IT3010

Empirical research methodologies in IT and digitalization

From practical problems to research proposals

January 18, 2022
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# Learning goals

1. **Designing an empirical research project in IS/SE/CS.**
   1. **Distinguish between IS, SE, and CS research fields.**
   2. **Understand the meaning of empirical research.**
2. **Writing research objectives/purpose for an IS/SE/CS research project.**
3. **Formulating research topics and questions for an IS/SE/CS research project.**
4. Describing research contributions for an IS/SE/CS research project.
5. Understanding various research strategies, and how and when to use/not use each in an IS/SE/CS research project.
6. Understanding various data generation tools, and how and when to use/not use each in an IS/SE/CS research project.
7. Data analysis.
8. Evaluating empirical research.
9. Research ethics.
10. Presenting research.

IS = Information Systems
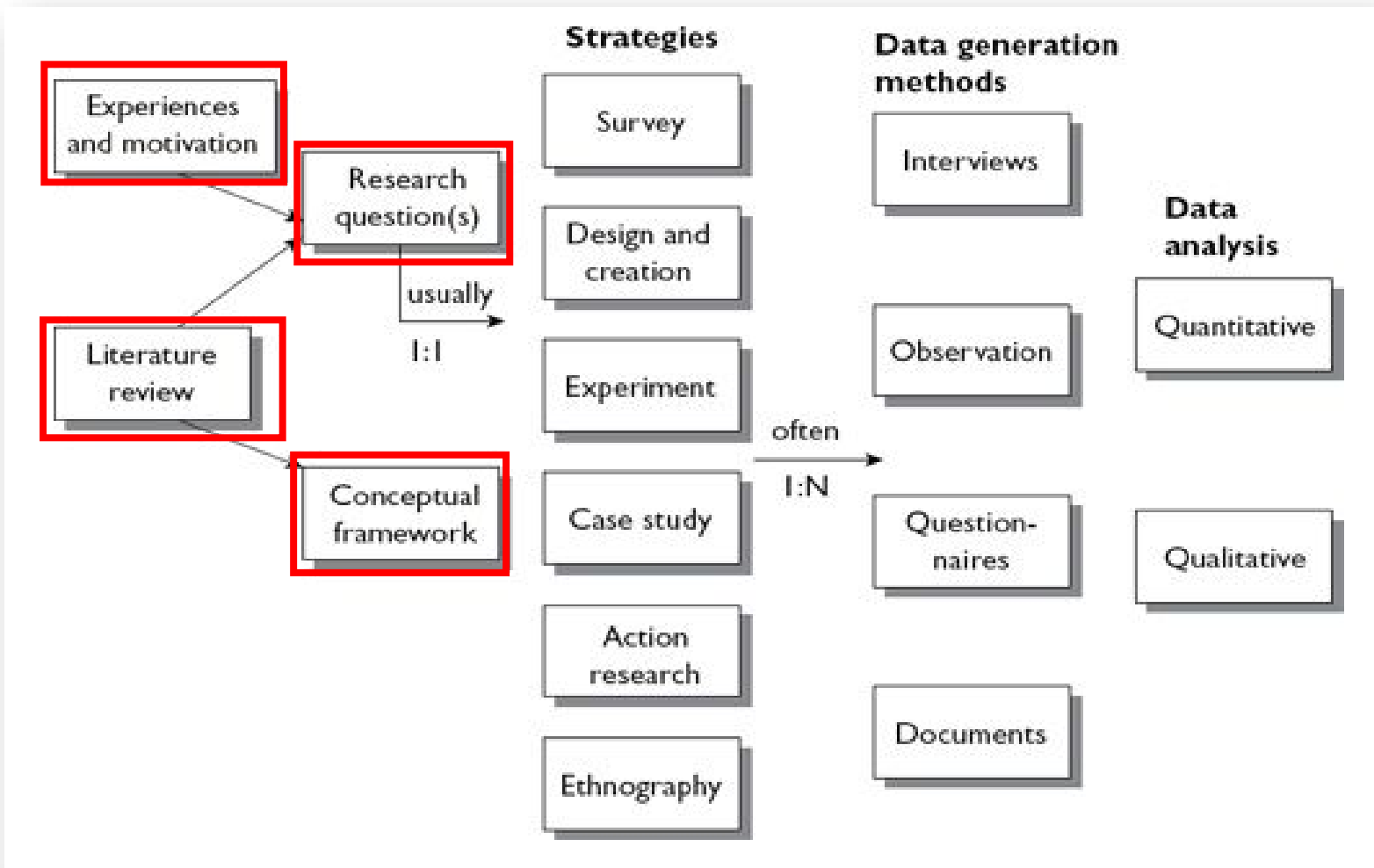SE= Software Engineering
CS= Computer Science

Agenda

- 1- Research design framework recap.
- 2- Primary and secondary data.
- 3- Doing a literature review.
- (Break 15 minutes)
- 4- Finding relevant research questions.
- 5- Formulating rigorous research questions.
- 6- Questions.

