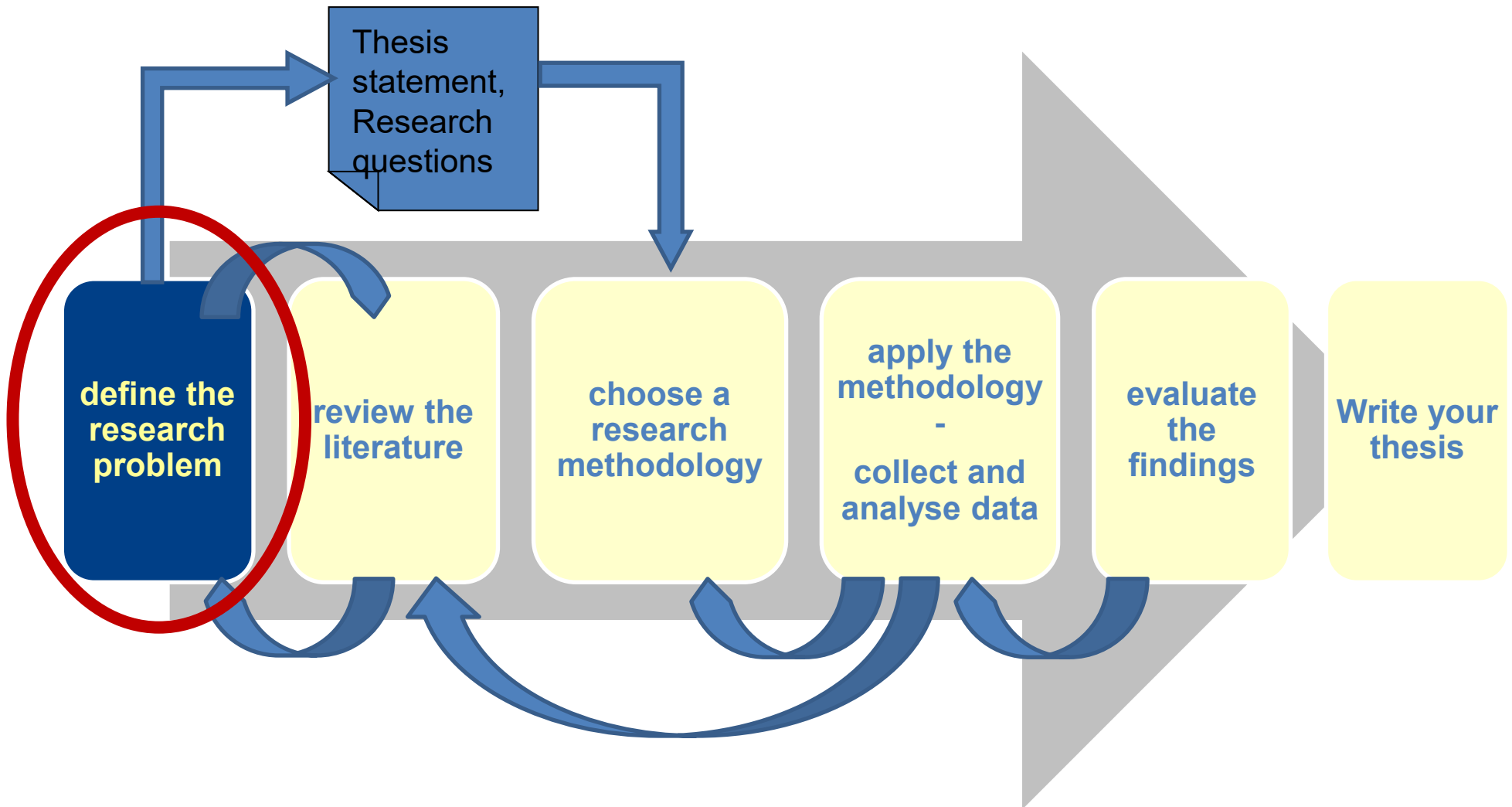# Research Problem

Knut Hinkelmann

Research Process

The research process is meant as a guidance for you

Thesis statement, Research questions

define the research problem

review the literature

choose a research methodology

apply the methodology - collect and analyse data

evaluate the findings

Write your thesis

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Ellis, T. J., & Levy, Y. (2008). Framework of Problem-Based Research : A Guide for Novice Researchers on the Development of a Research-Worthy Problem. *Informing Science: The International Journal of an Emerging Transdiscipline*, *11*, 17–33.

