

Research Methodology in CSE, MTech-I (1st semester)

Chapter 1: Introduction & Overview

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Chapter 1: Topics of Study

- **Introduction:** What Is Research? Definition, Characteristics, Motivation and Objectives, Research Methods vs Methodology. Research as an integral part of professional practice. A way to gather evidence for practice. Evidence-based practice. Applications of research in practice. Development and policy formulation.

Overview of the research process: its characteristics and requirements Types of research: Descriptive vs Analytical, Applied vs Fundamental.

Overview of Research Designs: Quantitative vs Qualitative vs Mixed Methods Designs. Conceptual vs Empirical.

Research Process & Methodology: The research process as an eight step model. Deciding what to research. Planning how to conduct the study. Conducting the research study.

[DCJ: 4 hours]

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- In the process, this exercise creates new knowledge which is interesting/useful

What is research?...

- Research is defined as the **creation of new knowledge** and/or
- the use of existing knowledge in **a new and creative way** so as to generate **new concepts, methodologies and understandings**.
- This could include **(re)-synthesis and analysis of previous research** to the extent that it leads to new and creative outcomes.

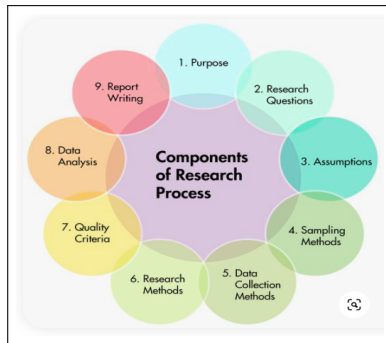


Figure: Research Process

Driving force for research: Facts or Artifacts

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 - Acceptance plan - validation by the customer

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- the **new** approach must **create** a useful artifact or **improve an existing** artifact

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Revisited: How vital is the newness-usefulness?

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What is research? Other perspectives...

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 - to **investigate** the possibilities and ways for **further improvements** and refinements.

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 - that **develop and test new ways** that contribute to the advancement of practice and profession.

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Research Methodology

the knowledge of research methodology provides one with the techniques to find answers to research questions.

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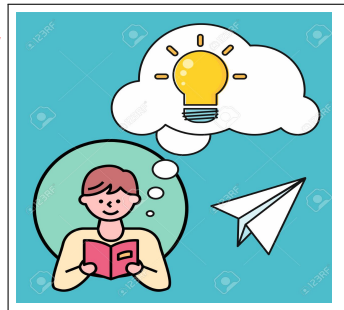


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 - **Systematic** investigation.

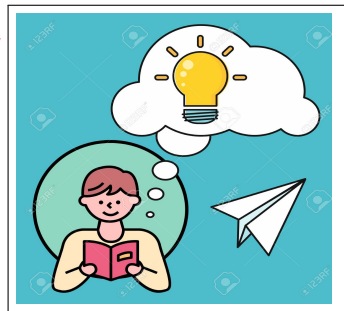


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 - **Systematic** investigation.
 - Textbook problems, in contrast, are not about new facts.

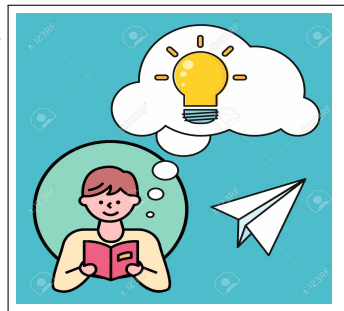


Figure: Thinking Research

- Oxford online dictionaries: the **systematic investigation** into and study of materials and sources in order **to establish facts and reach new conclusions**.
- Wikipedia: research can be defined as the **search for new knowledge**, or as any systematic investigation, with an **open mind, to establish novel facts**, usually using a scientific method.
- Points to note
 - **New** conclusions, **novel** facts.
 - **Systematic** investigation.
 - Textbook problems, in contrast, are not about new facts.
 - So, though such problems may be difficult, they are not research problems.

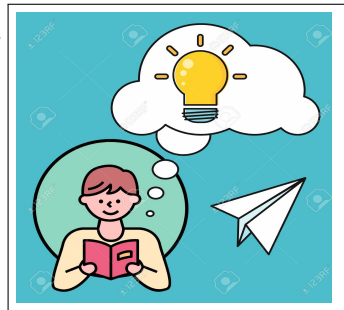


Figure: Thinking Research

*The conclusion at the end has to be new for research
Now when one starts, the conclusion obviously is not
known.... So, How does one even start?*

A Key Difficulty...

