Theory Building

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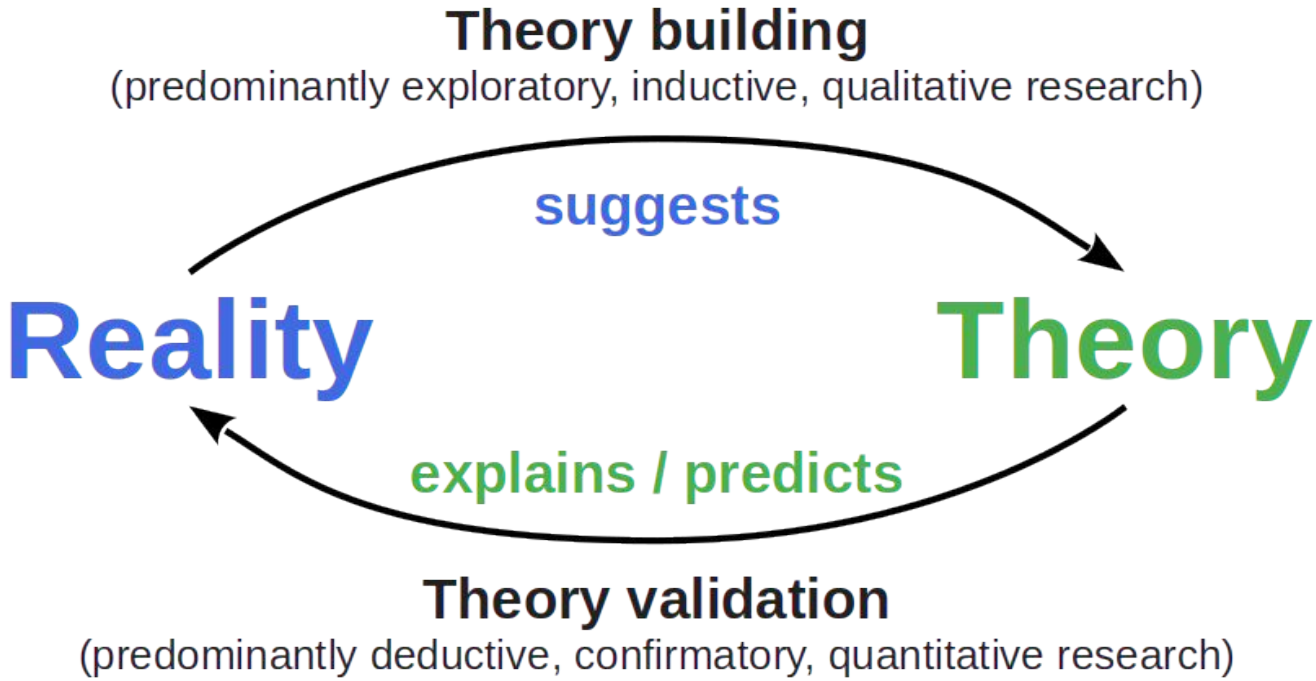
Agenda

1. Theory building
2. Qualitative research
3. Example methodologies
4. Multi-method research
5. Mixed-methods research
6. Quality assurance

1. Theory Building

The Logic and Process of Science (Recap)



Purpose of Theory Building

The purpose of scientific theory building is to

- Create, build out, and evaluate a theory that
  - Correctly explains and/or predicts reality
  - Can can be continuously tested
  - In a cost-efficient way

Types of Research Questions Answered

Explanatory questions like how, why?