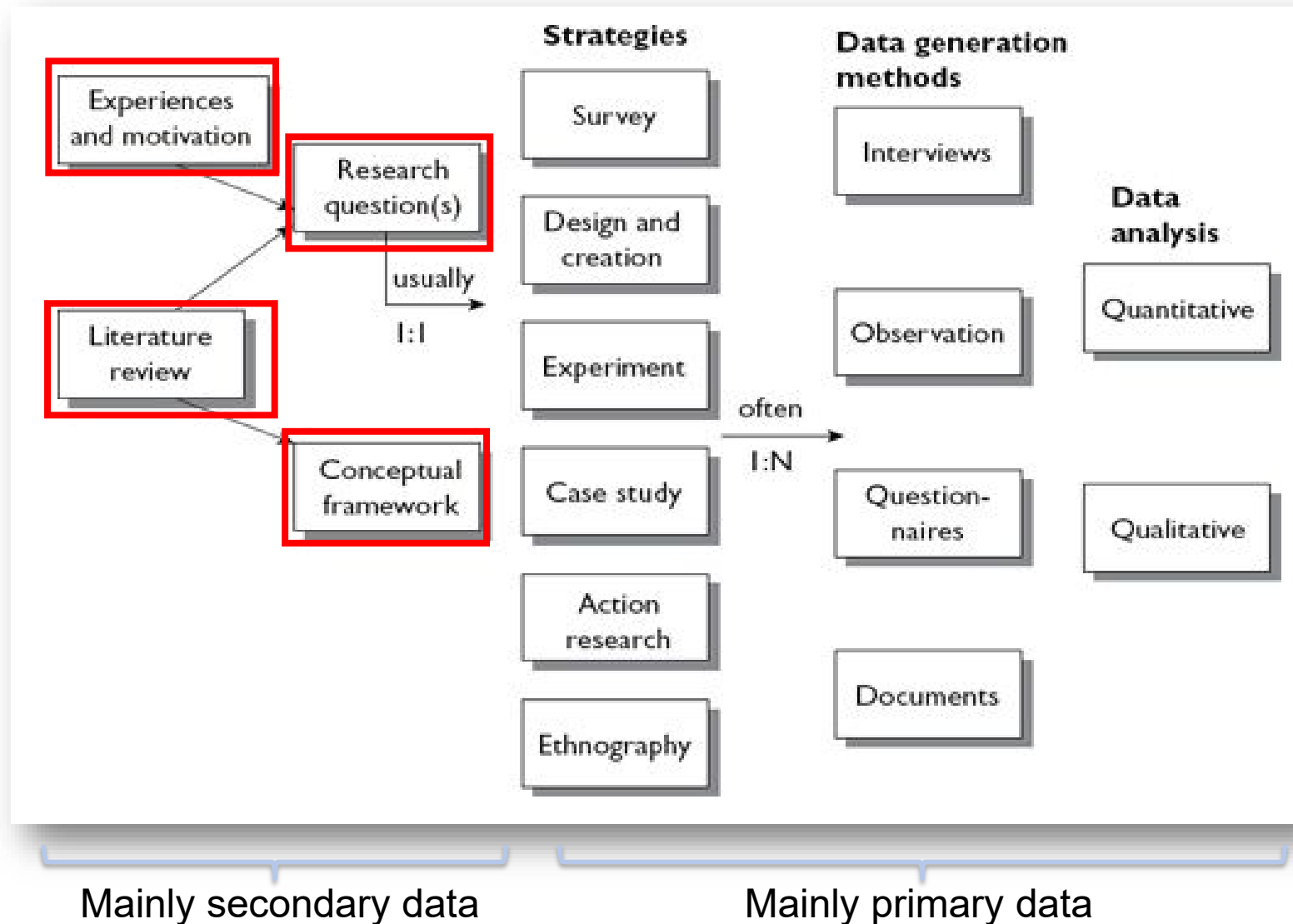# A research design framework
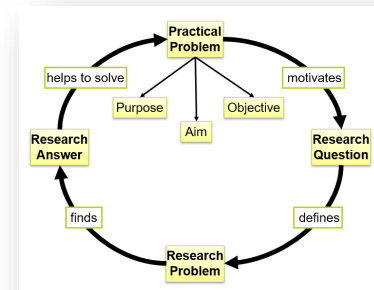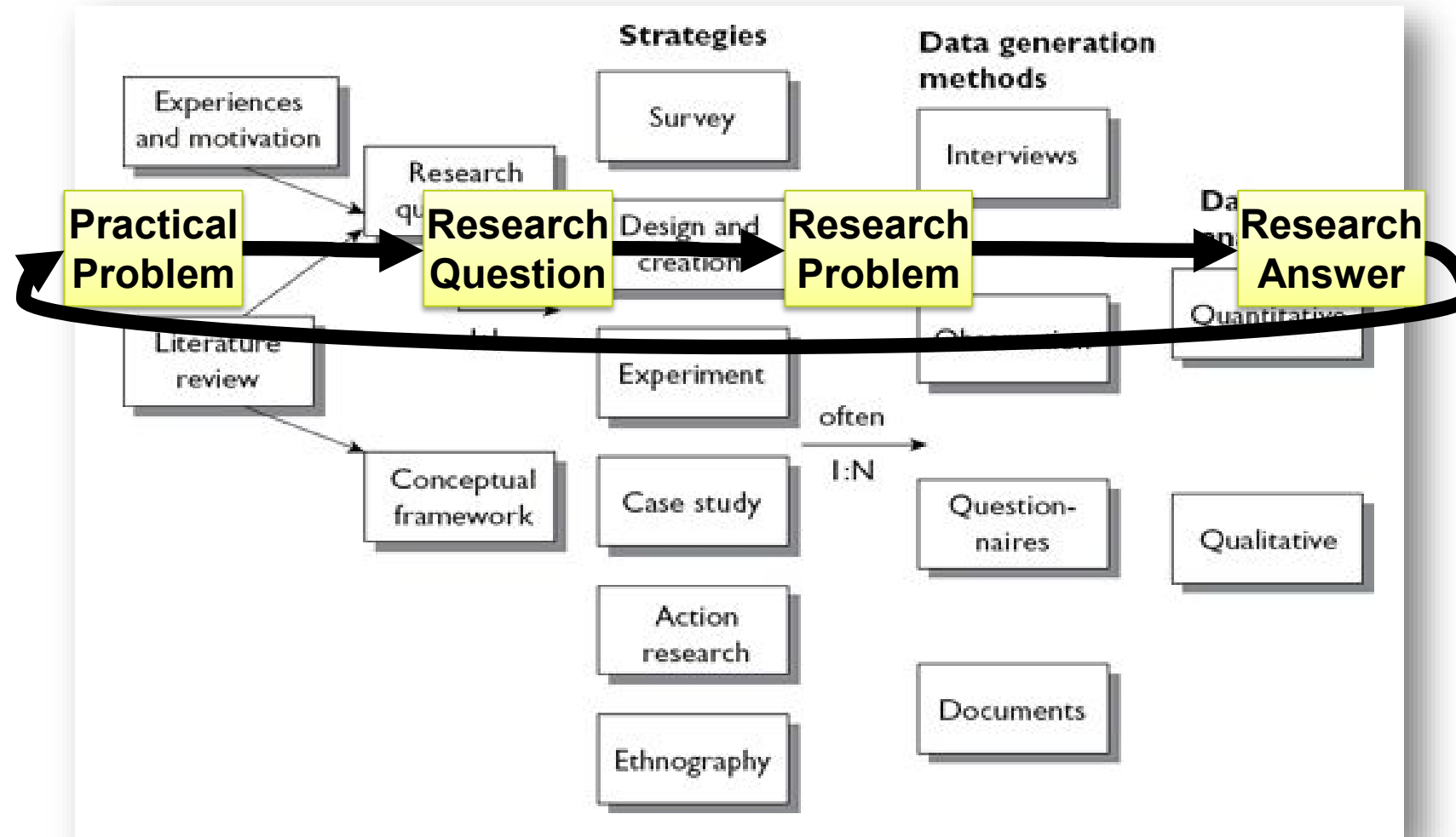
In this lecture

Primary and secondary data

- Primary sources:
  - Are first-hand narratives, original documents/objects or factual accounts.
  - Are created during or close to the event or period.
  - Have a direct connection to a person, time, event or place.
  - Have not been subject to processing, manipulation, analysis or interpretation.
- Secondary sources:
  - Interpret, analyze and critique primary sources.
  - Provide a second-hand version of events or an interpretation of first-hand accounts.
  - Can tell a story one or more steps removed from the original person, time, place or event.