- Solution

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 - One guesses what may be a possible conclusion.

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- One guesses what may be a possible conclusion.
- A guess is based on "circumstantial evidence".
- A good guess is based on intuition and imagination.
- A strong guess can turn into a belief.

A Key Difficulty...

- Failure in guesses

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 - A guess gives a target to work towards.

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 - A guess gives a target to work towards.
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 - But, the work may suggest new avenues.
- New targets
 - maybe some modifications of the initial target.
 - Need to ensure that a new target is also worth working towards.
- New techniques
 - the known techniques are not appropriate for the work.
- Negative results
 - the initial target and similar other targets are not realisable.

The Value of Failure in Science

The screenshot shows a web browser displaying the Frontiers article page. The browser's address bar shows the URL: frontiersin.org/articles/10.3389/fnins.2019.01121/full. The browser's bookmark bar includes folders for 'Miscellaneous', 'Pedagogy', 'Finance', 'MyCourses', 'Homefront', 'Online WealthChe...', 'ResearchRelated', 'LaTeX Color Defini...', and 'Other Bookmarks'. The Frontiers website header features the 'frontiers' logo, the journal name 'Neuroscience', and navigation links for 'Sections', 'Articles', 'Research Topics', 'Editorial board', and 'About journal'. A 'Submit' button and search icons are also present. The article title is 'The Value of Failure in Science: The Story of Grandmother Cells in Neuroscience', categorized as a 'CONCEPTUAL ANALYSIS article' in 'Front. Neurosci.' from '24 October 2019' in the 'Sec. Perception Science' section. The DOI is <https://doi.org/10.3389/fnins.2019.01121>. The author is 'Ann-Sophie Barwich*', with an affiliation in the 'Department of History and Philosophy of Science and Medicine, Cognitive Science Program, Indiana University, Bloomington, Bloomington, IN, United States'. The article has '28,307 total views' and a 'View Article Impact' button. Social media sharing options for Twitter, LinkedIn, and Facebook are available. A 'Download Article' button is located in the top right corner of the article content area.

frontiersin.org/articles/10.3389/fnins.2019.01121/full

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CONCEPTUAL ANALYSIS article
Front. Neurosci., 24 October 2019
Sec. Perception Science
<https://doi.org/10.3389/fnins.2019.01121>

The Value of Failure in Science: The Story of Grandmother Cells in Neuroscience

Ann-Sophie Barwich*

Department of History and Philosophy of Science and Medicine, Cognitive Science Program, Indiana University
Bloomington, Bloomington, IN, United States

28,307 total views

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Figure: <https://www.frontiersin.org/articles/10.3389/fnins.2019.01121/full>

The Value of Failure in Science ...

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Preview

IRI ACHIEVEMENT AWARD ADDRESS

IN RESEARCH, FAILURE IS THE PARTNER OF SUCCESS

John Backus

Failure is one of the most common difficulties that researchers face--and the one least talked about.

The movies have always portrayed research as a glamorous and thrilling enterprise, one in which inspiration and happy persistence have wonderful results, results that bring the researcher fame and glory, all within an hour or two.

But you don't hear very much about the real human difficulties and discouragement that are such an inevitable part of research. And the result of this glamorization is that many gifted young people, who might have made valuable contributions, fail to do so.

You may say that portraying research as only exciting should attract more people to it, and of course you're right. And as a result, a great many brilliant young people...

disparity between their inflated image of what research should be like and the often harsh reality of actually doing research.

I believe that this tendency to quit research, which I see so much of, is a problem that managers should be more concerned about, because it results in the loss of much talent.


In Search of Excellence repeatedly observes that encouraging people to be innovative often has really astounding results, that many people you might not expect to be creative turn out to make really valuable contributions.

JOURNAL ARTICLE

**IN RESEARCH,
FAILURE IS THE
PARTNER OF SUCCESS**

John Backus

Research
Management
Vol. 27, No. 4 (July-
August 1984), pp. 26-
29 (4 pages)
Published By: Taylor &
Francis, Ltd.



<https://www.jstor.org/stable/24119072>

Figure: <https://www.jstor.org/stable/241190721>

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- **Conceptual, framework, approach**
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 - New algorithm for doing something
 - Approach for verification, specification,...

In the next set of slides...to be continued

B l a n k