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■ This section deals with three questions:

1. What is a research-worthy problem?

2. How can we find a research-worthy problem?

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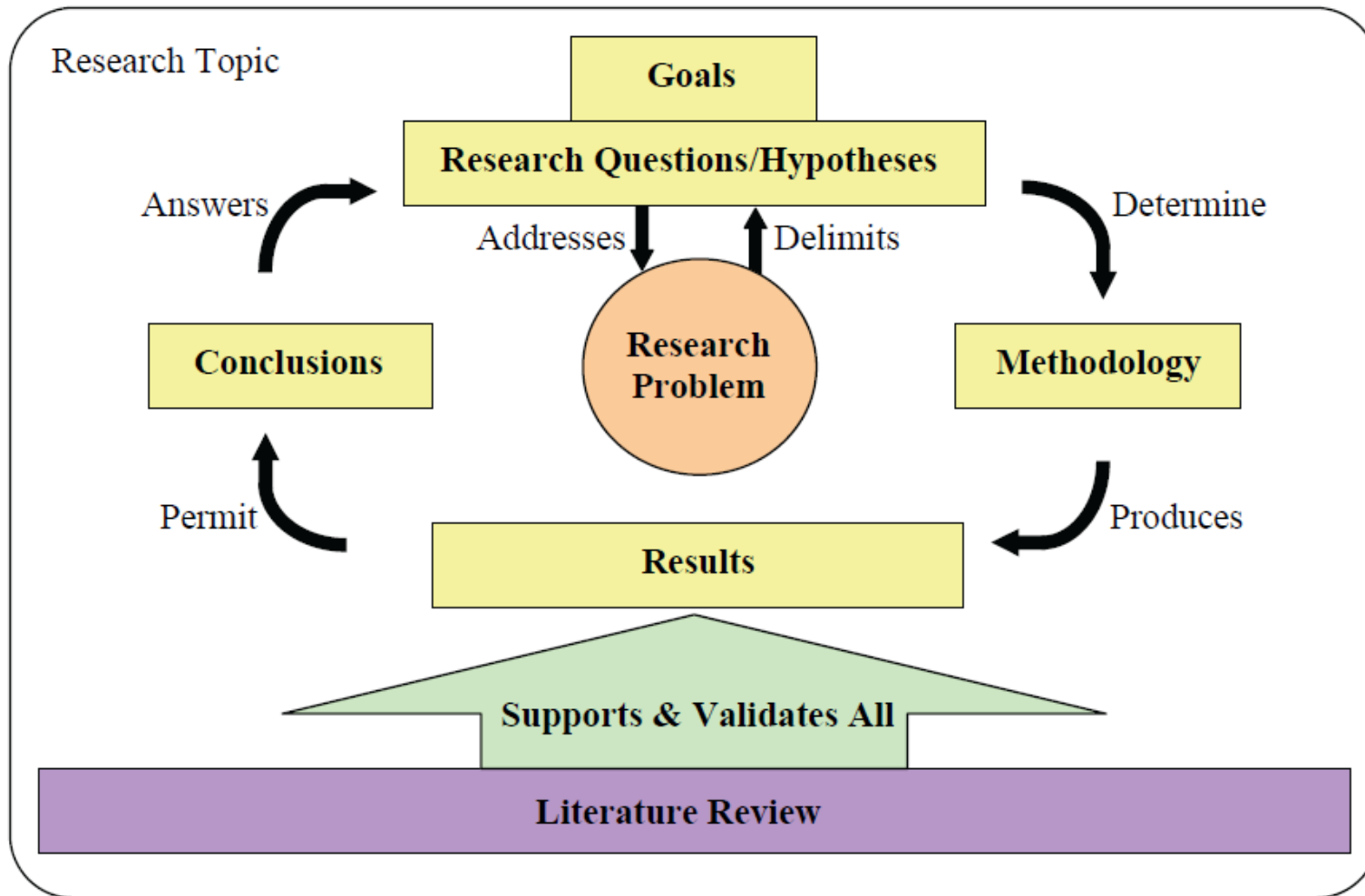knut.hinkelmann@fhnw.ch

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Science starts only with problems.

- Karl Popper

No dissertation is worth anything without a problem

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The Problem-Based Research Cycle

(Ellis & Levy 2008)

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1. What is a research-worthy problem?