By: Catherine Dawson

Quiz

- Can you guess what is primary and what is secondary?

- Go to menti.com
  - Use code 97 90 55 86

Where to use which?

Mainly secondary data   Mainly primary data
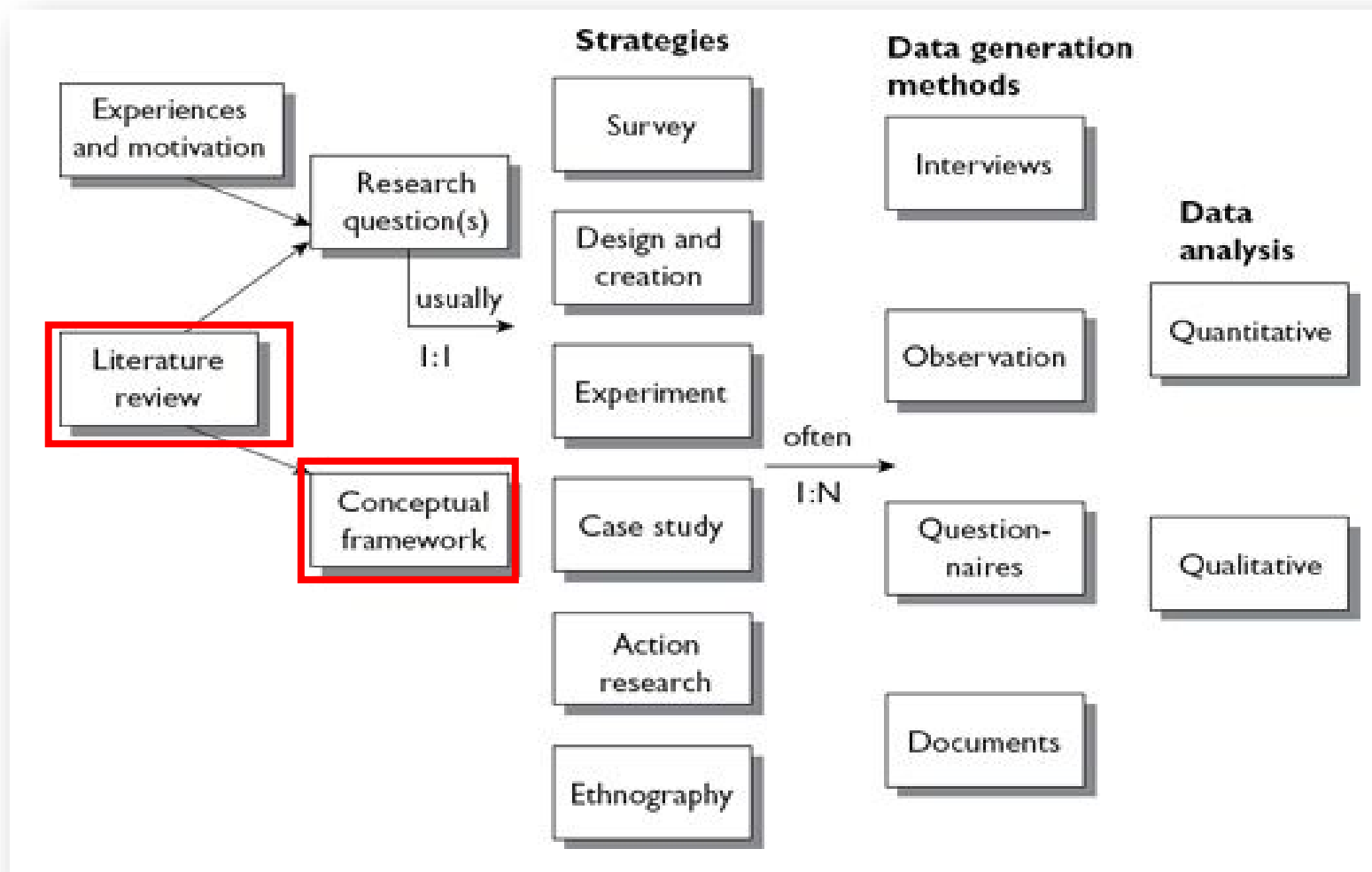
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Doing a literature review

The goal is to:

1) Develop your conceptual framework,

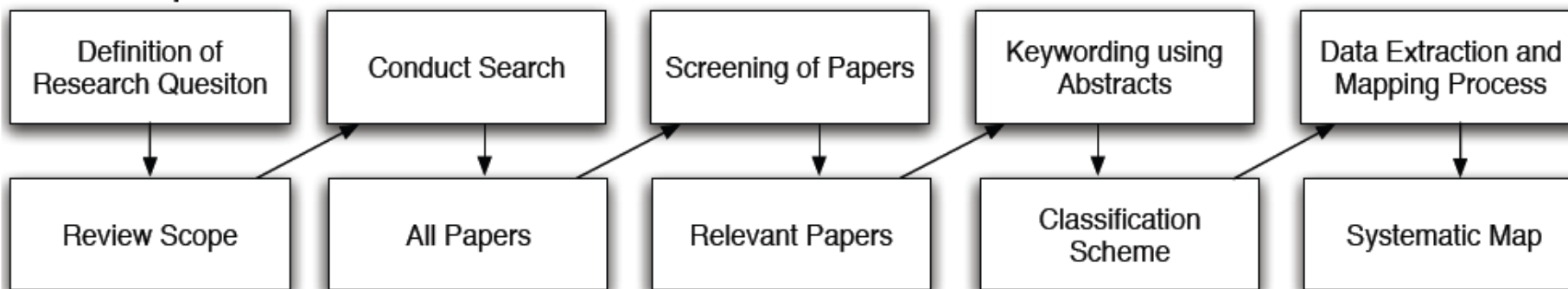2) Find gaps in our knowledge (where your contribution can be)

Phases of a systematic review

- *Searching*: The right keywords and search engines.
- *Obtaining*: PDFs or paper copies.
- *Assessing*: Is this peer-reviewed research?
- *Reading*: What is it about? Coding…
- Critically evaluating
- *Recording*: EndNote, Mendeley, Zotero….
- *Writing a critical review*: Finally, use your brain!
- Avoiding Plagiarism

Process Steps

| Definition of Research Quesiton	Conduct Search	Screening of Papers	Keywording using Abstracts	Data Extraction and Mapping Process
Review Scope	All Papers	Relevant Papers	Classification Scheme	Systematic Map

Outcomes

Sources of literature

- Main source: **Refereed research papers**:
  - From journals (if peer-reviewed)
  - From conferences and workshops (if peer-reviewed)
- *Books*: Are good for understanding the problem and building a conceptual framework and theories.
- *Manuals*: Are good for understanding e.g. a system, but not as a source for a review.
- *Reports*: Sometimes good research quality but not peer-reviewed.
- *Newspapers, magazines, radio, television*: Can be good quality "expert opinion" but not peer-reviewed.

