

An Overview of Computer Science Research Methods

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Previously:

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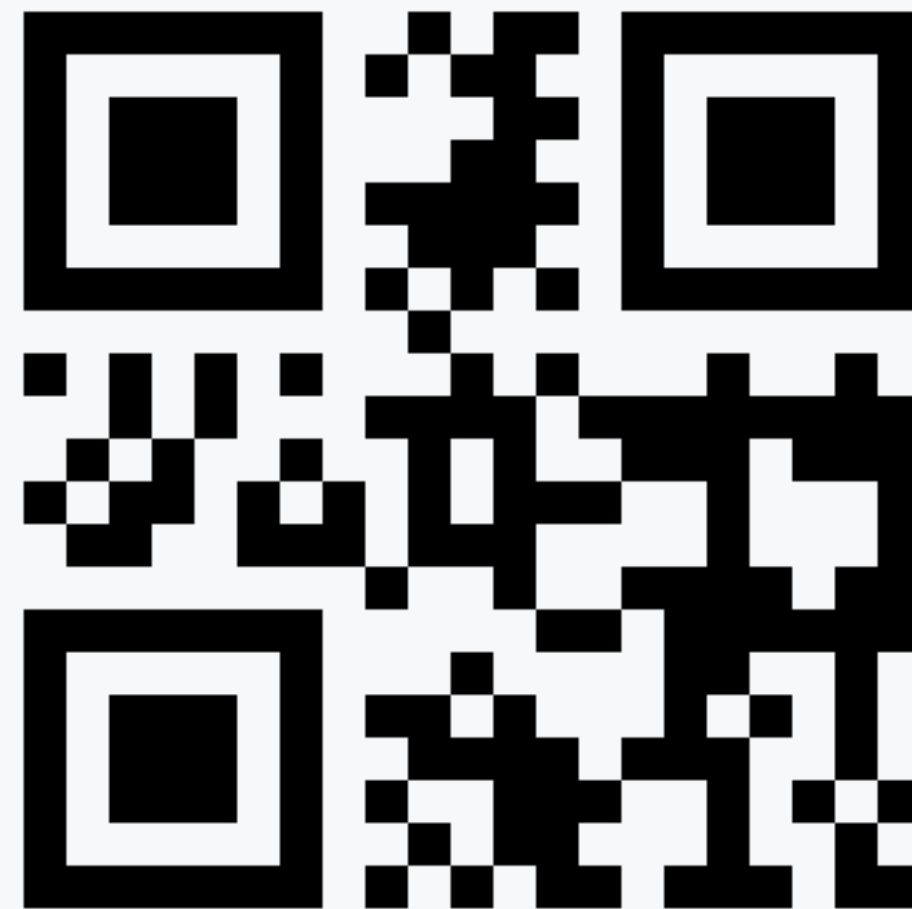
Research: Improving how computer can help people do better and transparent science

<https://chatw.ch>

Topics

- Empirical methods
 - Quantitative
 - Qualitative
- Non-empirical methods
 - Design
 - Engineering
 - Theoretical
- Settings
 - Research with human participants
 - Online studies
 - Simulation
- Meta-research
 - Research ethics
 - Open science, research transparency
 - Peer reviewing and publications
 - Formulating and refining research questions

Slides & OLAT



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	MON	TUE	WED	THU	FRI	SAT	SUN
W8	Feb 17	18	19	20	21 ORM 10	22	23
W9	24	25	26	27	28	1	2
W10	Mar 3	4	5	6	7 ORM 10	8	9
W11	Mar 10	11	12	13	14	15	16
W12	Mar 17	18	19	20	21 ORM 10	22	23
W13	Mar 24	25	26	27	28	29	30
W14	Mar 31	Apr 1	2	3	4 ORM 10	5	6
W15	Apr 7	8	9	10	11	12	13
W16	Apr 14	15	16	17	18	19	20
W17	Apr 21	22	23	24	25	26	27
W18	Apr 28	29	30	May 1	2	3	4

W18	Apr 28	29	30	May 1	2	3	4
W19	May 5	6	7	8	9	10	11
W20	May 12	13	14	15	16 ORM 10	17	18
W21	May 19	20	21	22	23	24	25
W22	May 26	27	28	29	30 ORM 10	31	Jun 1

10:00
~11:30 Lunch break
12:15

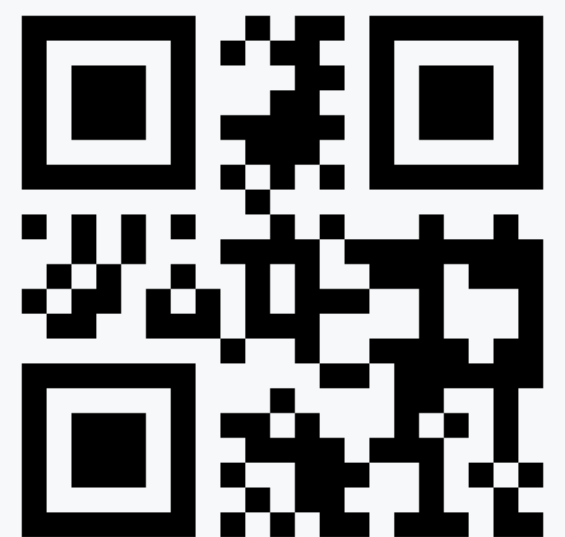


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Assessments

Criteria for passing this course

- Hand-in at least 3 out of 4 assignments
- Complete all commentaries
- Have two one-on-one meetings with Chat at the beginning and at the end of the course

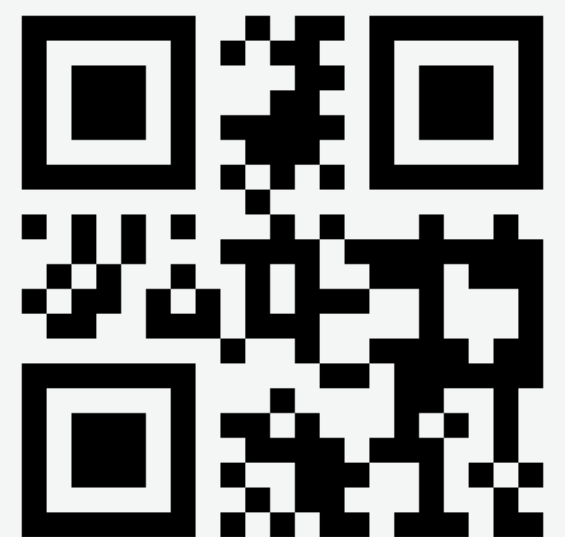


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An Overview of Computer Science Research Methods

Session 1: Locating research methodology

Chat Wacharamanotham

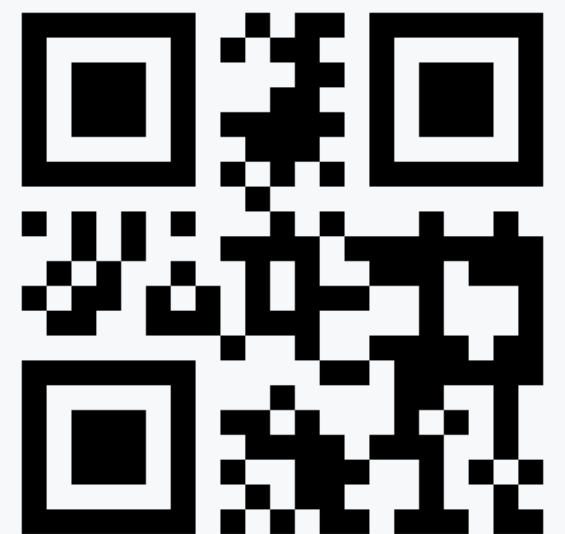


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Learning outcomes

Course participants can

- ❑ analyze substantive, conceptual, methodological aspects of research
- ❑ roughly explain the onion model (first iteration)
- ❑ explain the first set of research quality criteria (generalizability, precision, realism)
- ❑ explain the continuum of qualitative-quantitative data and processing procedures
- ❑ apply these concepts to analyze own research



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McGrath's analysis of research