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Start with Why

Simon Senek: Start with Why - https://www.youtube.com/watch?v=IPYeCltXpxw
Full Talk: https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action

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Start with Why

Simon Senek: Start with Why - https://www.youtube.com/watch?v=IPYeCltXpxw&t=38s
Full Talk: https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action

WHY: The Research Problem

One cannot place value on research without a clear understanding of, first, *why* that research had been conducted.
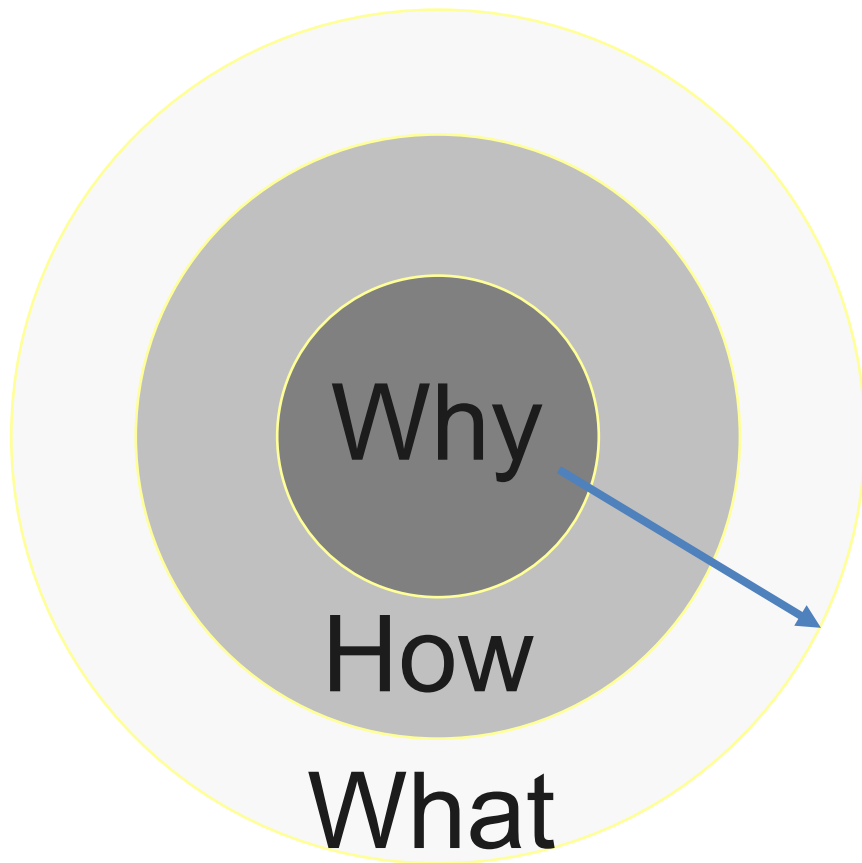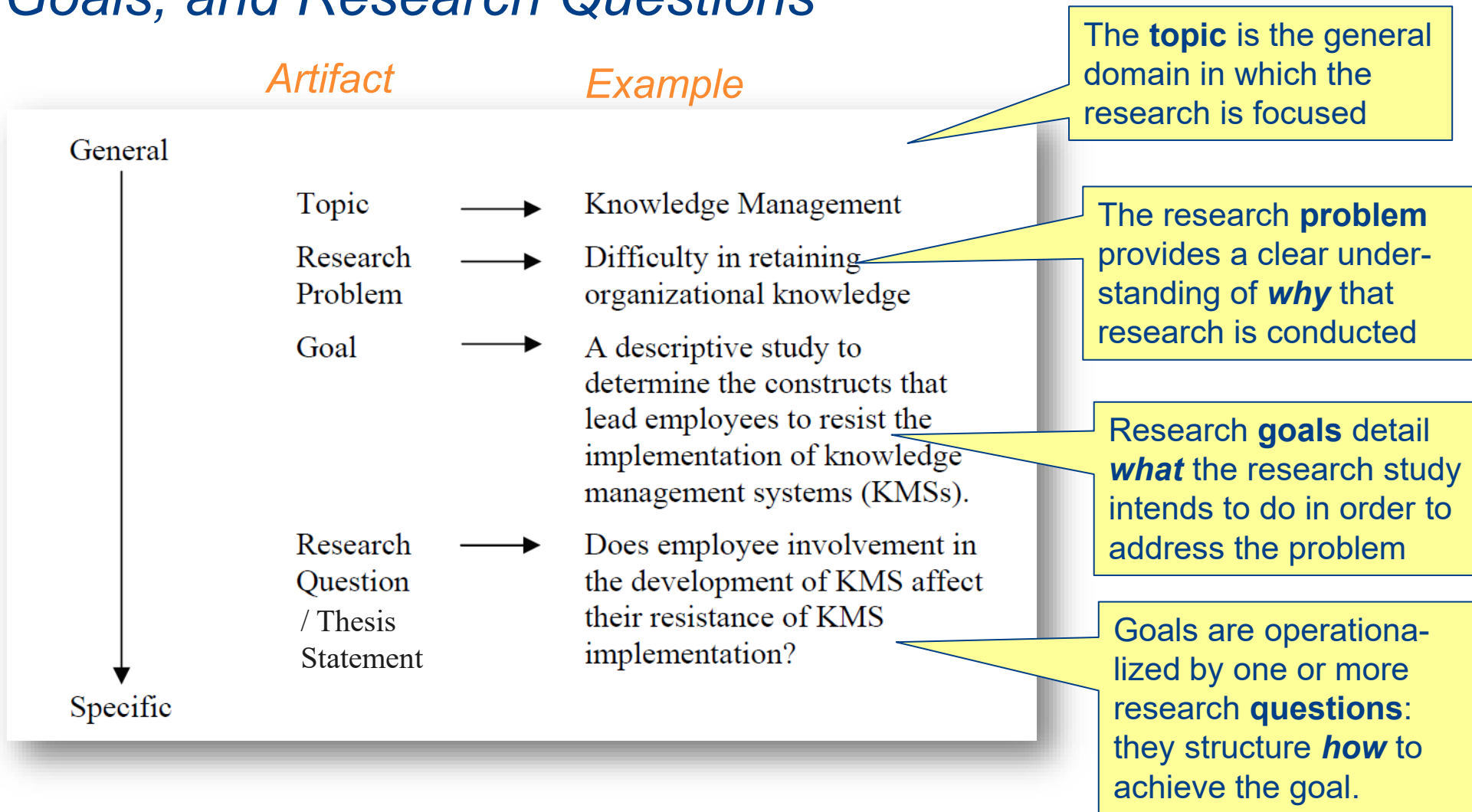