Creating an initial literature list

- Breakout rooms with groups.
- Choose one of the following (perceived) practical problems:
    1. (Groups with odd numbers) Covid-19 contact detection apps violate our privacy.
    2. (Groups with even numbers) Online teaching leads to social isolation among students.
- You are IT researchers addressing these problems (10 minutes):
    - Discuss what search keywords you would use to search for relevant literature.
    - Go to scholar.google.com and use some of the keywords to search for literature.
    - Choose 5 sources and rank them based on quality.
    - Add your list to Padlet.

Where does a document belong?

Here?

Here?

Or here?
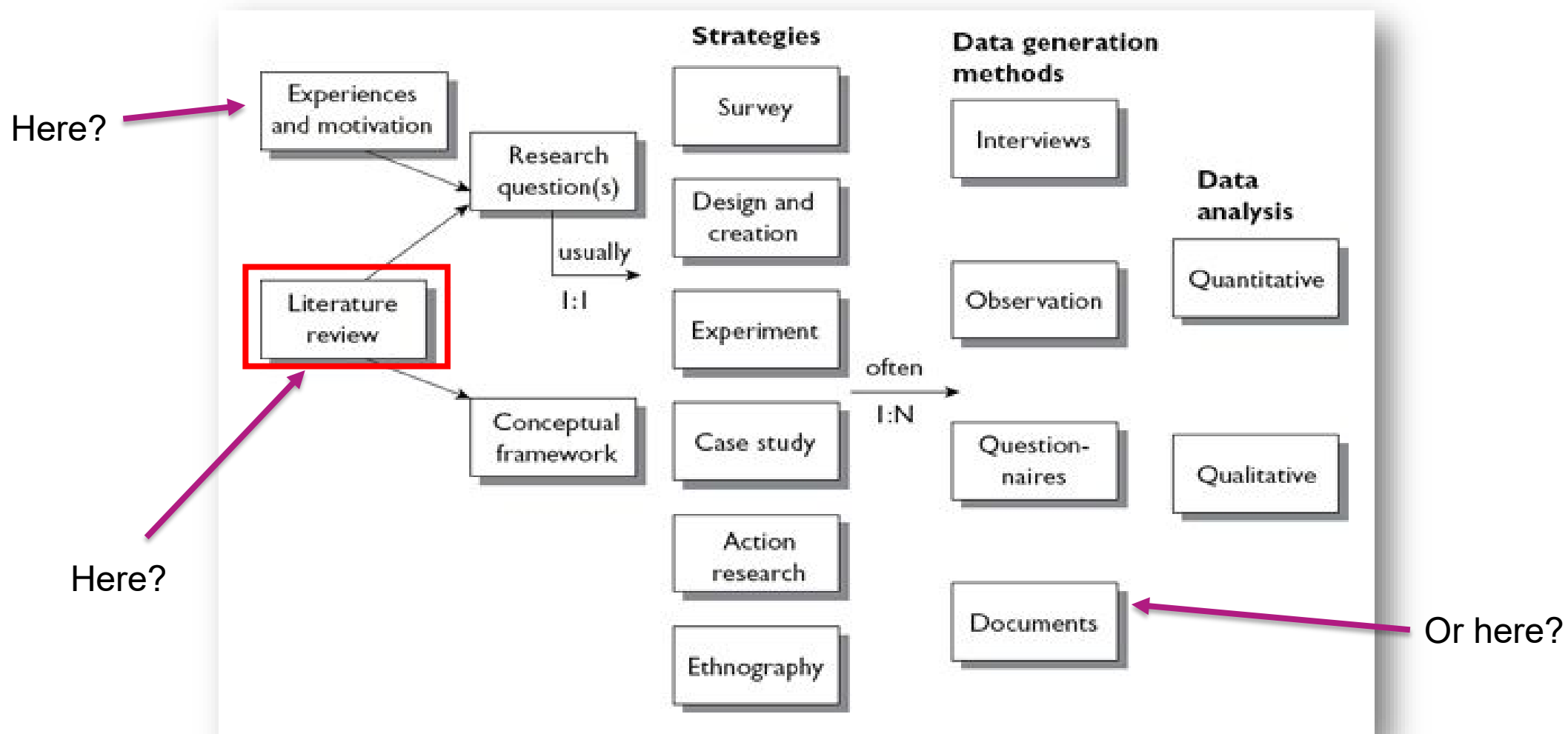
Building a conceptual framework
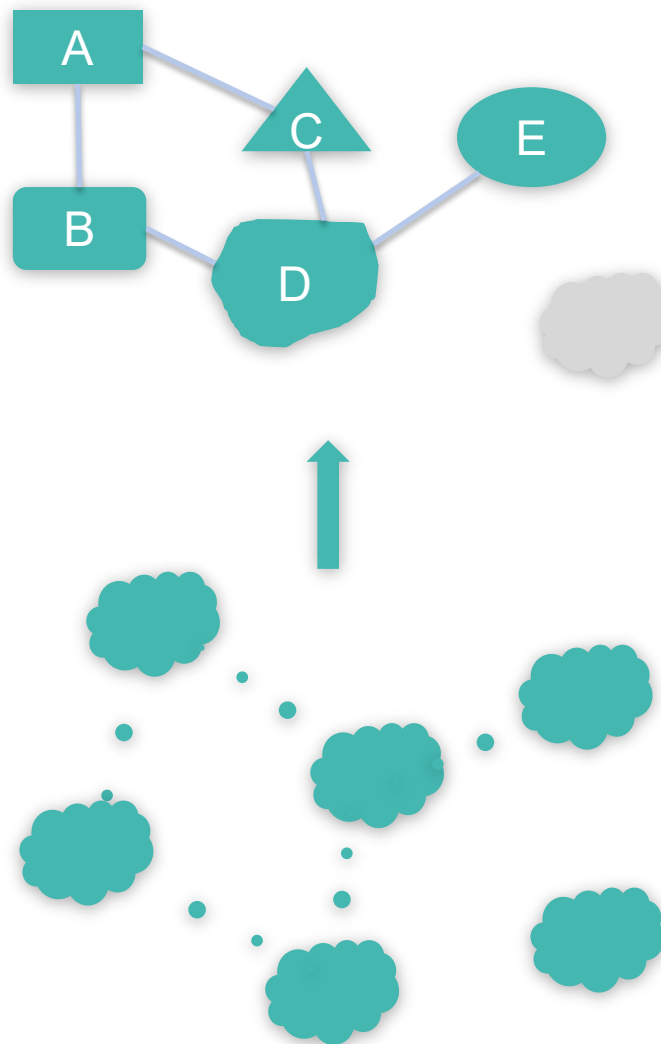
Building a conceptual framework

