



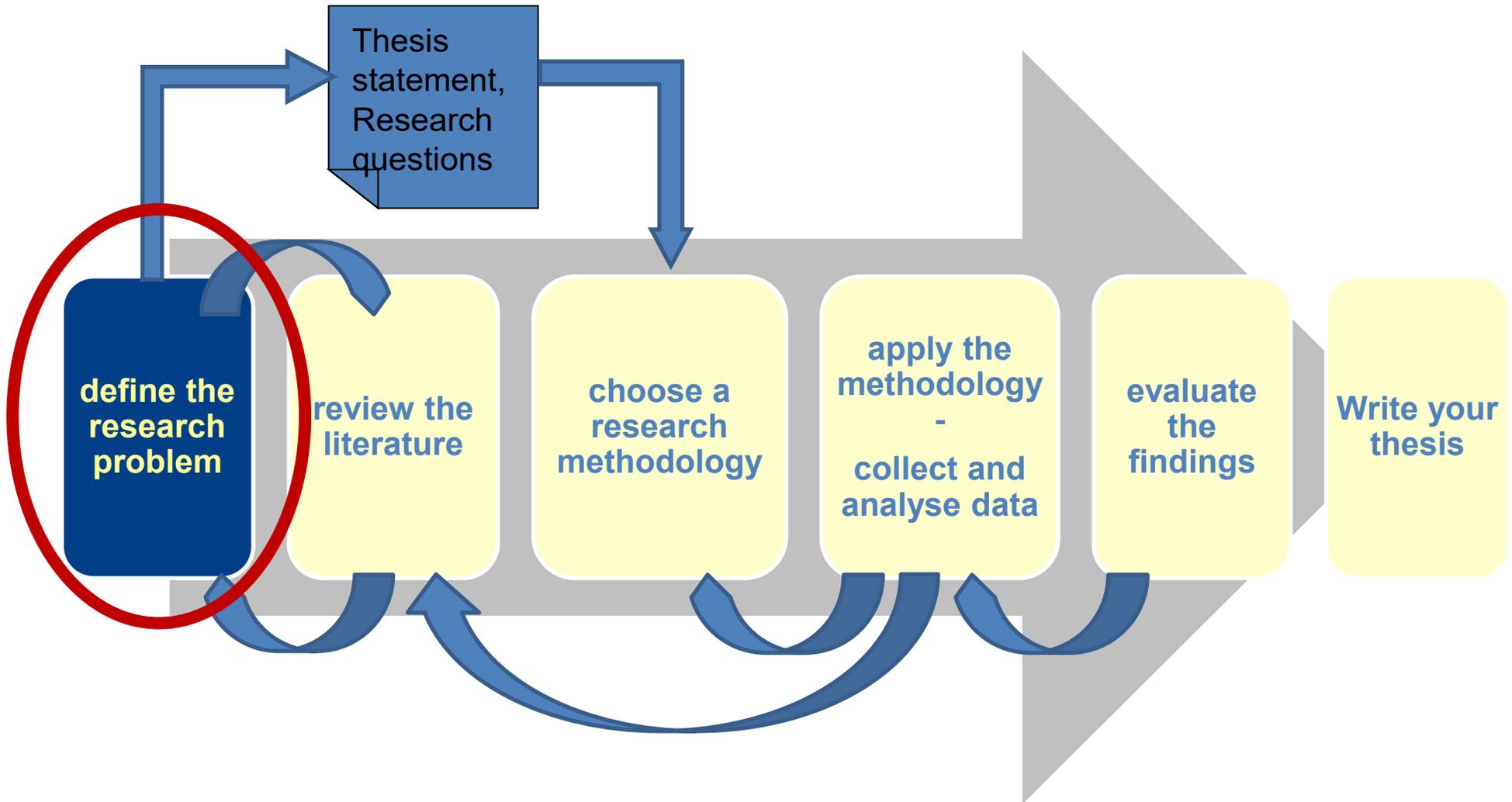
Research Problem

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Research Process

The research process is meant as a guidance for you



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.

- This section deals with three questions:

1. What is a research-worthy problem?

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

Science starts only with problems.