- Questions that lead to a theory

Not: Whether something is the case

Theory Building Research

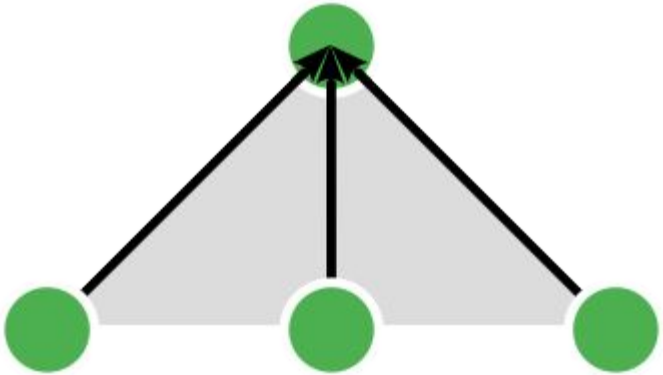
Theory building research is

- Exploratory
- Inductive
- Qualitative

Inductive Reasoning

Inductive research is based on **inductive reasoning** which is

- Abstracting from data by recognizing patterns and drawing conclusions

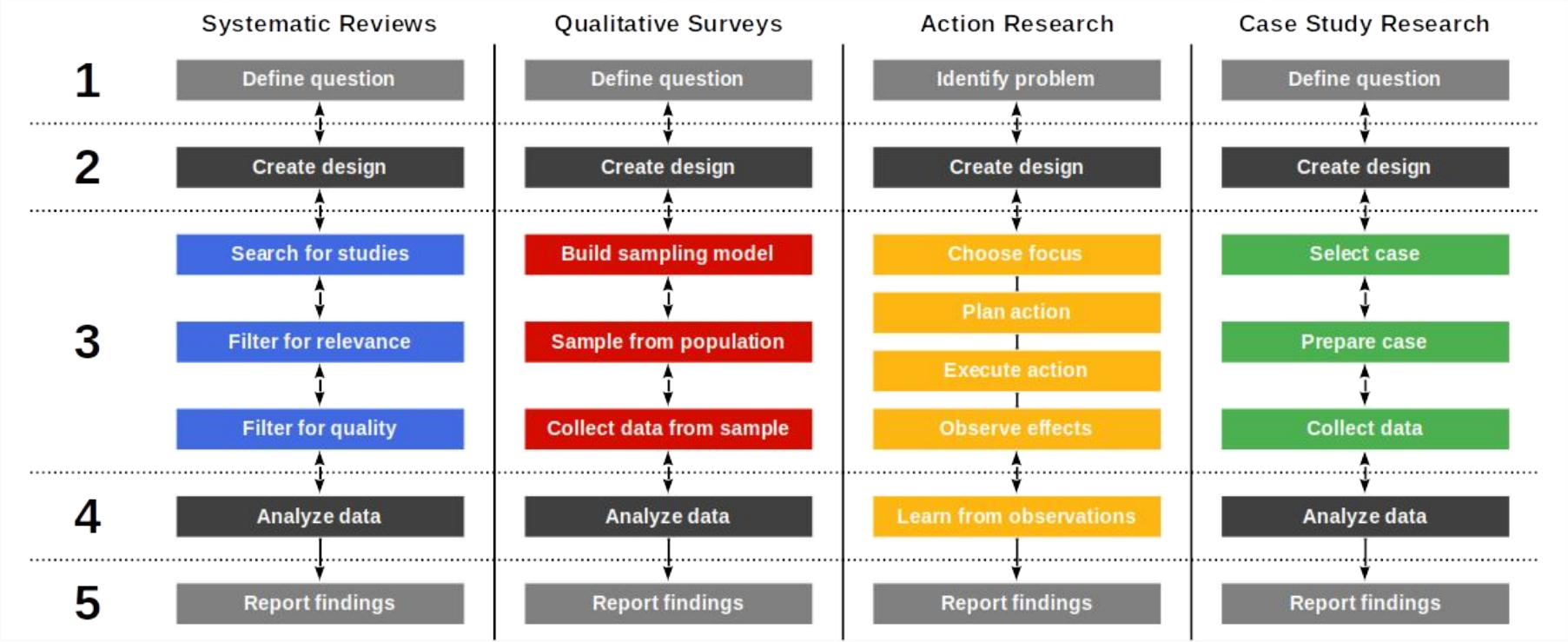


Theory Building Process

The **theory building process**

- Is iterative
- Is incremental
- Mitigates risk
- Never ends

Theory Building Processes by Methodology



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What Makes a Good Theory? [1]

1. Testability
   - The degree to which empirical refutation is possible
2. Empirical support
   - The degree to which empirical studies support the theory
3. Explanatory power
   - The degree to which all known observations can be explained
4. Parsimony
   - The theory's simplicity
5. Generality
   - The theory breadth and width
6. Utility
   - The theory applicability

[1] See Sjoberg et al. (2008): Building theories in software engineering

2. Qualitative Research

Base Terminology (Recap)