- From summarizing what you read...

To...

- Building a conceptual framework

Table 1. Approaches to Literature Reviews

Concept-centric	Author-centric
Concept X … [author A, author B, …]	Author A … concept X, concept Y, …
Concept Y … [author A, author C, …]	Author B … concept X, concept W, …

Table 2. Concept Matrix

Articles	Concepts				
	A	B	C	D	…
1		✖	✖		✖
2	✖	✖			
…			✖	✖	

Table 3. Concept Matrix Augmented with Units of Analysis

Articles	Concepts														
	A			B			C			D			…		
Unit of analysis	O	G	I	O	G	I	O	G	I	O	G	I	O	G	I
1				✖				✖							✖
2	✖			✖	✖		✖								
…							✖	✖			✖				

Legend: O (organizational), G (group), I (individual)

Webster, Jane, and Richard T. Watson. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, vol.26, no.2, pp. xiii–xxiii.
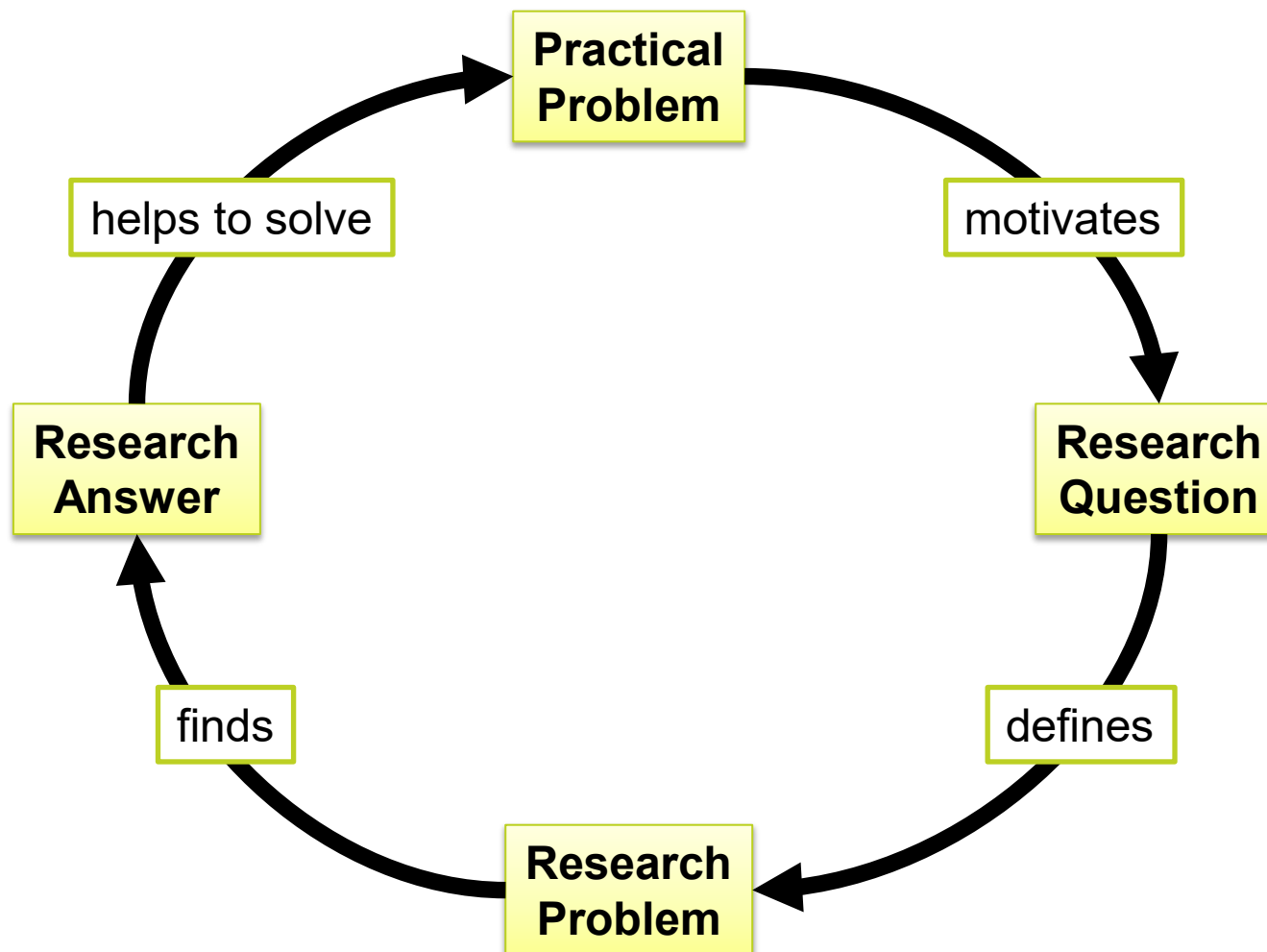
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The thinking man

