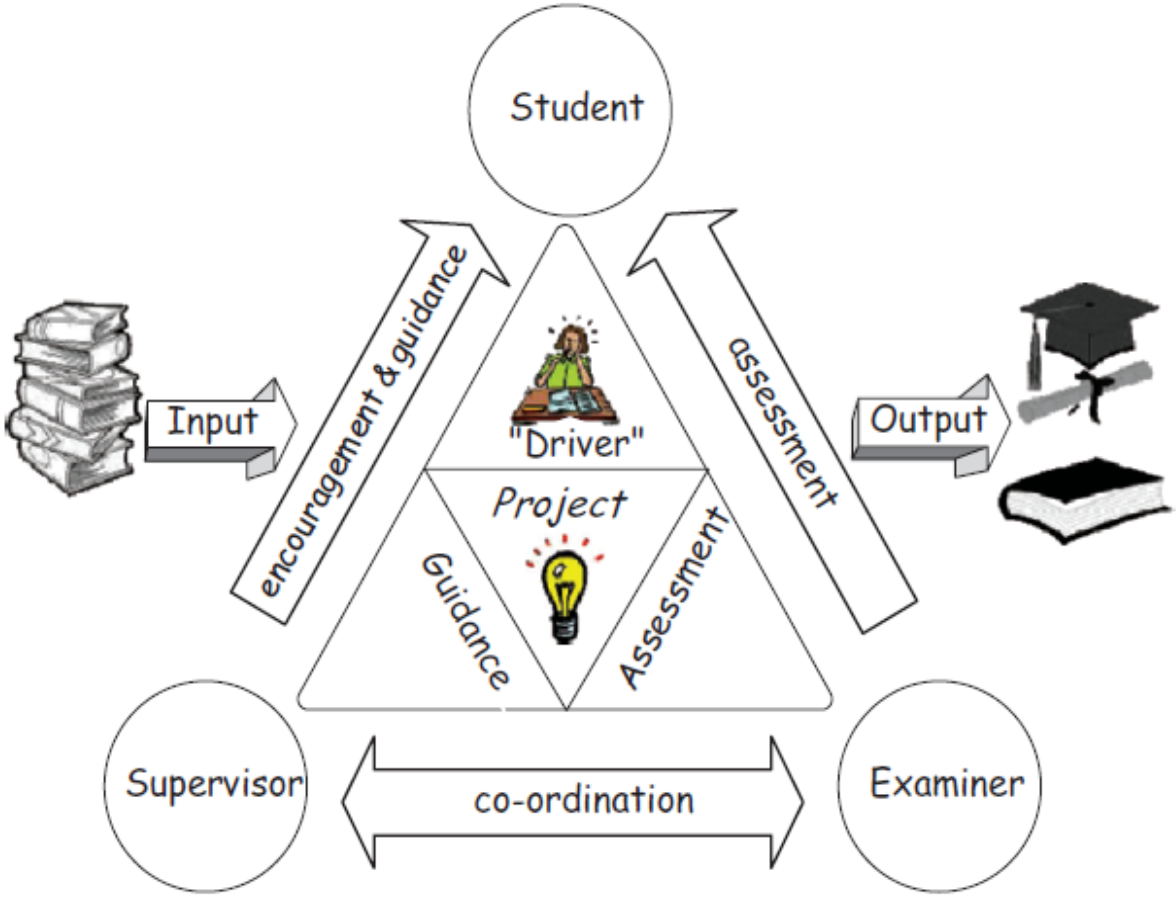


Problem definition & Objectives → Literature Review → Metodology → Conceptual Model → **Artifact Development** → Evaluation and validation

Supervisors

- Each master student must choose a research topic according to the master program speciality;
- Should develop a proposal and during this semester, and should invite a NOVA IMS professor to supervise the master thesis according to the supervisor research interests;
- In the first contact to the potencial supervisor it is a good practice that the student already has a one page proposal including:
  - Problem + Research Question
  - Research Objectives
  - Adequate Methodology
- To help you with the topics that each professor is interested, please consult the list of supervisors available in Moodle

Actors Involved & Roles



(Berndtsson et al., 2007)

Useful questions to help you with possible reseach topics

- What did the authors conclude?
- What alternative conceptual models, explanations or hypotheses did the authors consider?
- What methods did the authors use to approach the problem?
- Do you accept the authors' conclusions? If not, are there other methods that could allow you to test their conclusion?
- Does the authors' research suggest new ways to interpret a different problem?
- Are there other problems that could be studied using the same methods?