- Karl Popper

No dissertation is worth anything
without a problem

1. What is a research-worthy problem?

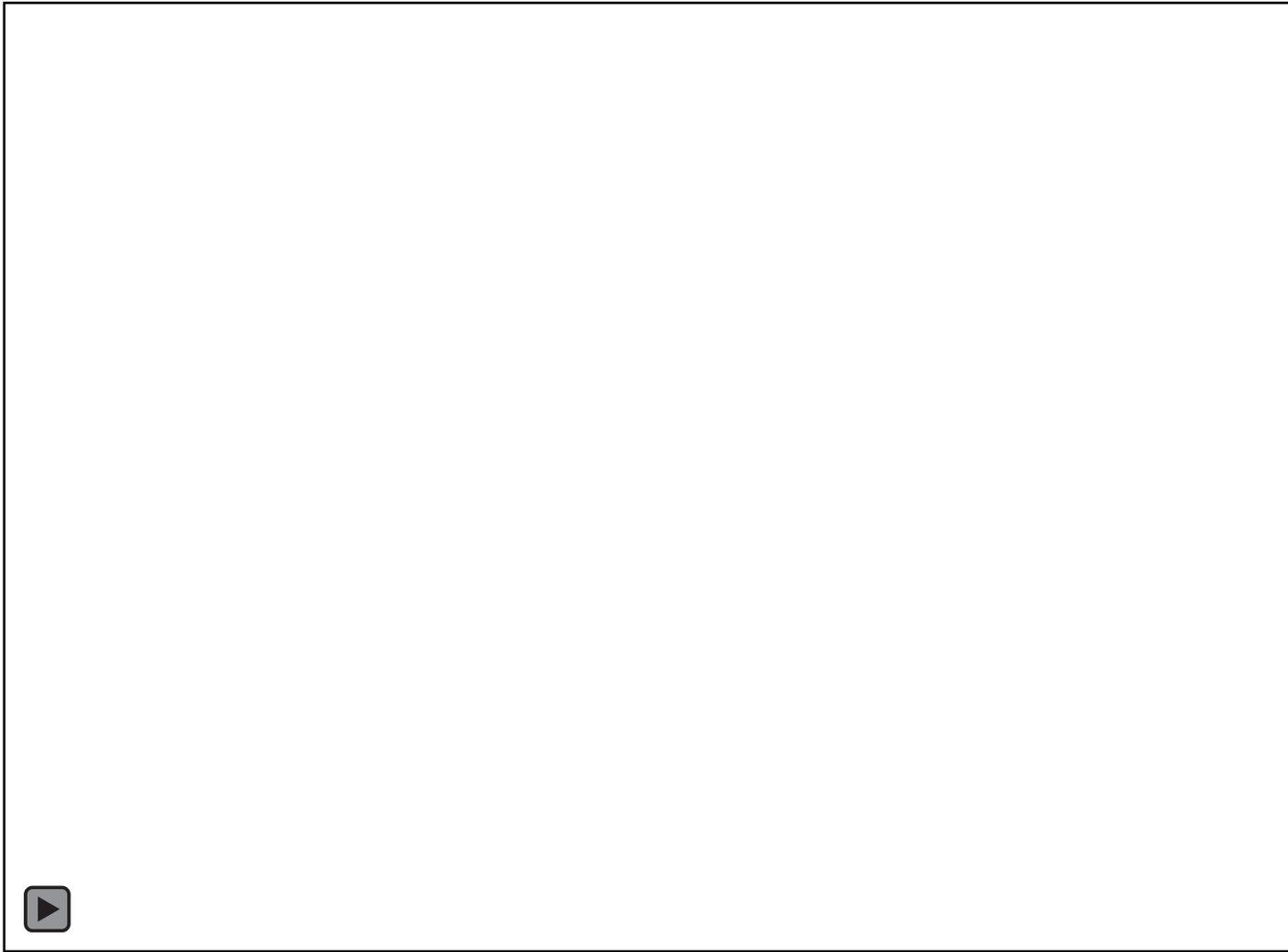
Start with Why



Simon Sinek: Start with Why - <https://www.youtube.com/watch?v=IPYeClXpxw>

Full Talk: https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action

Start with Why

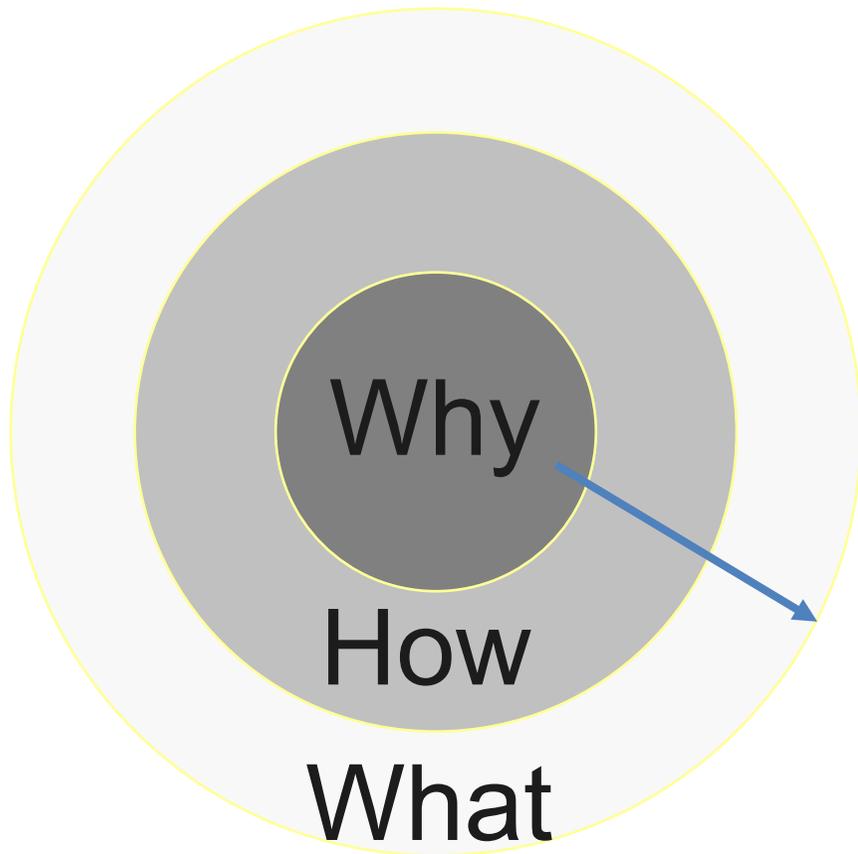


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WHY: The Research Problem