Substantive

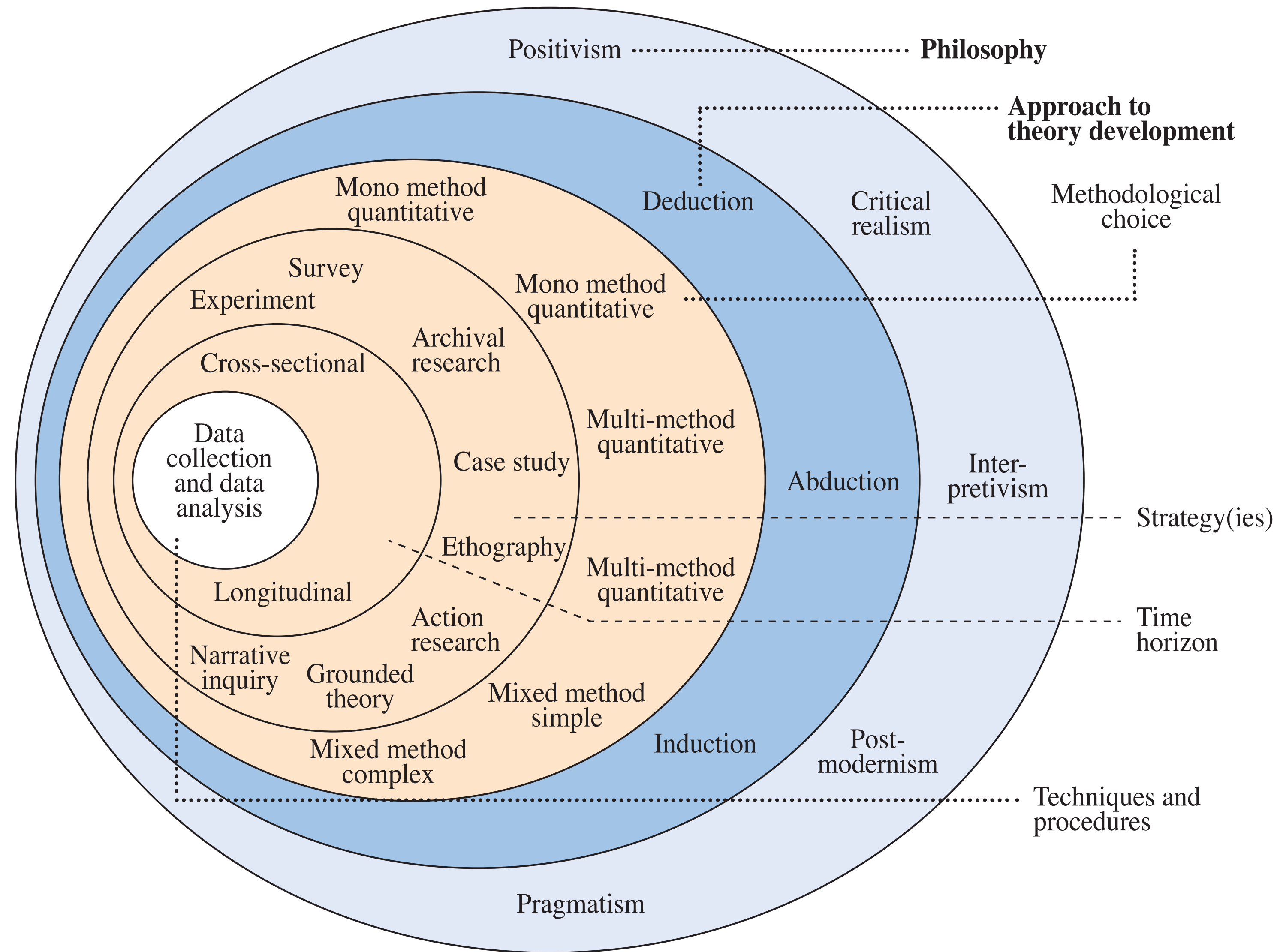
Content worthy of attention

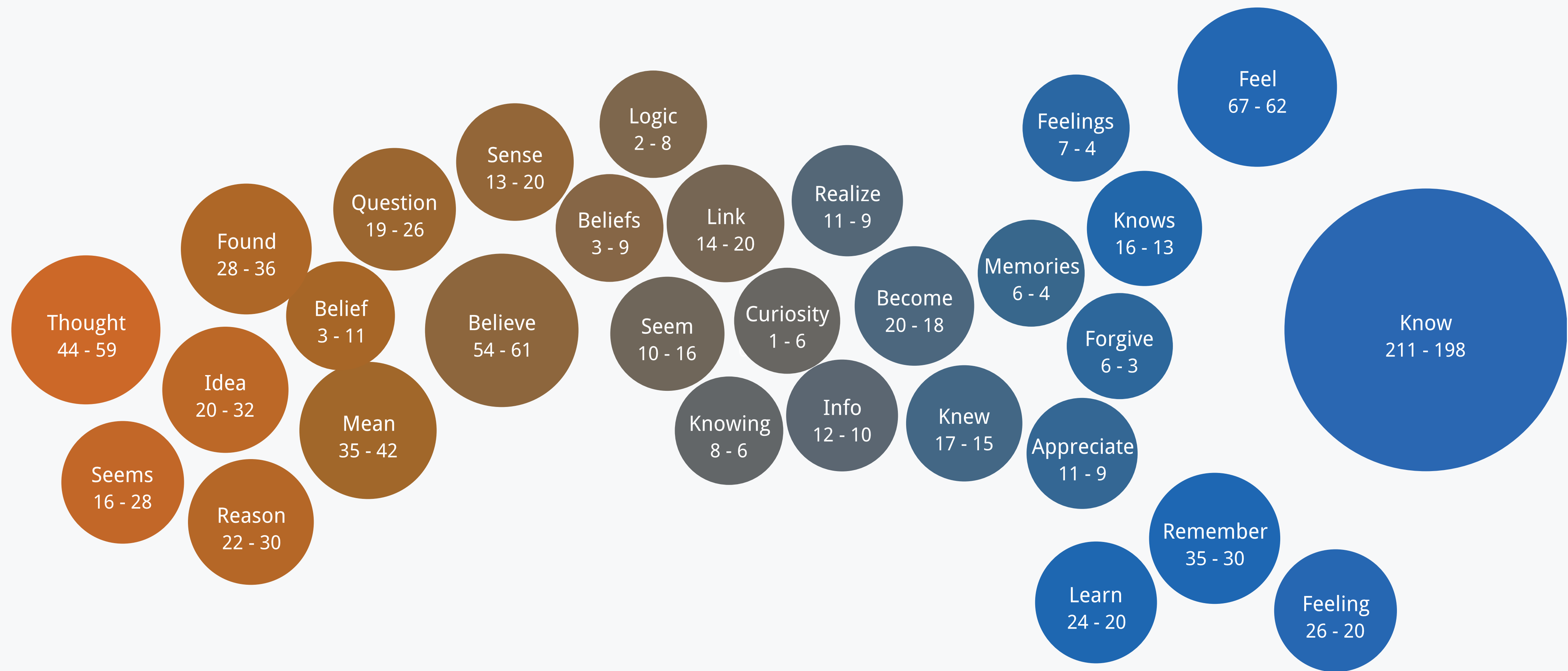
Conceptual

Ideas that give meaning to our results

Methodological

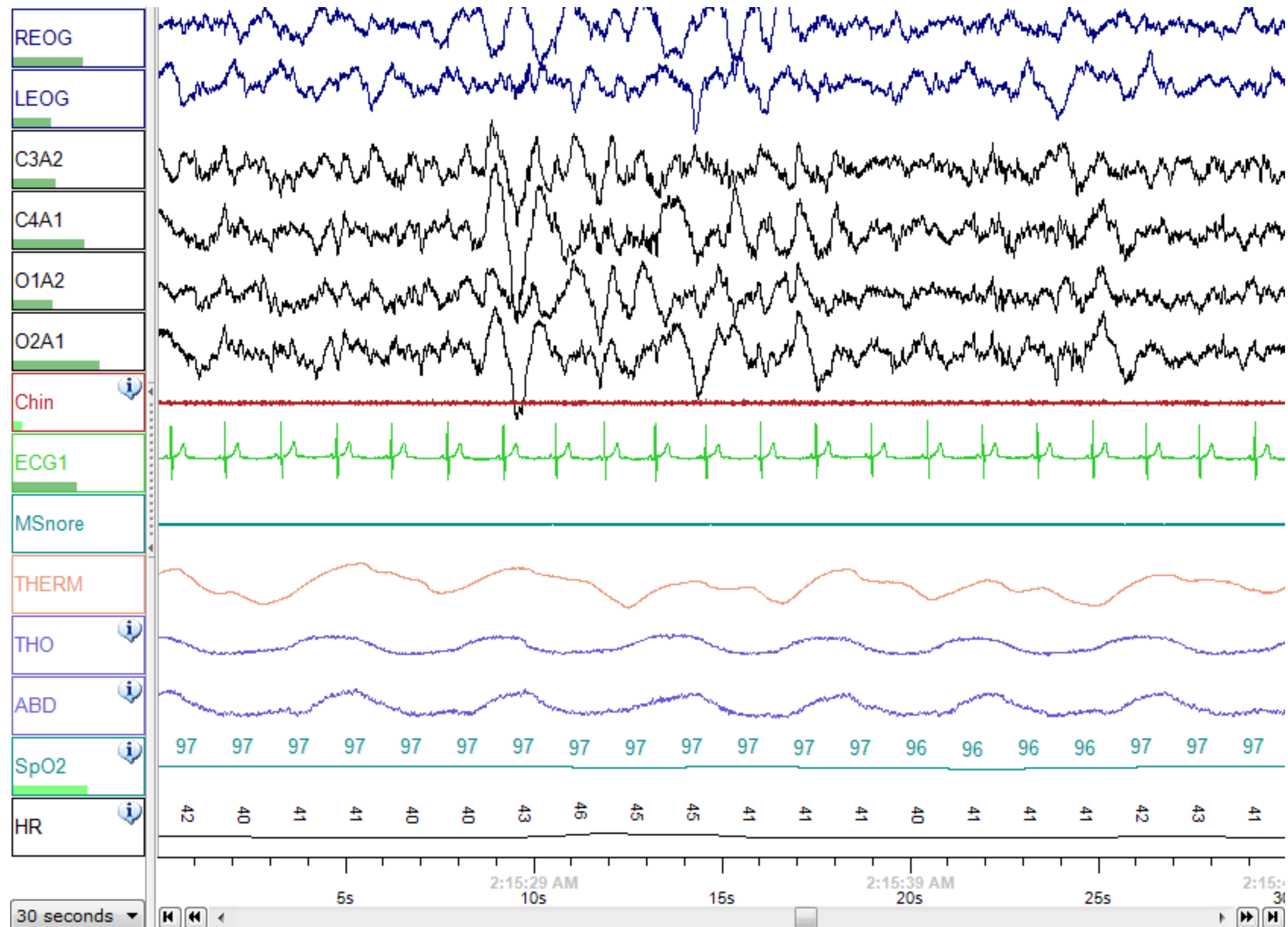
Techniques that are useful to conduct research