Why: Research Problem

How: Methodology *)

What: Contribution

*) structured by research questions

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Relationship Among the Topic, Research Problem, Goals, and Research Questions

Artifact

Example

General

Topic	→	Knowledge Management
Research Problem	→	Difficulty in retaining organizational knowledge
Goal	→	A descriptive study to determine the constructs that lead employees to resist the implementation of knowledge management systems (KMSs).
Research Question / Thesis Statement	→	Does employee involvement in the development of KMS affect their resistance of KMS implementation?

Specific

The **topic** is the general domain in which the research is focused

The research **problem** provides a clear under-standing of *why* that research is conducted

Research **goals** detail *what* the research study intends to do in order to address the problem

Goals are operationa-lized by one or more research **questions**: they structure *how* to achieve the goal.

(Ellis & Levy 2010), adapted from (Creswell, 2005, p. 62)

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Topic vs Problem

■ Do not confuse problem and topic

  ♦ A ***problem*** has an impact and thus is the starting point of research: → Solve the problem

  ♦ A ***topic*** is just an area of interest. It does not have an impact and thus cannot serve as starting point for research

Examples of topics:
- Model-driven Transformation Support of PAIS
- Model-driven software engineering for IoT applications.
- Multi-Agent Systems
- Modeling and application of autonomous and adaptive systems.
- Modeling and Enactment of IoT-Aware Business Process
- Blockchain and scalability issues
- Modelling Internet of Things Aware Business Process

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Research Problem: Deriving new Knowledge

A research problem exists if at least two elements are present.

♦ The current state differs from the ideal state

♦ There is not an "acceptable" solution available, i.e. there is a known gap in the body of knowledge.

- either there is no solution documented in the literature, or
- the solutions noted in the literature lead to mixed results or contradictions

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What makes a Problem Research-Worthy?

■ A problem is research-worthy if it requires research to solve it
   ♦ Deriving new knowledge (originality)
   ♦ Results are relevant (significance)

Environment   **Body of Knowledge**

Business Need →   *Applicable Knowledge* ←

Solution of Problem — relevant

Addition to Knowledge base — new

(Ellis & Levy 2008)

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What does «new knowledge» and «gap in knowledge» mean?