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



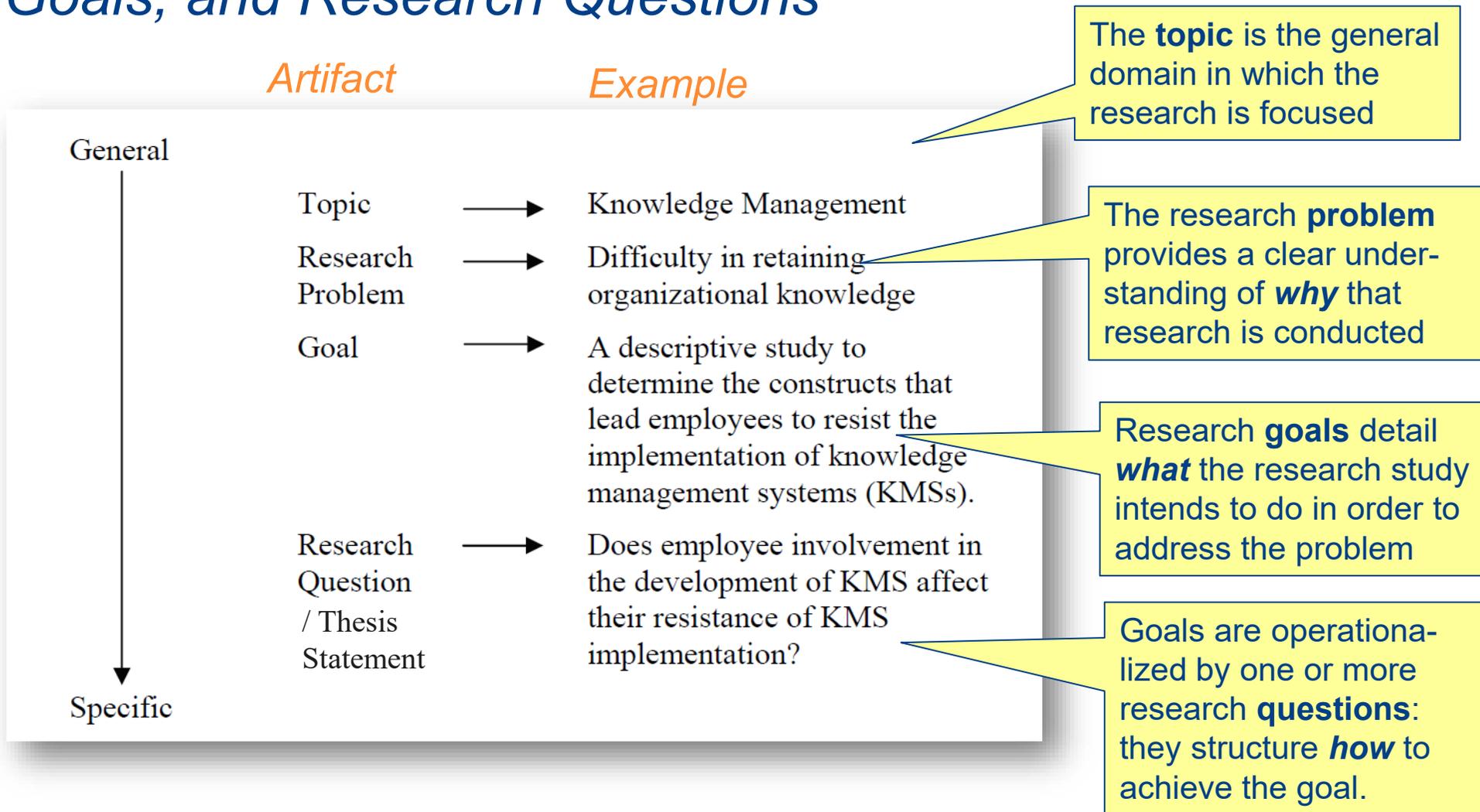
Why: Research Problem

How: Methodology ^{*)}

What: Contribution

^{*)} structured by research questions

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



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

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