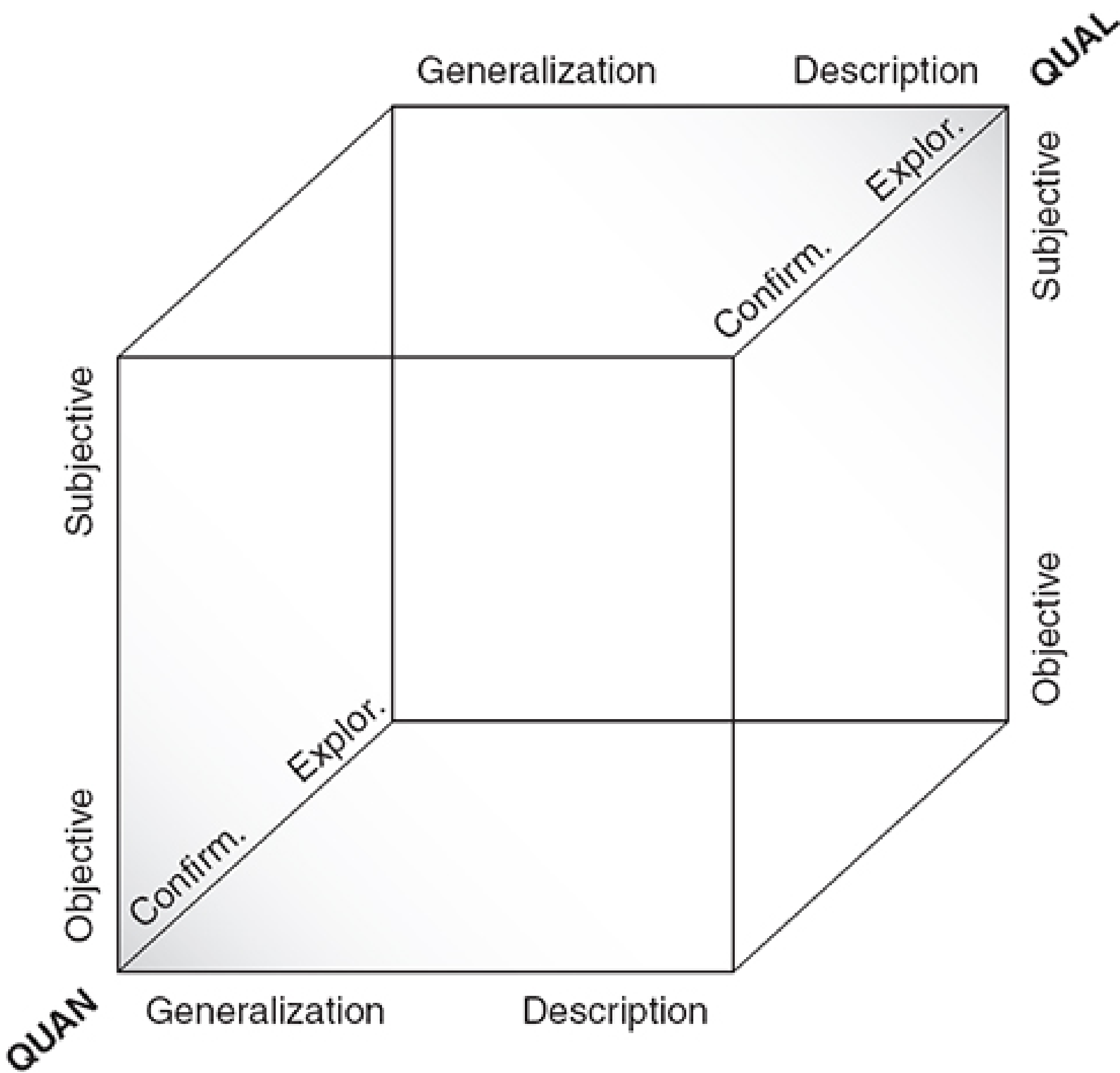


Words used relatively more by
Atheist Followers

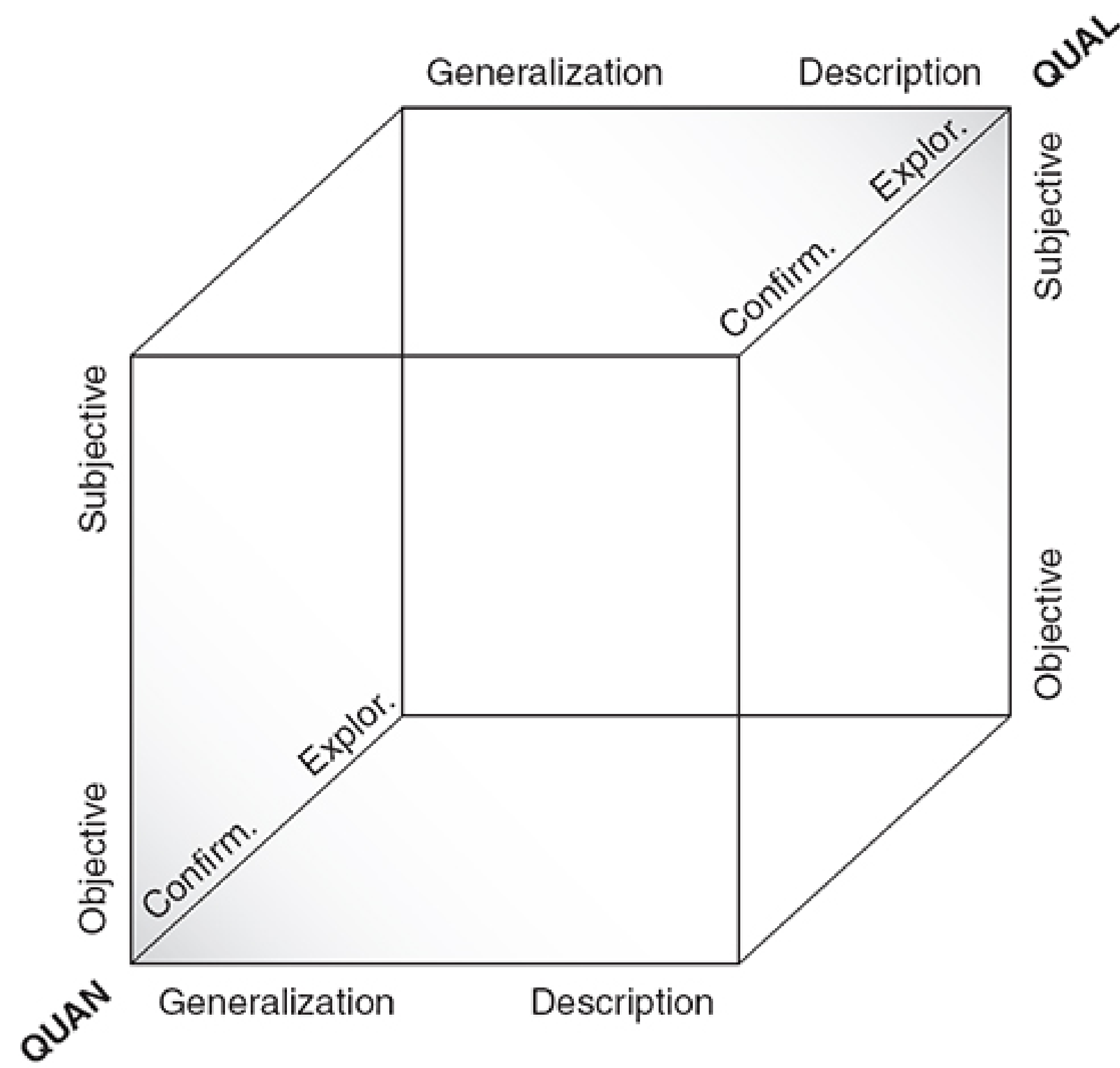
Words used relatively more by
Christian Followers



CONTINUUM OF RESEARCH PARADIGMS (SELECTED 3 DIMENSIONS)



CONTINUUM OF RESEARCH PARADIGMS (SELECTED 3 DIMENSIONS)



Objectivity: The extent to which the researchers are detached from the thing or people being studied

Research studies that are concerned with human experiences may inevitably be **subjective**. The subjectivity could be in the study participants, the researchers, or both

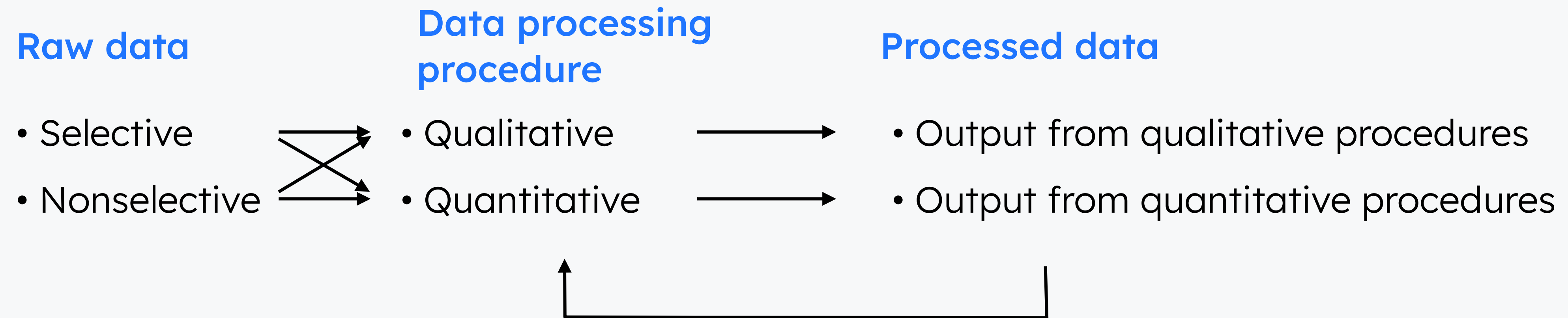
Generalizability: The extent to which we can use the results of a research study (which is based on a relatively small set of specific observations) to form a general statement about a larger set of possible observations (different people, settings, times, measures, and characteristics other than those used in that study).

Some research projects might not aim for generalizability. Instead, they aim to provide detailed and rich **descriptions** of specific phenomena

Confirmatory: The extent to which researchers are certain about specific outcomes prior to conducting the study

In many situations, humanity may not have enough knowledge about the topic of research. Thus, researchers may approach the project without predefined answers or specific questions. Such projects are called **exploratory**.

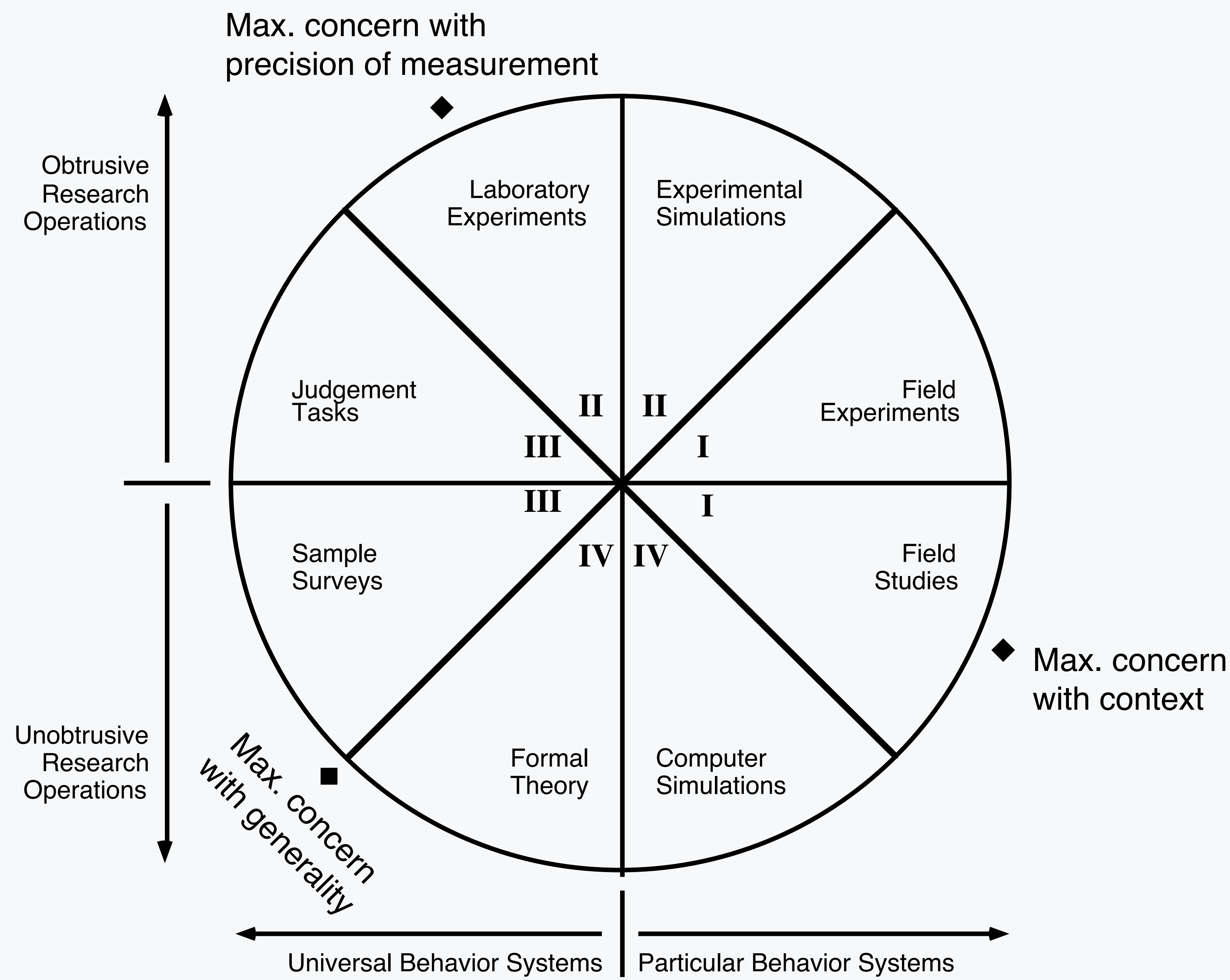
AN ALTERNATIVE WAY TO THINK ABOUT QUAL VS. QUANT



Selective raw data: Data collected at researchers' discretion (e.g., field notes during ethnographic study)