You

Rigor

Relevance

Your research

Practice

Other researchers
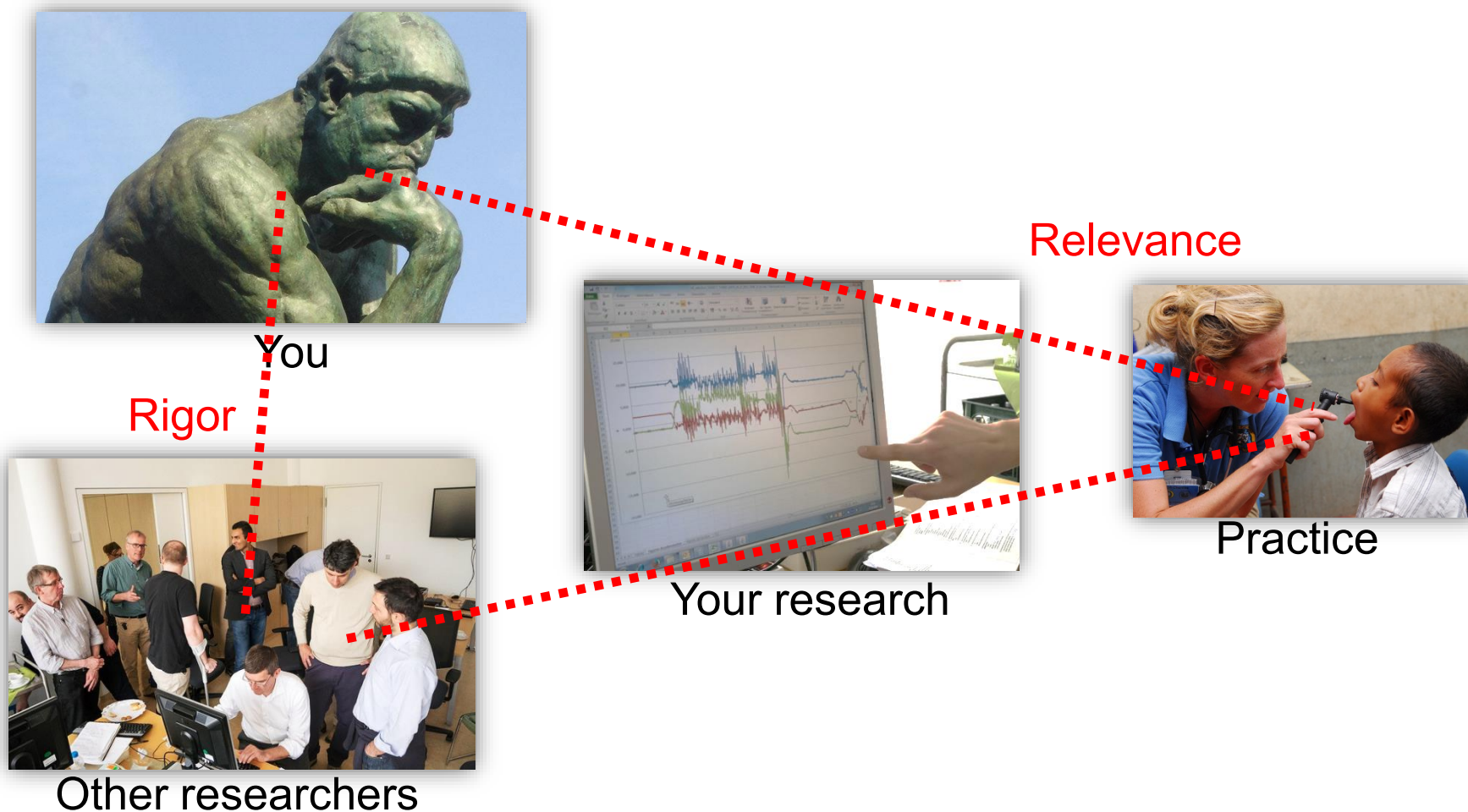
Practical vs. Research Problems

# Practical vs. Research Problems

|	Condition	Cost
Practical Problem	An undesirable situation in the real world	Unhappiness, pain, material cost, social cost, etc.
Research Problem	Not knowing or not understanding something	Cost of not knowing (and thereby not being able to solve the practical problem).

Practical vs. Research Problems

	Condition	Cost
Practical Problem	An aging population leads to more fall injuries.	These injuries are costly in terms of mental, social and economical costs.
Research Problem	Not knowing what causes fall injuries. For IT: Not knowing what IT solutions can help.	Cost of not knowing (and thereby not being able to solve the practical problem).

Example research questions

Practical problem	Research question	Research problem
An aging population leads to more fall injuries. Goal: How do we prevent falls among elderly?	• What do we know about the causes of falls among seniors? • What do we know about the role of IT in preventing falls among seniors? • What types of IT systems are best in preventing falls among seniors?	Not knowing what causes fall injuries. For IT: Not knowing what IT solutions can help. Goal: How do we answer the research questions?
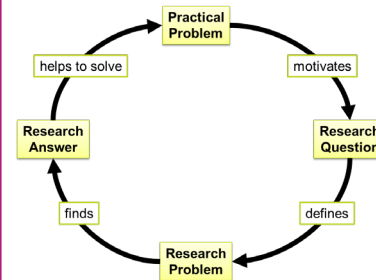
Relevance
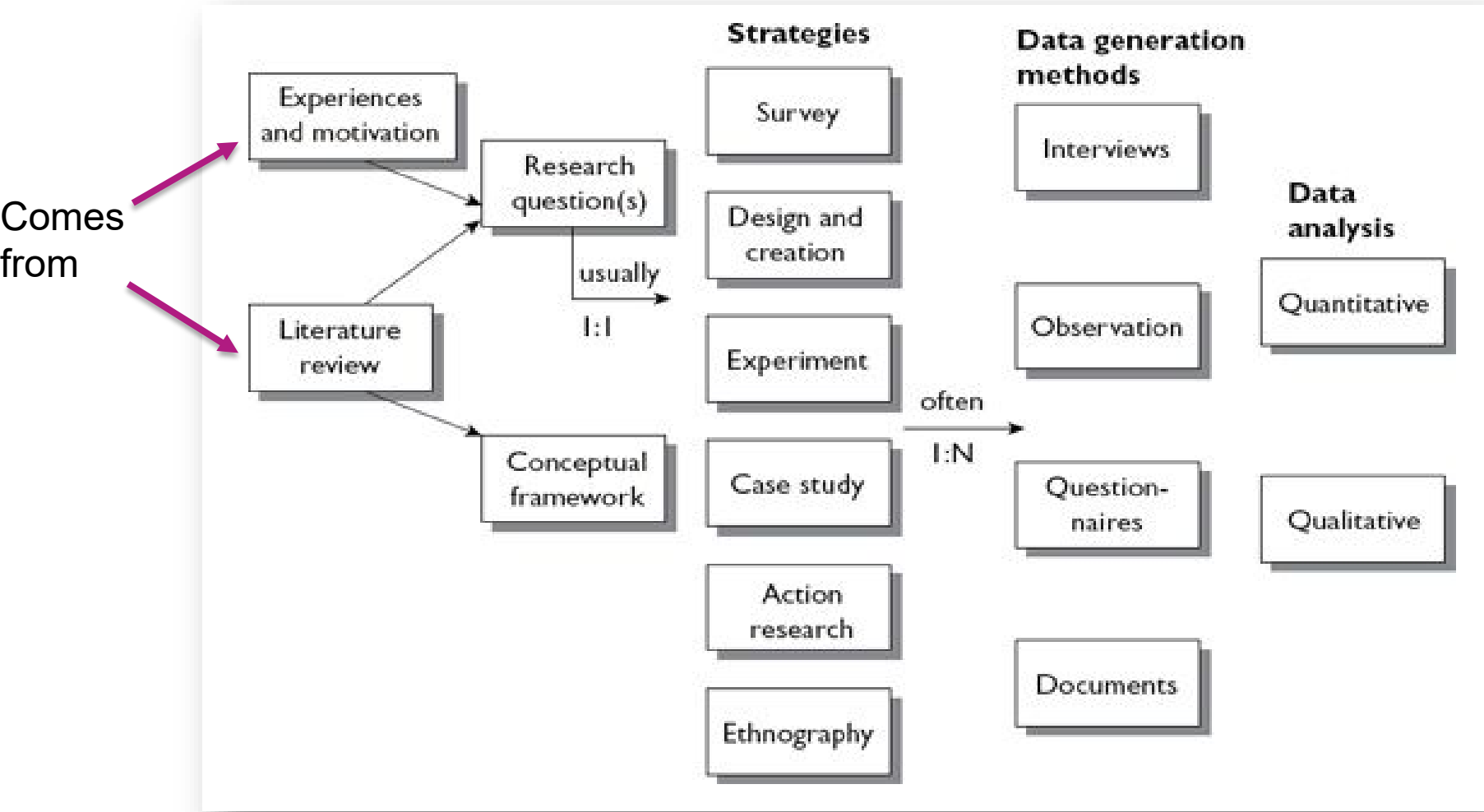
Comes from