- The task of a researcher is to **increase the overall** knowledge that exists in very incremental way
    - ♦ It is **not** about a whole new theory
    - ♦ It is about a (small) **increase** in knowledge
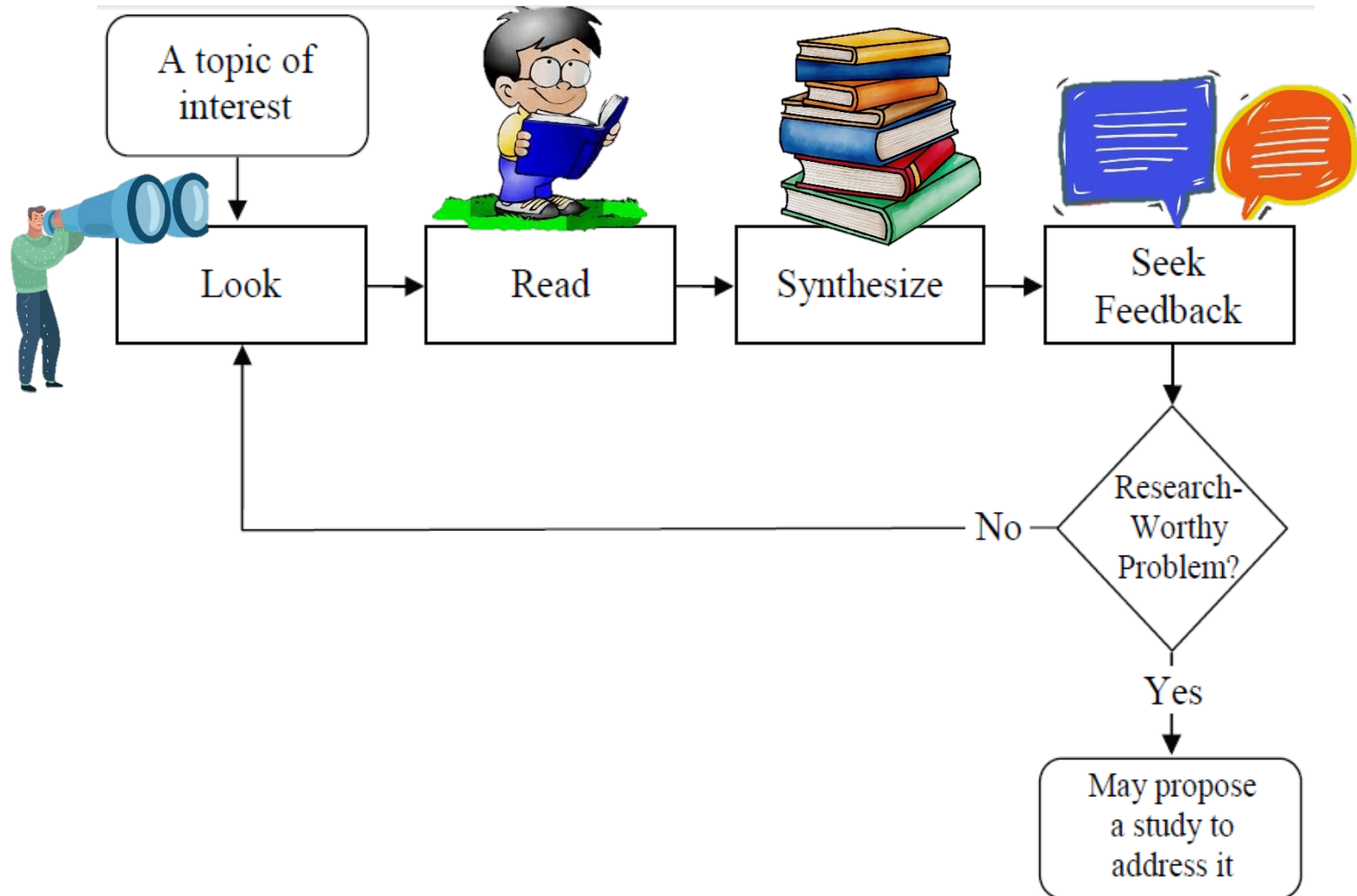- A problem must not be too broad

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Research-Worthy Problems Should Not …

… be based solely on personal observations and/or experiences:

 ♦ identifiable *literature that documents the problem* or literature that documents *conflicting results* should be the basis for a research-worthy problem

… be based just on a comparison of two sets of data.