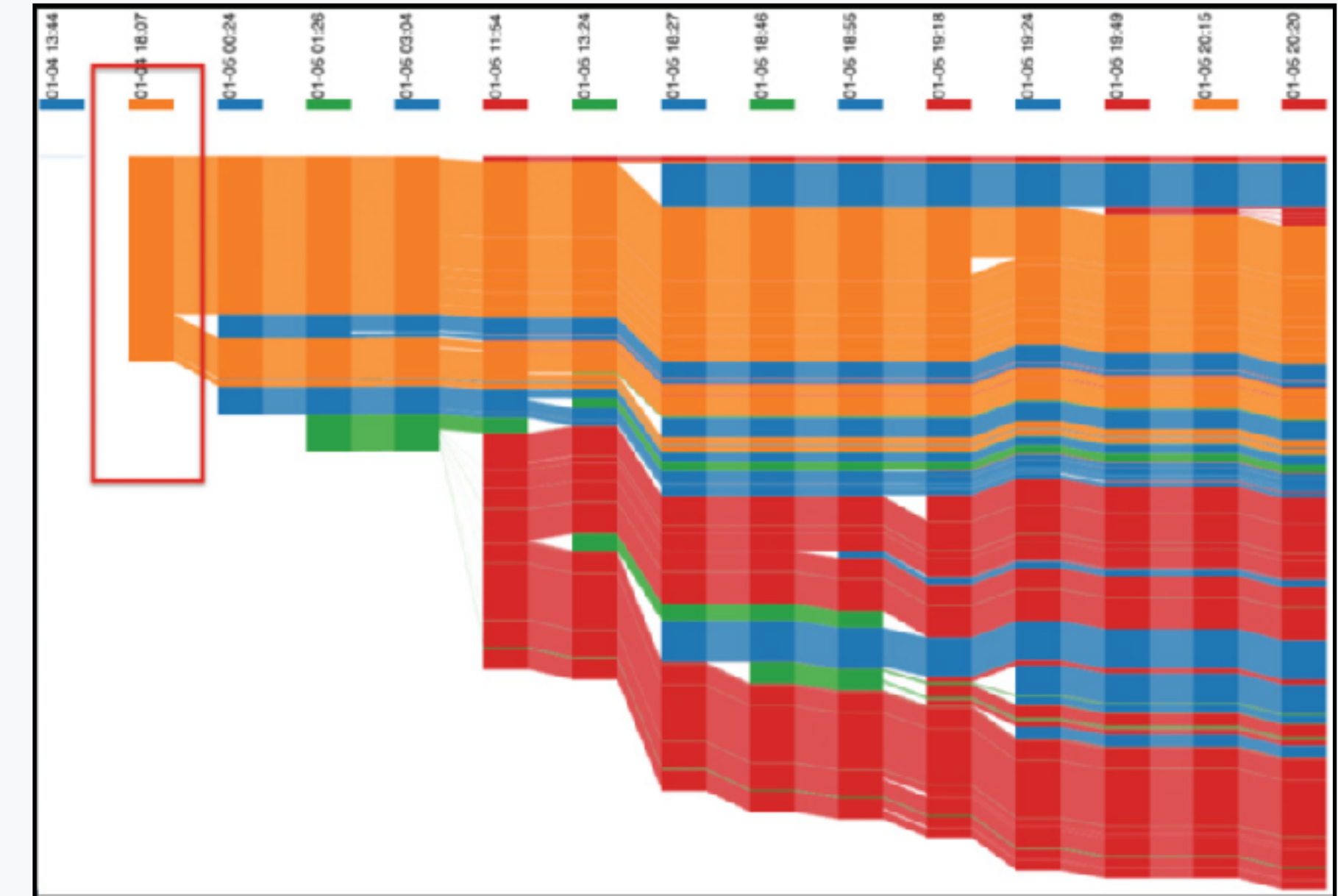
Nonselective raw data : Data collected without researcher discretion at the time of collection, (e.g., task completion times logged by software)

Strategies
for empirical
research



EXAMPLE

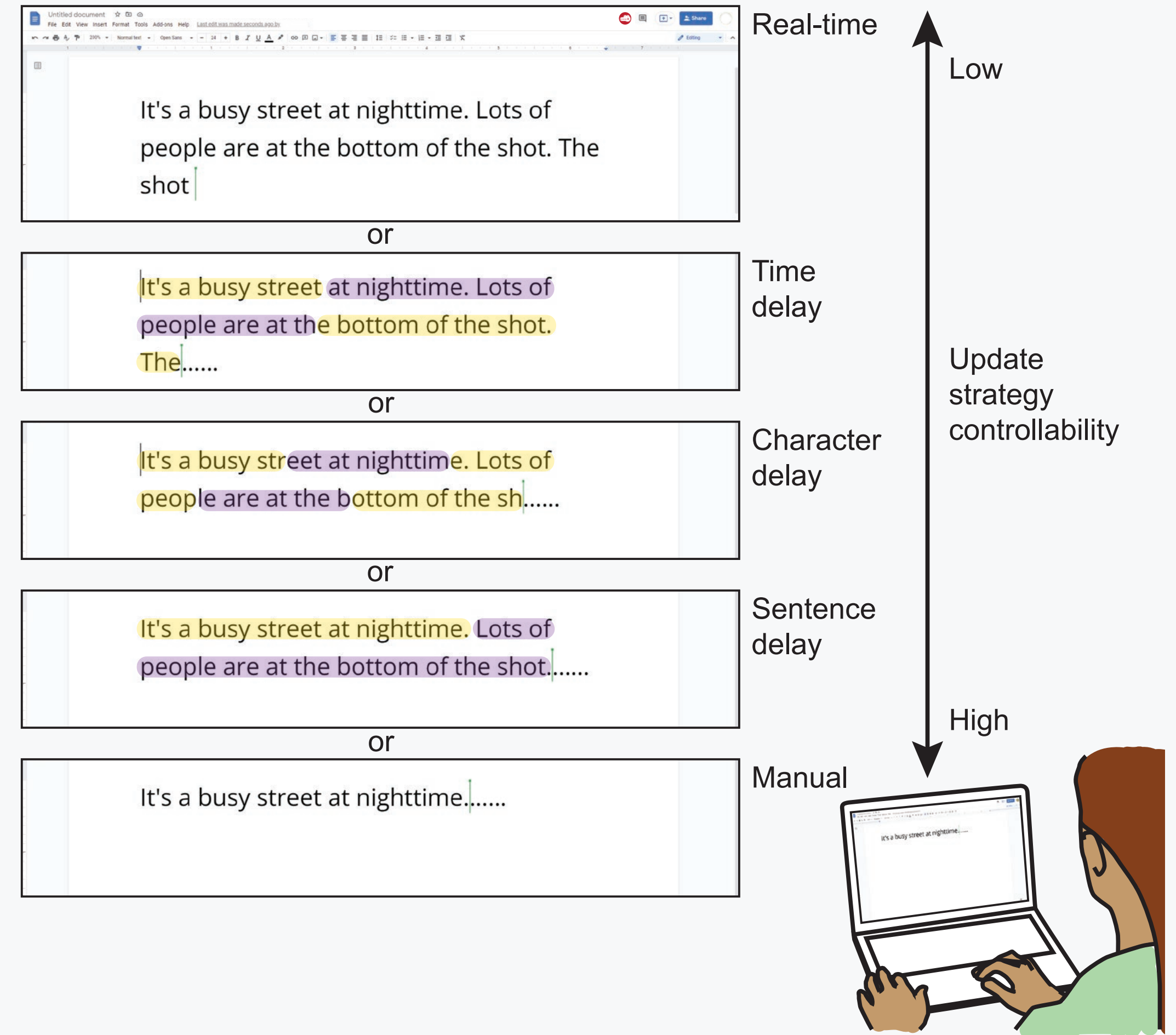
- Collaboration behavior on Google Docs
- Data: Interaction traces from 96 Google Docs from students' work in a semester
- Researchers group the traces into collaboration styles
- These styles are then associated with the writing quality rated by experts
- Some collaboration styles yielded higher writing quality than others