Researchers use a research methodology

- Recap: A start-to-finish framework for performing theory building

To create a research design

- Recap: A process description for answering a research question

That utilizes research methods

- Recap: A method answering a type of research question

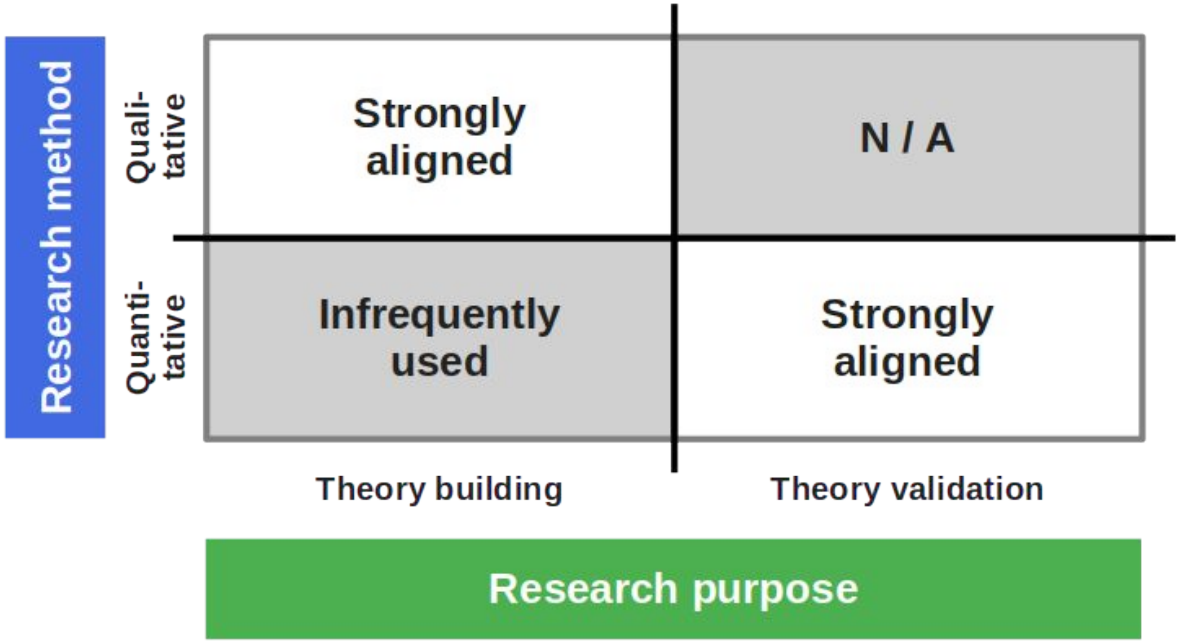
Which combine research practices

- Recap: A way of doing something with a defined outcome

What Makes a Research Design a Qualitative Design?

1. The **theory building** purpose
2. The use of **theoretical sampling** in data collection
3. The acquisition and use of **qualitative data**

Qualitative vs. Quantitative Research Methods (Recap)

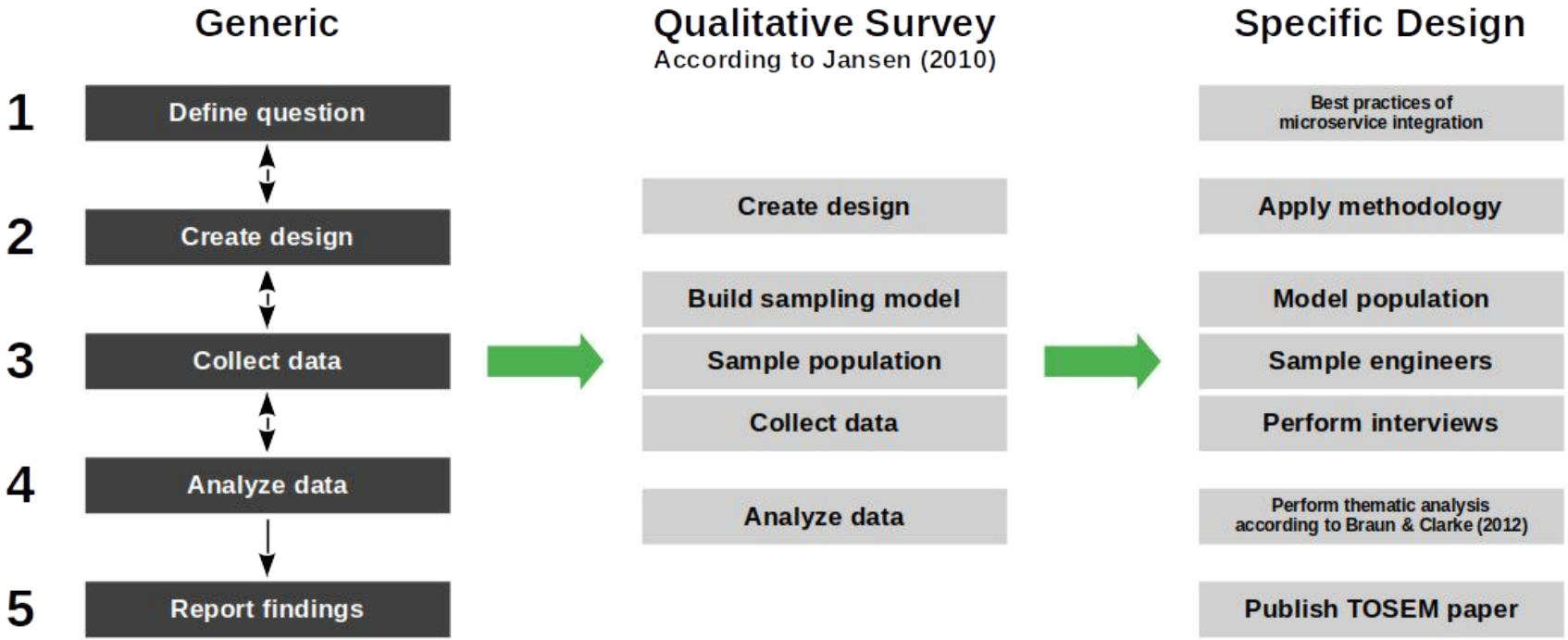


Example Qualitative Research Methodology (Recap)