 ♦ comparing performance with and without a new method/approach does not represent a viable research-worthy problem. A research-worthy problem could be to understand the effect of method/tool on performance.

 ♦ comparison itself doesn't constitute the research-worthy problem but is rather the methodology used to address a problem, e.g. to evaluate an artefact

… based on an investigation that yields a "yes" or "no" answer.

 ♦ Answers to such questions, again provide very little contribution to the body of knowledge.

 ♦ Better ask questions with "how" or "why"

(Ellis & Levy 2008)

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2. How can we find a research-worthy problem?

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Process of Finding a Research-Worthy Problem

(Ellis & Levy 2008)

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Process of Finding a Research-Worthy Problem

- **Look** around to identify a potential research-worthy problem.

- **Read** the literature and identify valid scholarly sources.

- **Synthesize the literature** and internalize the body of knowledge.

- **Consult** with others **seeking feedback**

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Where to look for relevant Problems

- What are you interested in?

- Think about problems that you have encountered
  - ♦ in your work environment or
  - ♦ in your previous academic work

- Chat with
  - ♦ peers
  - ♦ friends
  - ♦ your supervisors

- Read newspapers

Environment
Problem

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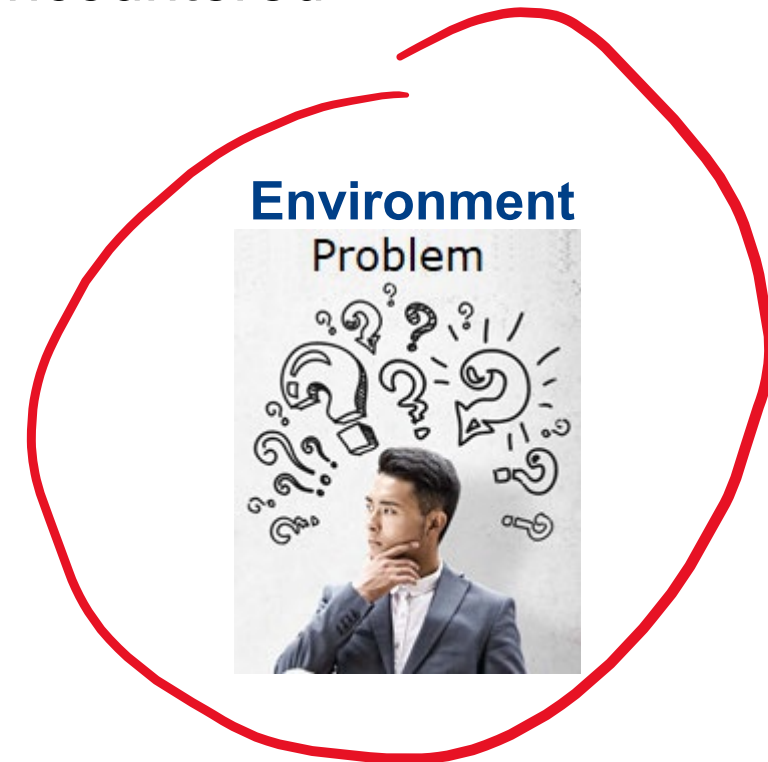
Research Problem and Literature Review

The research problem is almost always established through the literature review.

- The literature review serves as the foundation for the research

- Identifying "holes" in the body of knowledge:

    ♦ what is *not* known in the area

    ♦ what still needs to be done
    (many papers contain a section "future research")

Body of Knowledge

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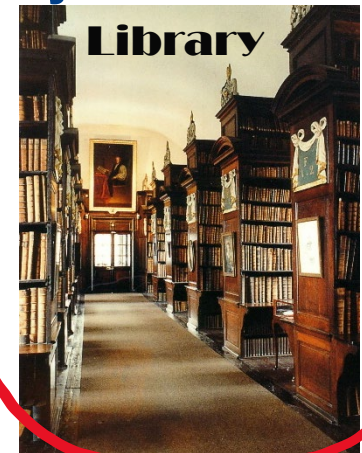
Process of Reading Scholarly Literature

1. Identifying the leading journals, conference proceedings, and scholars in the domain of interest.

2. Perform search for body of knowledge

   → lecture on literature review

3. Identifying "holes" in the body of knowledge identified in the scholarly articles: what is *not* known in the area – what still needs to be done. Identify *literature that*

   - *documents the problem*
   - documents *conflicting results*

   (e.g. conclusion chapter or recommendations for future research)

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