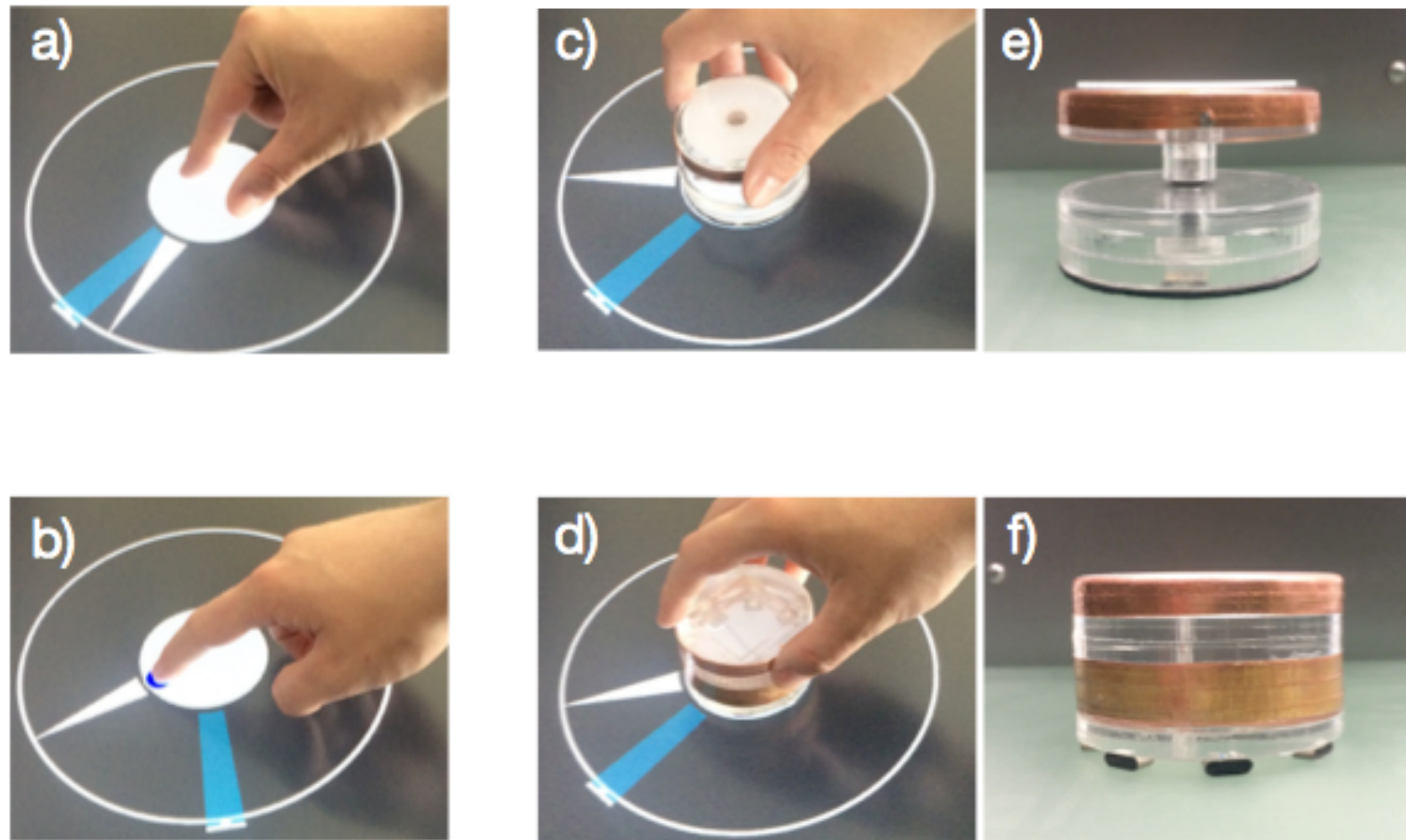
EXAMPLE

- Collaboration behavior on Google Docs
- Different update intervals are presented to the observers
- Observers rate their experience (e.g., ability to follow updates, naturalness)
- Results: Different strategies yielded different ratings

(b) Observer's view for different update strategies.



EXAMPLE



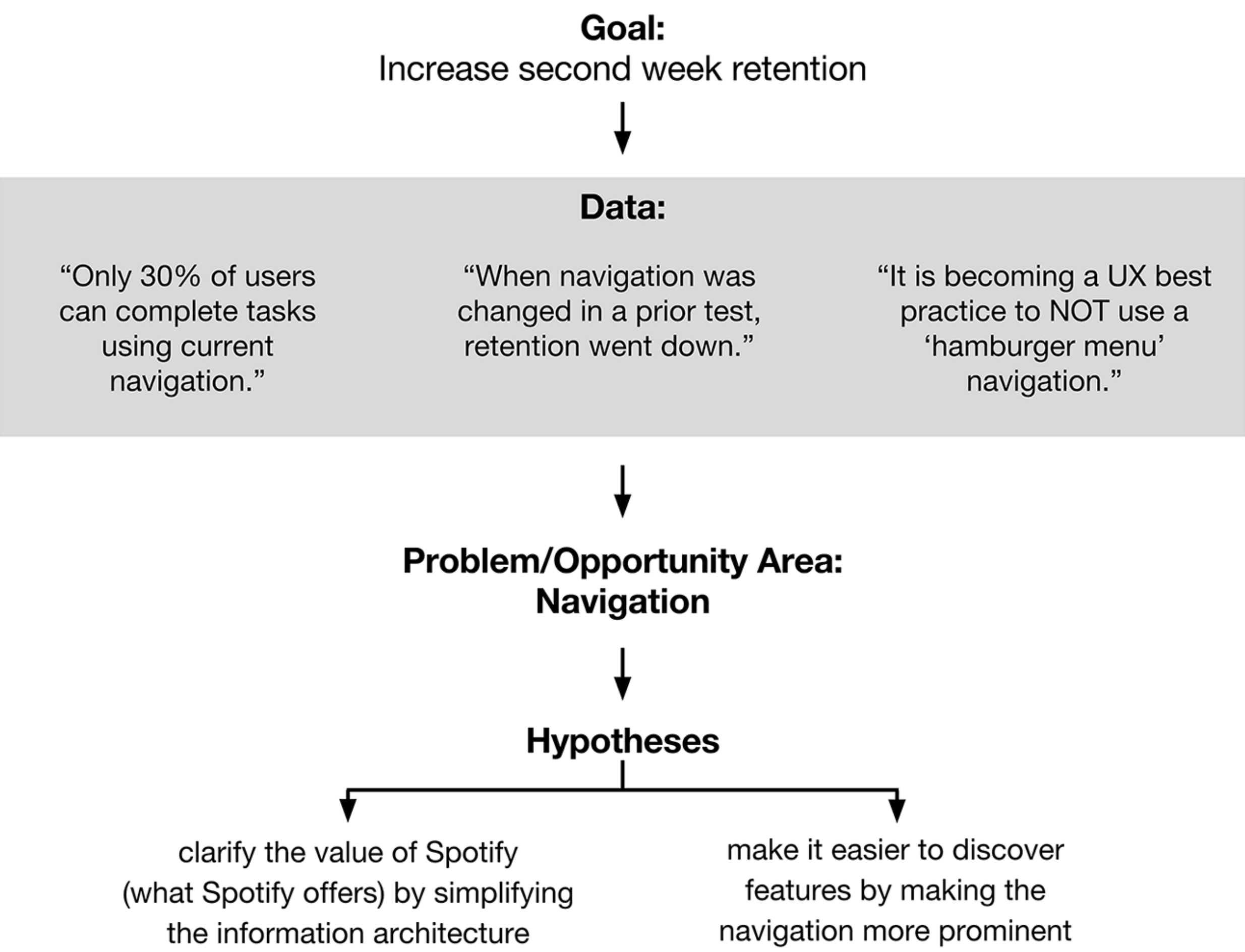
Conditions:

- Eyes-on both control and output
- Input is in the peripheral vision
- Eyes-free from the input

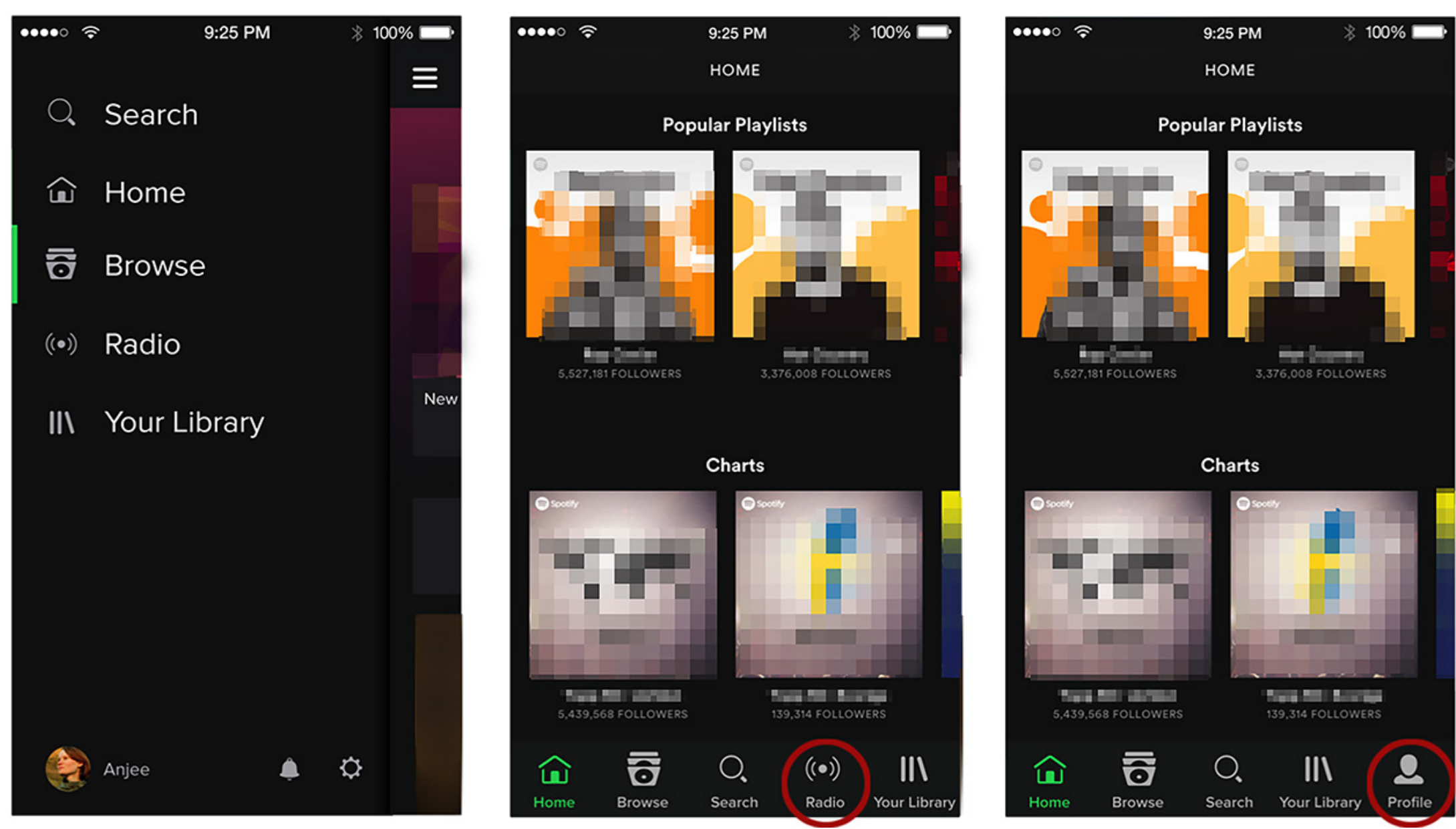
Measurements:

- Movement time
- Number of overshoots

EXAMPLE: SPOTIFY APP NAVIGATION



Conditions: Three designs

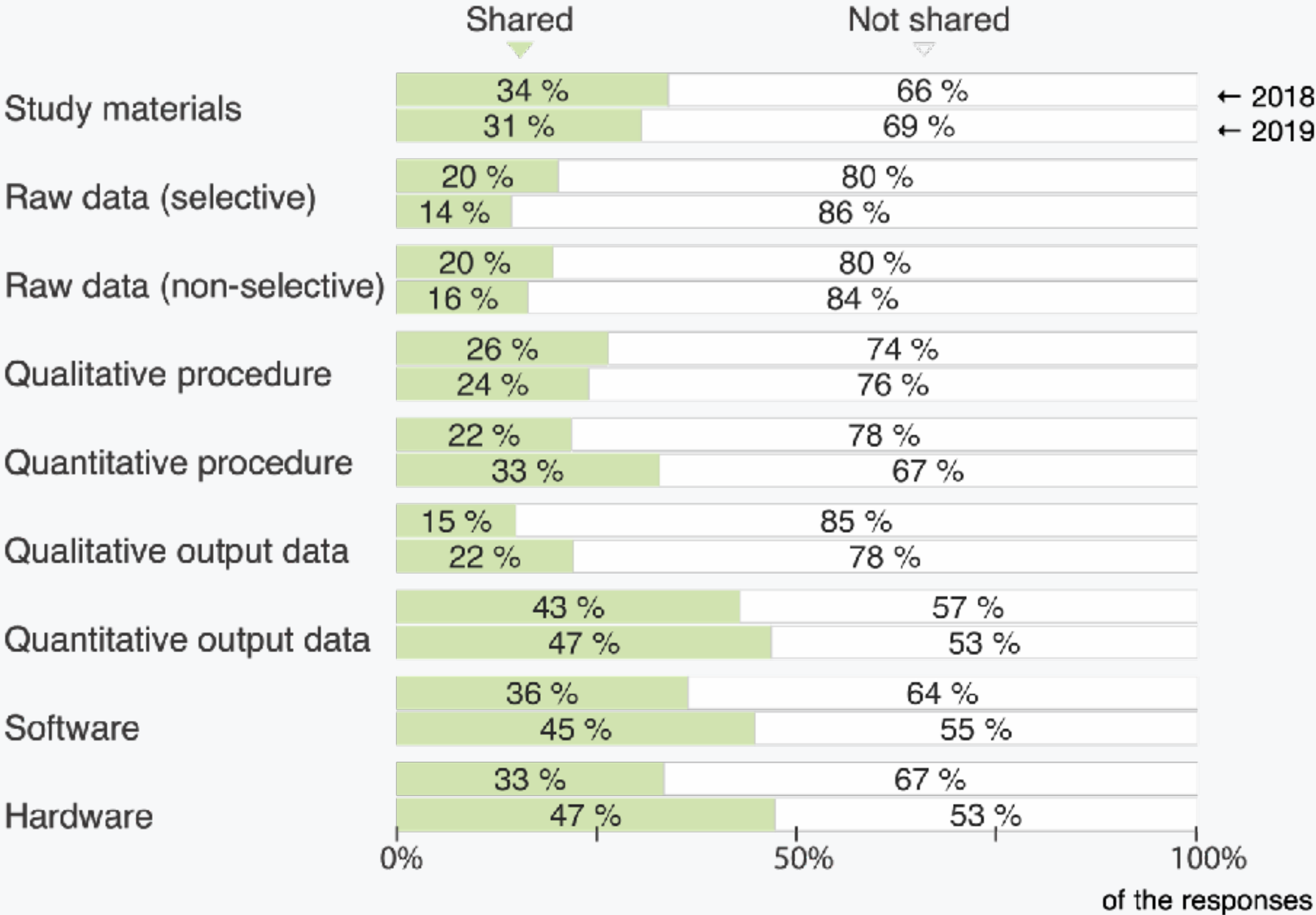
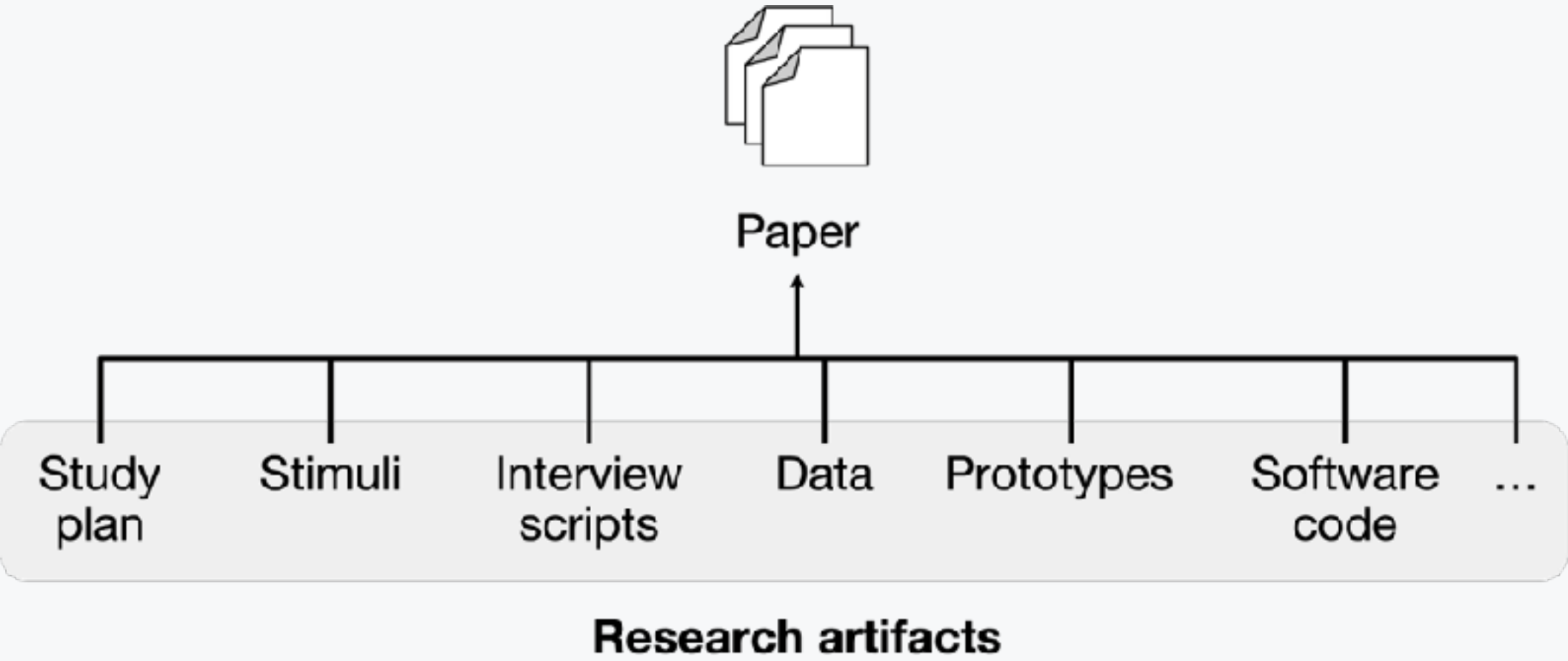


Measurement: Second week retention rate

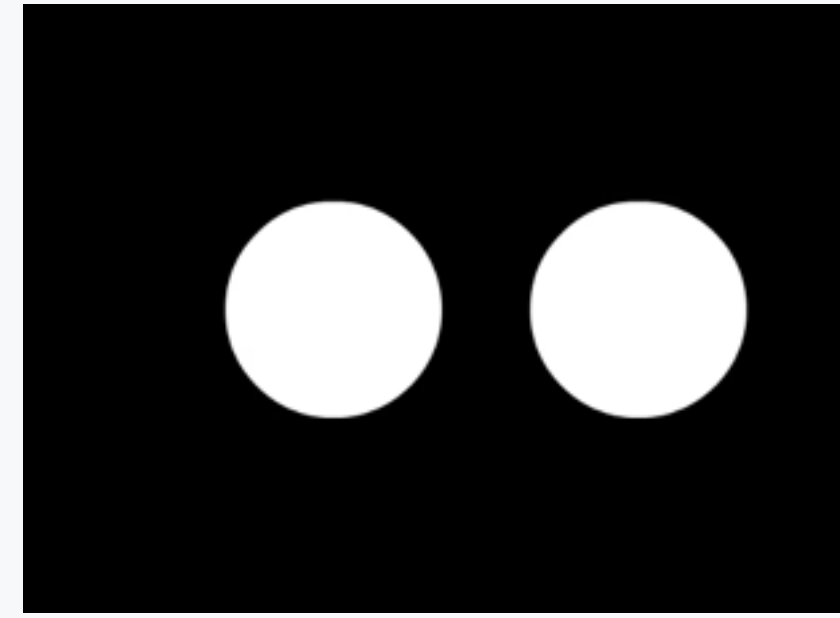
EXAMPLE

We sent a questionnaire to authors of CHI 2018–19 papers

- What types of research artifacts they generate?
- If they share it, how?
- If not, why?