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Non-rigorous research questions

- Research questions that are not asked.
- Research questions that are not answered.
- Research questions that have Yes/No answers.
- Research questions whose answers don't produce any new knowledge.
- Research questions that don't have "symmetry of outcome".
- Research questions that are too broad.
- Research questions that are too narrow.
- Research questions that include presumptions.

Generating research questions

- Breakout rooms with groups.
- Choose one of the following (perceived) practical problems:
  1. (Groups with odd numbers) Covid-19 contact detection apps violate our privacy.
  2. (Groups with even numbers) Online teaching leads to social isolation among students.
- You are IT researchers addressing these problems (10 minutes).
  - Formulate one research question to address the practical problem.
  - How rigorous is your RQ? Compare to previous slide.

Rigorous RQs should

- Be focused,
- Drive the right research design,
  - Case study, design and creation, survey,….
- Drive the management of the research project,
  - Needed time,
  - Needed resources,
  - Inherent dependencies on others.
- Identify the right paradigm, (discussed later)
  - Positivist, interpretive, critical.

RQs should be focused

Research Area

Research Topic

Research Question

Problem space dimension
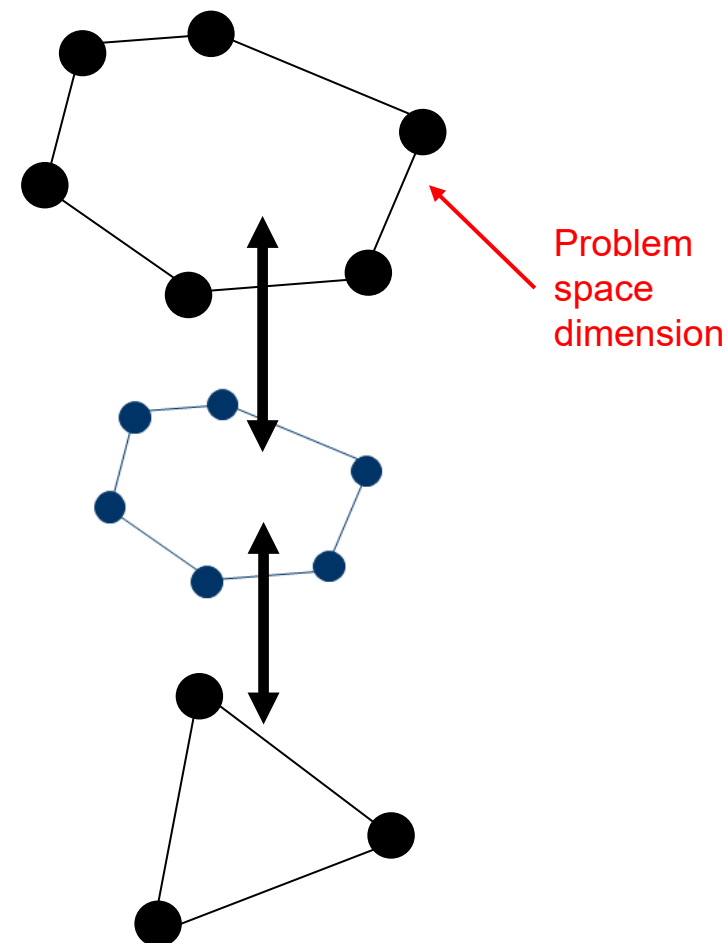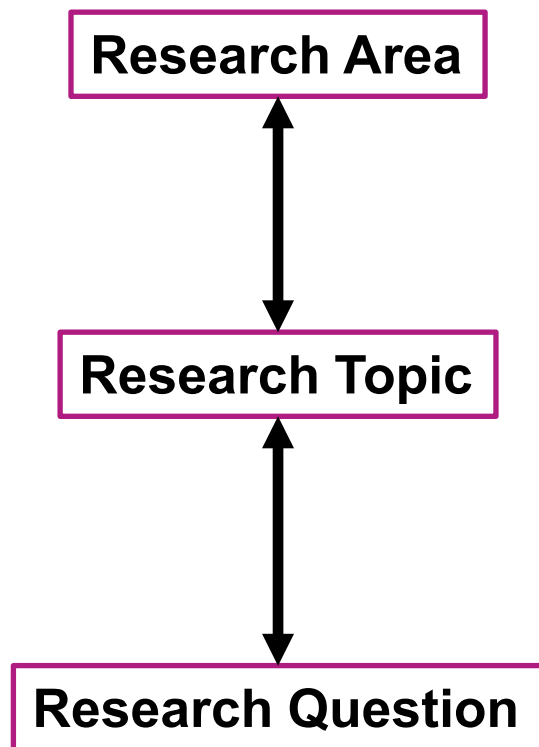
Stop narrowing down when you have a feasible research design!