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

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



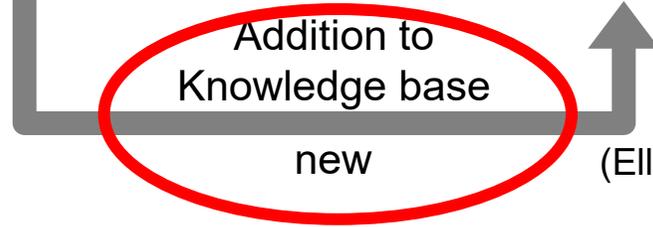
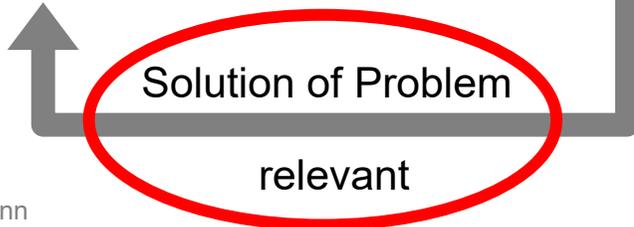
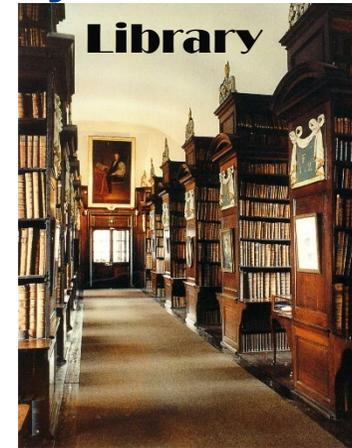
Business Need



Applicable Knowledge



Body of Knowledge



(Ellis & Levy 2008)

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

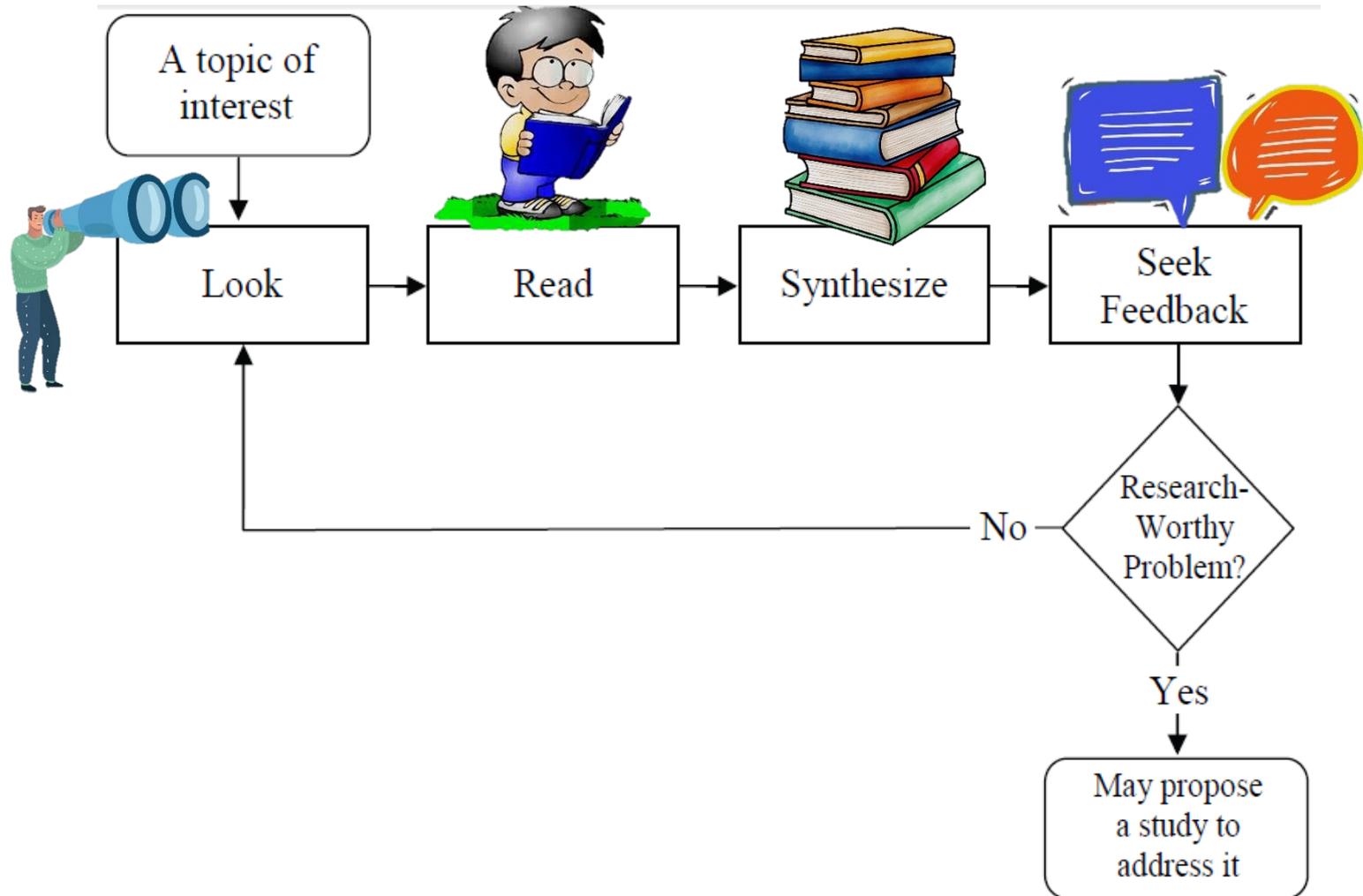
Research-Worthy Problems Should Not ...