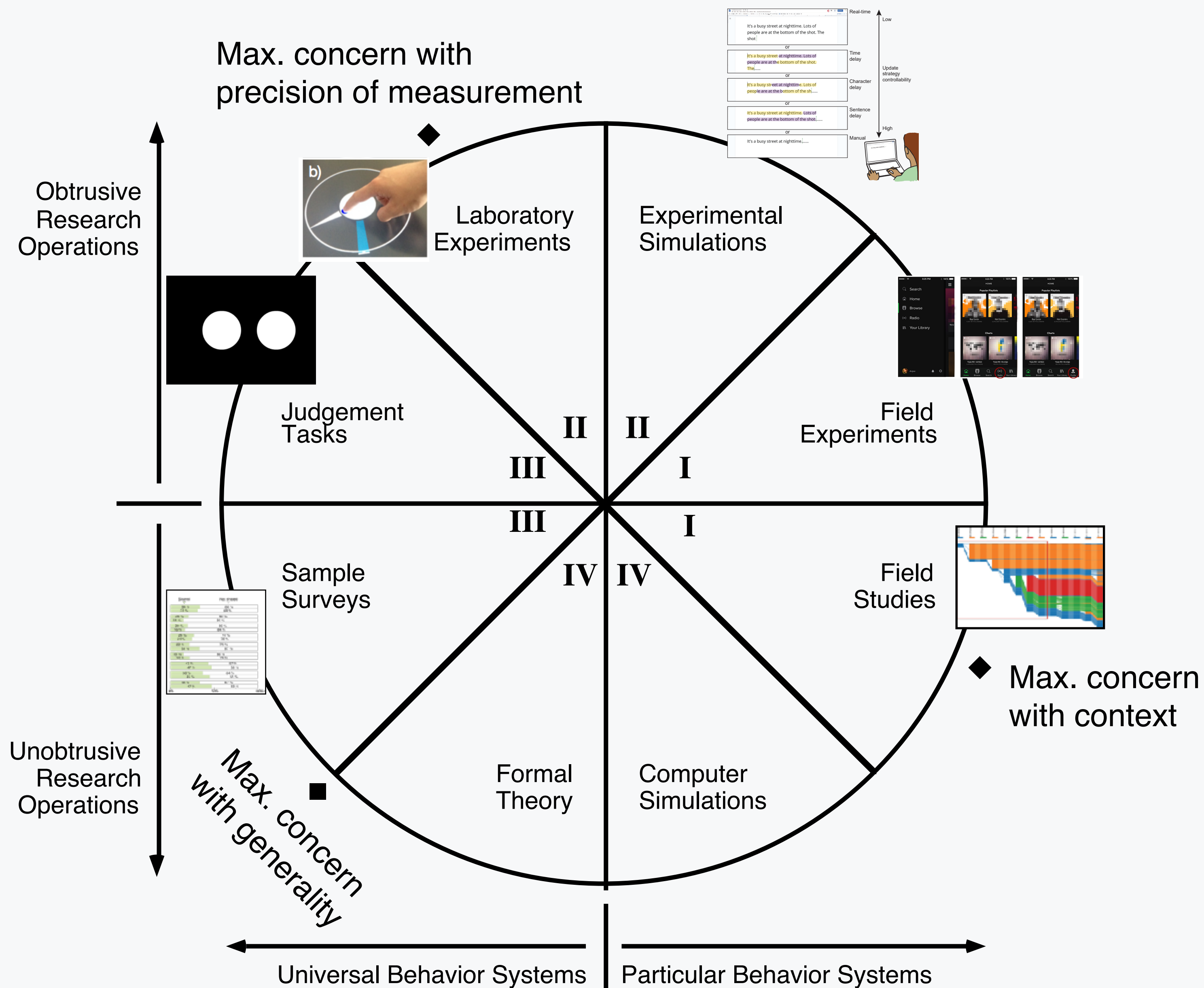
EXAMPLE



Video: Three versions of two white circles moving on black background

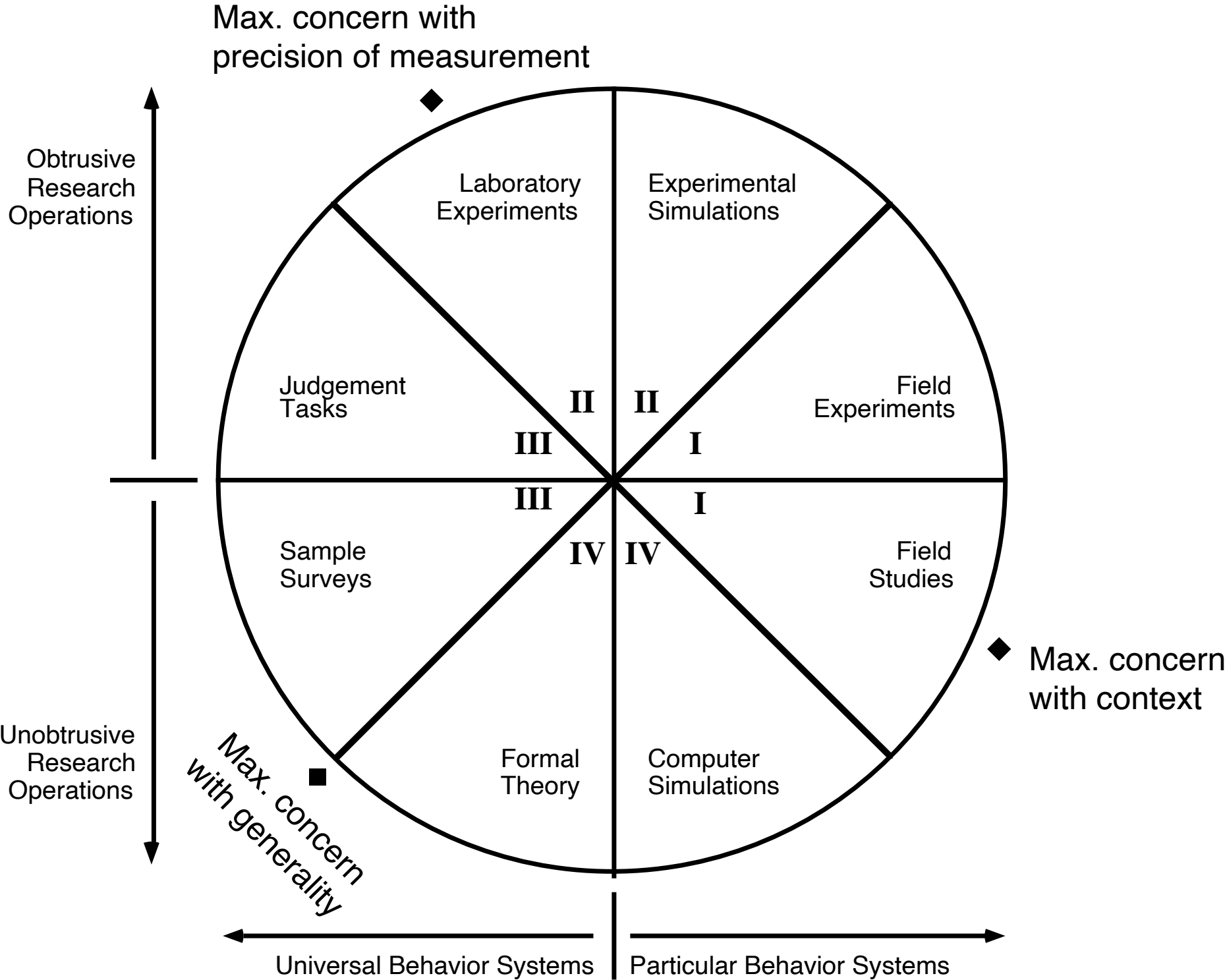
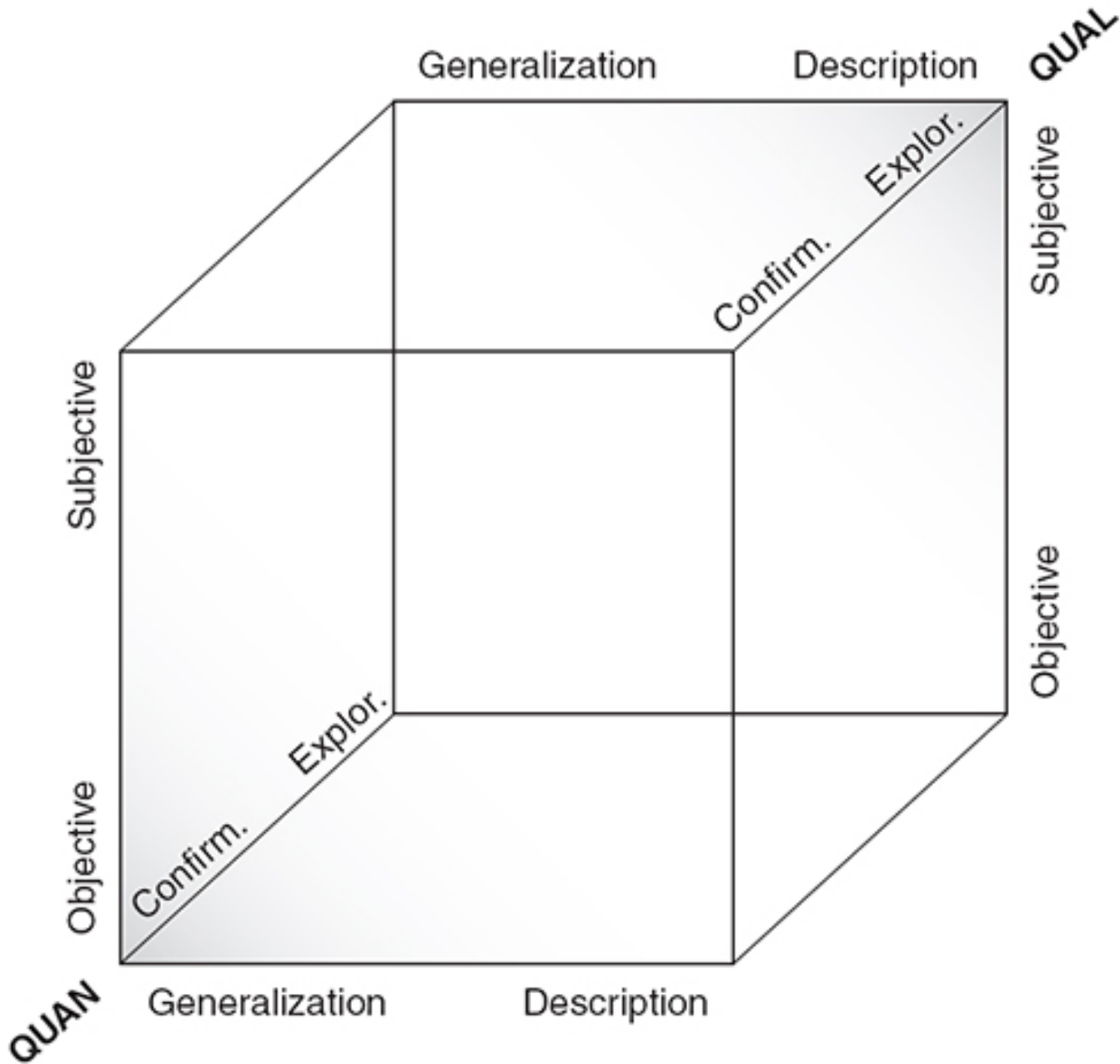
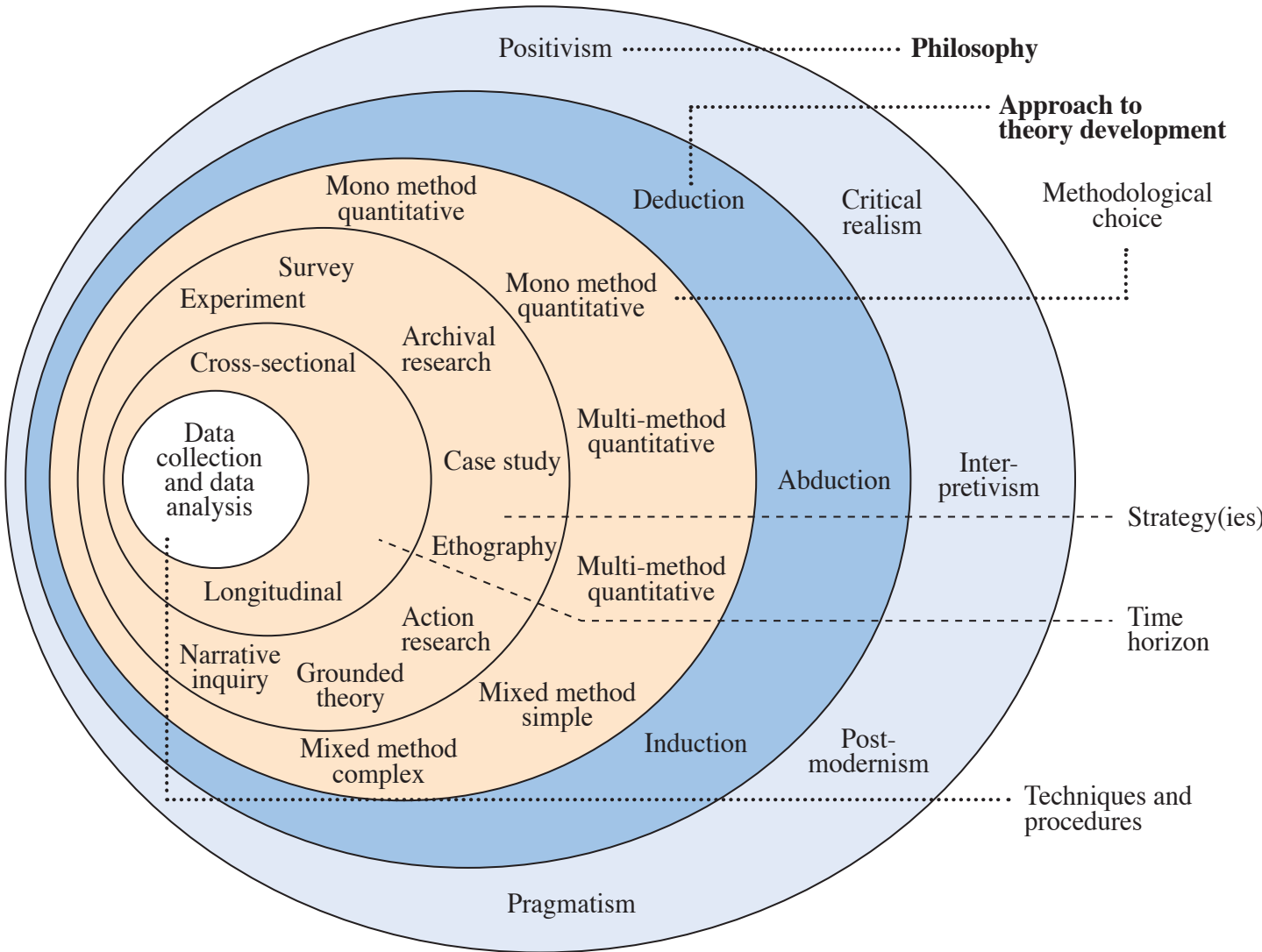
For each version, note down whether you think...:

- ...that the right circle moved on its own
- ...that the left circle caused the right one to move



- No single method is perfect
- Use more than one research approach to address the same question and triangulate their findings
- Takeaway: When you read the research article, notice the inherent limitation of the strategies that are used

Summary

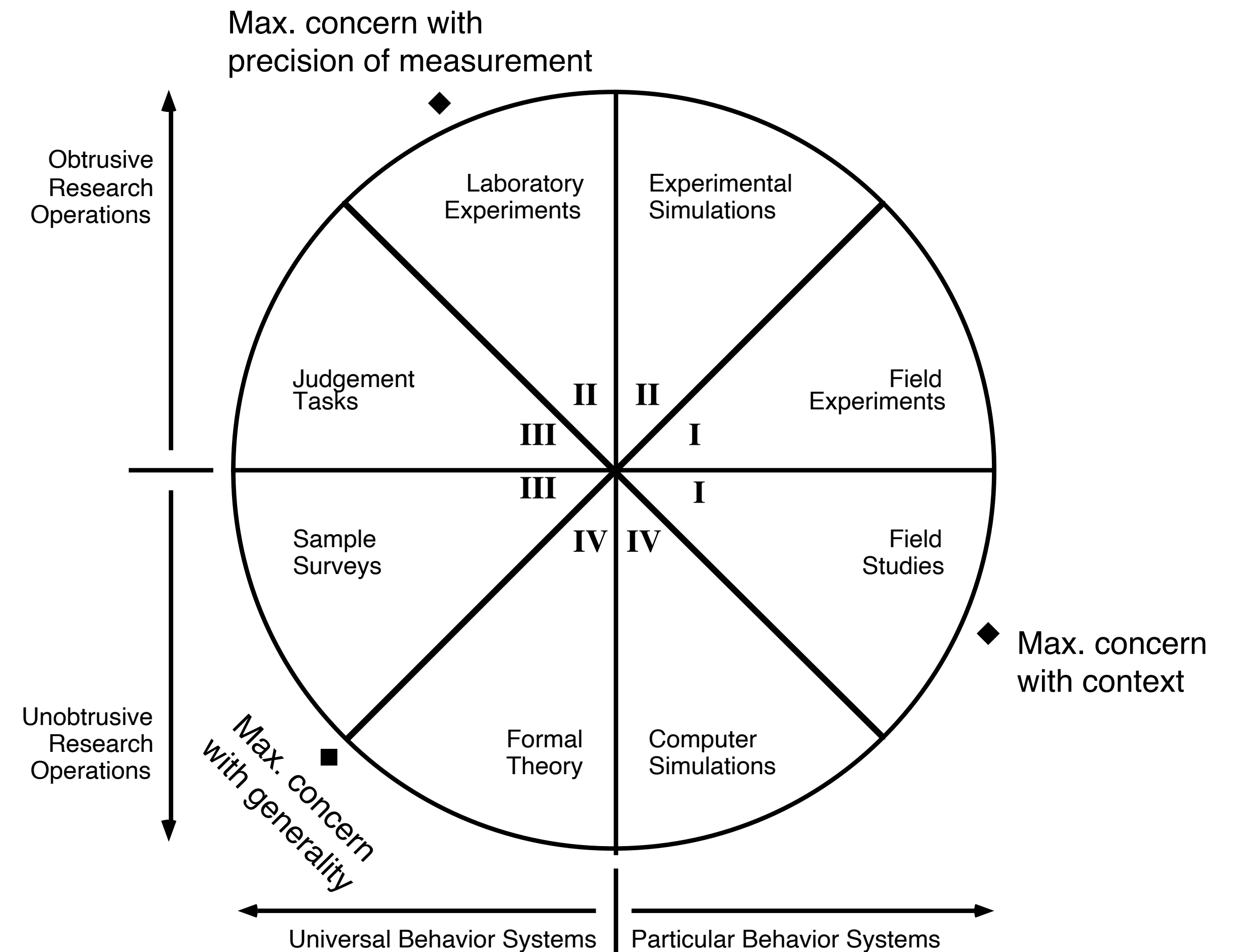


Reading assignment

McGrath (1995) Methodology Matters

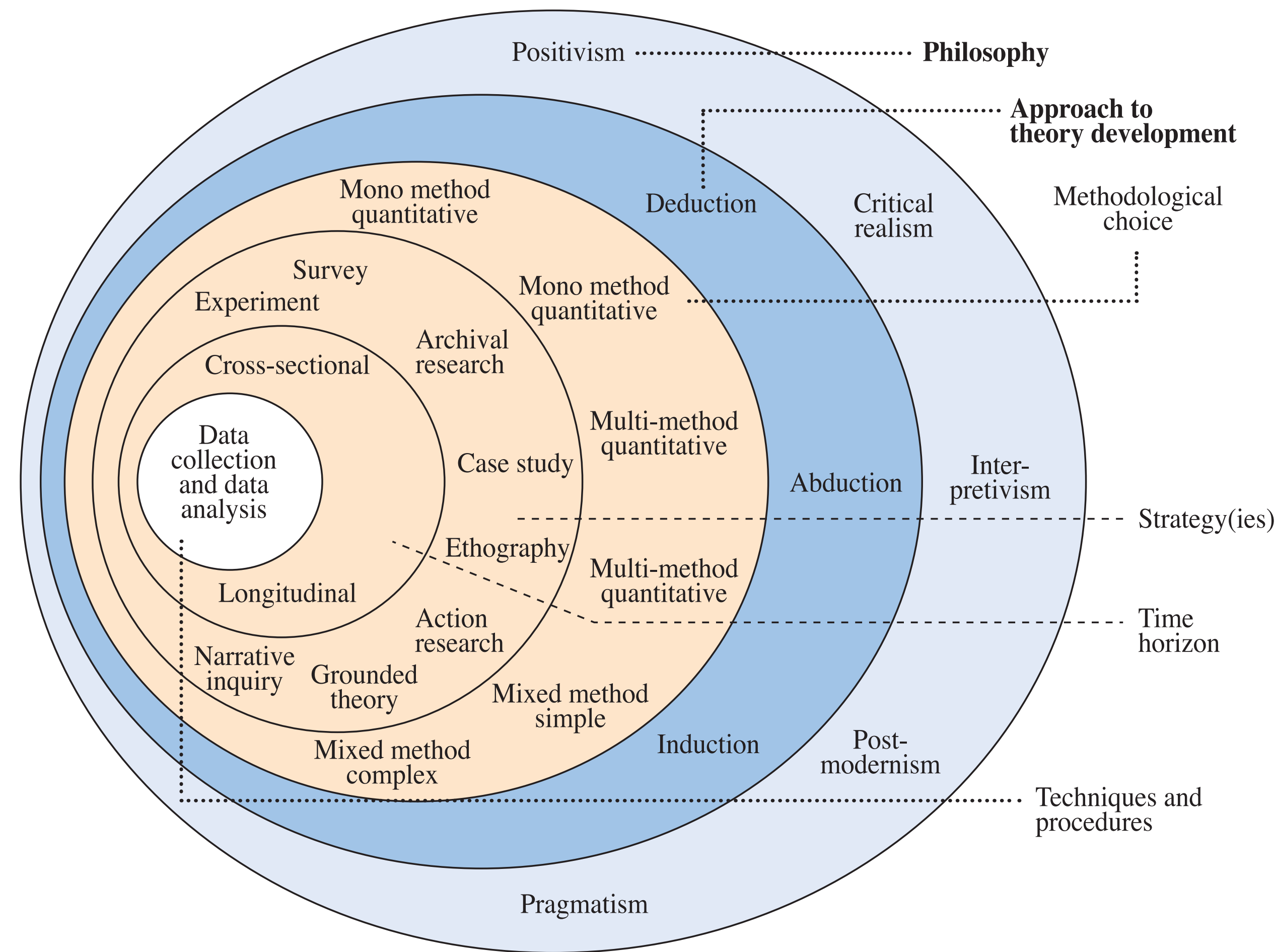
DOMAINS

LEVELS	SUBSTANTIVE	CONCEPTUAL	METHOD- OLOGICAL
ELEMENTS	Phenomena	Properties	Modes of Treatment
RELATIONS	Patterns	Relations	Comparison Techniques
EMBEDDING SYSTEMS	Ongoing systems [e.g. human-computer systems]	Conceptual Systems (e.g., field theory)	Research Strategies (e.g. laboratory experiment)



Reading assignment

Saunders et al. (2016)



Reading assignment

Reading assignment set 1

Read before working on Assignment 1

- McGrath1995 - Methodology Matters
 - Read the first 10 pages and skim pages 11–15
- Guiding questions:
 - What are the differences between the three "domains" shown in Figure 1?
 - What are the generalizability, precision, and realism criteria? How do they relate? (p. 8 and Figure 2)

Read by March 21

- Saunders2016 - Research Methods for Business Students (Chapters 4–5):
 - Chapter 4 is likely to need reading and re-reading.
 - Chapter 5 is probably easier to read. Some elements may be already familiar to you.
- Guiding questions:
 - What comprises research philosophies?
 - What are the relationships between research philosophy and research methodology?
 - What are the differences between ontology, epistemology, and axiology?
 - Which research philosophy are you familiar with?
 - Which research philosophies are new to you?

Course Materials

Search 

Materials / 99 - Readings

☐ Name ▲

☐  01 - McGrath1995 - Methodology matters.pdf

☐  02 - Saunders2016 - Chapters 4–5.pdf

  Reading assignment set 1.md

Checklist

- Schedule a meeting with Chat: <https://calendly.com/chat-wacharamanotham/or-course-meeting-with-chat>
- Do the reading assignments
- Do Assignment 1