(Saunders & Philip, 2017)

Topics suggested by your organization

- Attention to this:
  - Might appear simple and easy in the choice, however if it is “not your topic”, you might fel less enthusiastic about it.
  - One of the problems in this situation is that the research project your manager wishes you to undertake is larger than that which is suitable for your course

(Saunders & Philip, 2017)

Preliminary study before chosing the topic

Read scientific papers , master thesis, Ph.D. dissertations, and look especially at:

Introductions

Conclusions (limitations, future work, theoretical implications)

Pick a gap that was not solved interialy by the authors

What makes a good research question?

1st of all the good research question is the one that it is supported by a research gap!

2nd a research question must not have an answer of yes and no (it would be too narrow in this case)

3rd the research question should be answered with more specific research objectives.

Research question

"In natural and social sciences the main question has been: **What or which kind is the world**?

Concerning an **artifact** and its construction process we ask: **Why** and **how we build** an artifact"

(Jarvinen, 2004)

"To define a problem as any situation where a gap exists between the actual and the desired ideal states"

(Sekaran, 2003)

Research Question

1st – Define the topic study

2nd – A research question is not a Yes/No question

3rd – A "How" question is very broad question, the researcher cannot know the steps to take

4th – The research question should be open-ended, but not uncertain

5th - The research question should not be too long, it should be concise

RQ: Definition

"**research question:** the one overall question or a number of key questions that the research process will address. These are often the precursor of research objectives."

(Saunders & Philip, 2017, p.19)

Examples of research questions

Research idea	*General focus research questions*
1 The marketing of security in credit cards	To what extent does a credit card company market the measures it takes to ensure consumer security in order to gain competitive advantage?
2 Organisations' employee newsletters	How effective are organisations' newsletters at gaining employee identification with the organisation in geographically diverse organisation structures, and why?
3 The use of shelf display point-of-sale material in retail supermarkets	How does the use of shelf display point-of-sale material in retail supermarkets affect buyer behaviour?
4 Sustainable accountancy	To what extent are organisations ensuring that environmental and social performance is better connected with strategy and financial performance, and why?

(Saunders & Philips, 2017, p. 21)

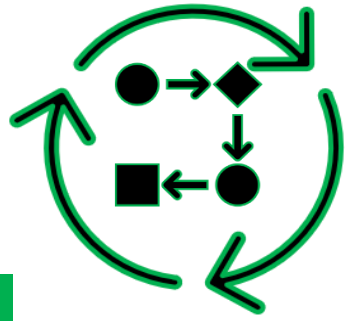
Research Objectives

"**Research objectives**: clear, specific statements that identify what the research process seeks to achieve as a result of doing the research."

Research question	*Research objective*
1 Why have organisations introduced employee communication schemes?	**1** To identify organisations' objectives for employee communication schemes.
2 How can the effectiveness of employee communication schemes be measured?	**2** To establish suitable effectiveness criteria for employee communication schemes.
3 Has employee communication been effective?	**3** To assess the extent to which the effectiveness criteria for employee communication have been met in published studies.
4 How can the effectiveness of employee communication be explained?	**4a** To determine the factors associated with the effectiveness criteria for employee communication schemes being met.
	4b To estimate whether some of those factors are more influential than other factors.
5 Can the explanation be generalised?	**5** To develop an explanatory theory that associates certain factors with the effectiveness of employee communication schemes.

(Saunders et al., 2017, p.21)

Rationale of the main steps for the proposal



3

Methodology

1

RQ

2

RO 1
RO 2
…
RO 6

References

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Jarvinen, P. (2000). Research Questions Guiding Selection of an Appropriate Research Method. (pp. 124–131). Presented at the ECIS.

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