- ... 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)

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

Process of Finding a Research-Worthy Problem



(Ellis & Levy 2008)

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.



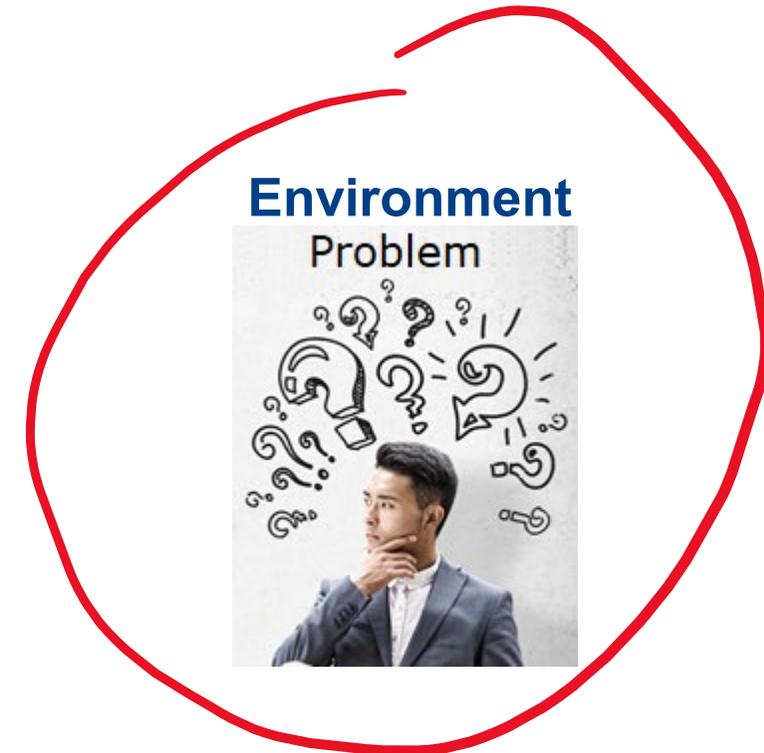
- **Consult** with others **seeking feedback**



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



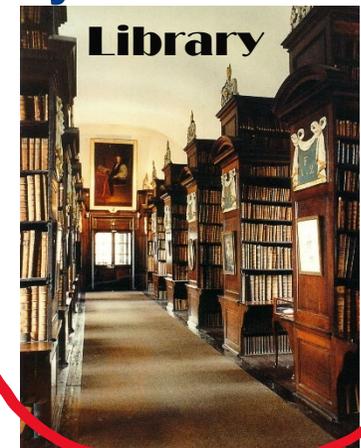
Research Problem and Literature Review



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



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)