How to focus?

Be coherent

- Use of active verb:
  - Understanding, Exploring, Interpreting, Constructing, Explaining, etc.
- Use of relevant nouns:
  - Experiences, Feelings, Views, Perspectives, Knowledge, etc.
- Indication of methodology:
  - Grounded theory, Action research, Exploratory study, etc.

Be structured

- What will be studied?
- Who will be studied
- When will they be studied
- Where will they be studied
- What will be studied
- How it will be studied
- Why it will be studied

Examples of focusing
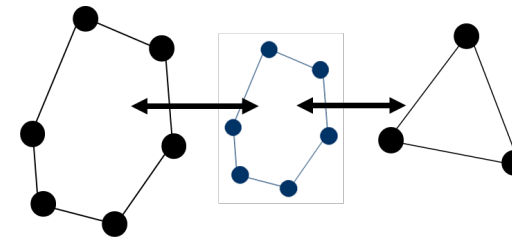
Area	Topic	Research Question
Aging and IT	Falls among seniors and the use of IT	What do we know about the role of IT in preventing falls among seniors?
	Empirical evidence of IT and falls among elderly	What types of systems have shown to actually reduce falls among seniors?
	Exercise-based interventions for fall prevention and the role of IT	How can an IT system help seniors to comply with preventive exercise interventions?
		What is the impact of using system X to promote exercise Y with N elderly living in nursing home A in Trondheim?

Questions?

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Theory lecture nr. 3
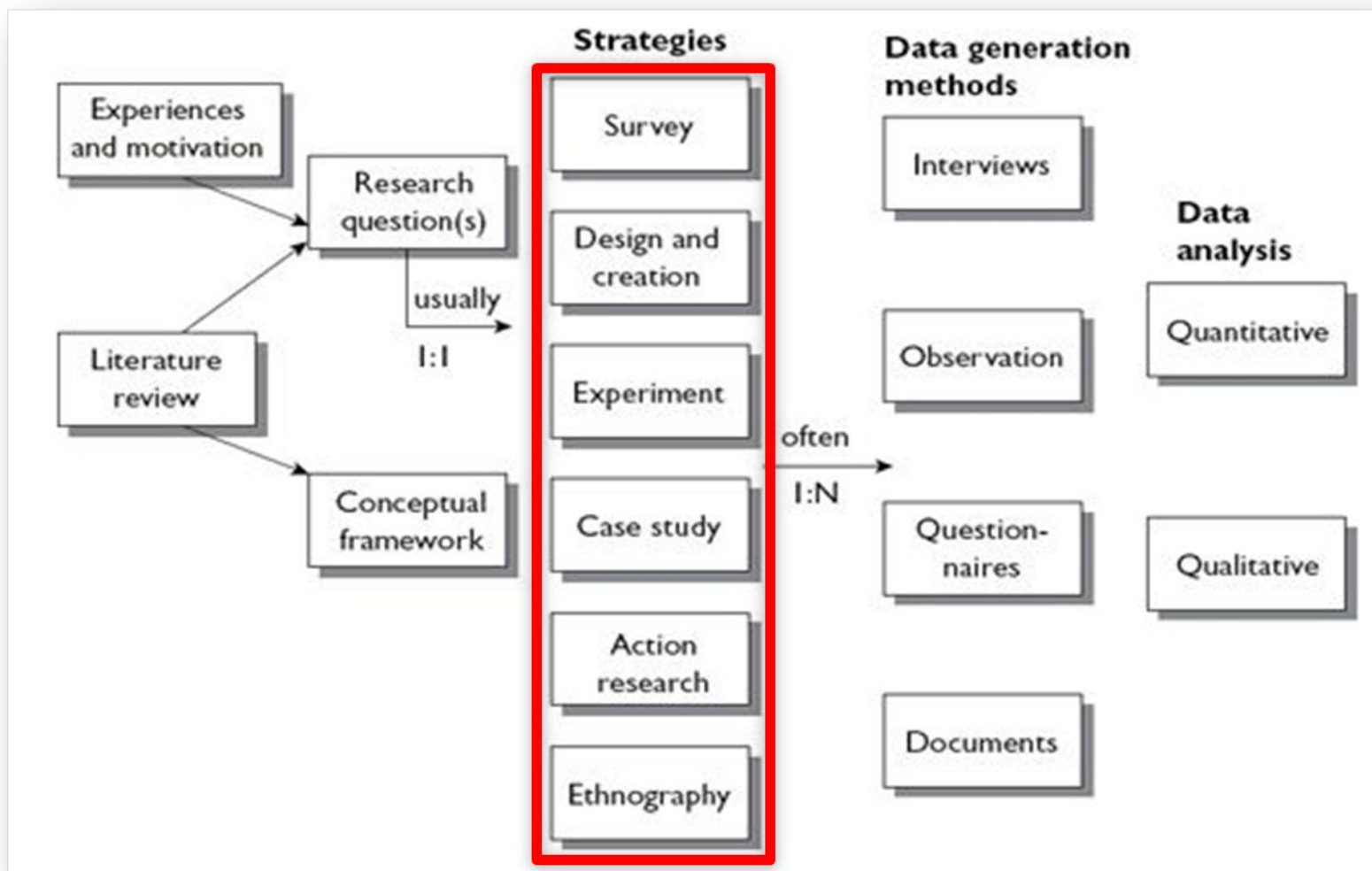
Remember:

- **Fill in the group registration form.**
  - Deadline today.
- **Meet your group ASAP when assigned.**

- **I need a reference group member from each group.**
  - Preferably voluntary.

Extras

Relevance: The "So what?" Test

- **Topic**: I am studying X
  - **Question**: Because I want to answer Y
    - **Significance**: In order to help solve real world problem Z

- From "So what?"
  - So what if problem Z is not solved?
- To "OMG! Tell me, what do we do about that?"
  - Problem Z is important also for me! Please solve it!

Examples of the "So what?" test

- **Topic**: I am studying falls among seniors.
  - **Question**: Because I want to find out what causes these falls.
    - **Significance**: In order to create IT-based solutions that can reduce falls among seniors and save us 50 billion NOK yearly.

- **Topic**: I am studying X
  - **Question**: Because I want to answer Y
    - **Significance**: In order to help solve real world problem Z