The **qualitative survey** according to Jansen (2010)

1. Write research protocol
2. Build sampling model
3. Sample for theory building
4. Perform interviews
5. Analyze transcriptions
6. Determine saturation
7. Iterate or conclude

Example Research Design Refinement



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3. Example Methodologies

Research Methodologies

Main categories

- **Systematic survey [1]**
- **Qualitative survey [2]**
- **Action research**
- **Case study research**
- Grounded theory
- Ethnographies

Not a methodology

- Introspection

[1] Most commonly: Literature survey
[2] Most commonly: Interview study

Action Research

Action research is a research methodology in which the researcher

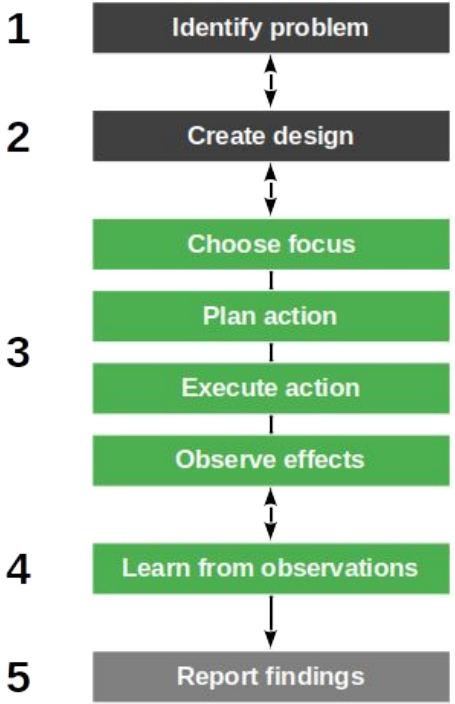
- Applies a theory being built to help create a desired outcome
- Evaluates the theory as to its trustworthiness

Participatory action research is action research in which the researcher

- Joins a case (organization) to work side-by-side with practitioners

The Action Research Process

1. Identify (research) problem
2. Create research design
3. Perform action
   a. Choose focus
   b. Plan action
   c. Execute action
   d. Observe effects
4. Learn from observations



Example Action Research Methodologies

- Lewin (1946): Action research
- McIntyre (2007): Participatory action research
- Kemmis et al. (2014): Critical participatory action research

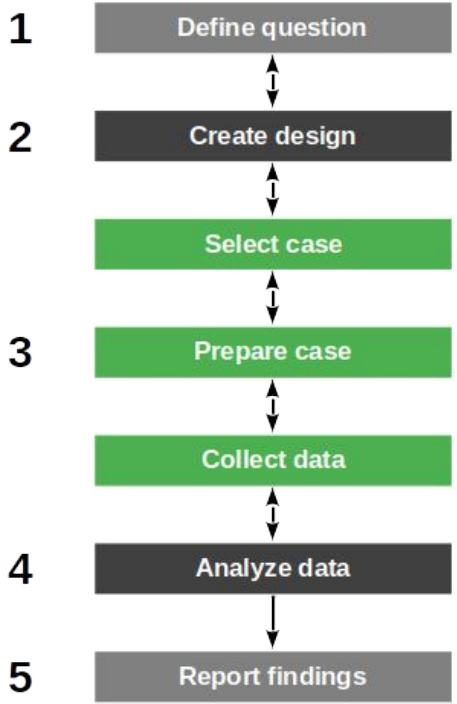
Case Study Research

Case study research is a research methodology in which the researcher

- Investigates a (contemporary) phenomenon it its original context
- Where the boundaries between phenomenon and context are blurry

Case Study Research Process

1. Define research question
2. Create research design
3. Iterate over
   a. Select case
   b. Prepare case
   c. Collect data
   d. Analyze data
4. Report findings



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Example Case Study Research Methodologies

- Eisenhardt (1989): Case study research
- Yin (2009): Case study research
- Runeson et al. (2012): Case study research in software engineering

Research Paradigms

- Analytical research
  - Research is detached; goal is understanding
- Action research [1]
  - Research is involved; goal is improving
- Design science research
  - Research is applied; goal is innovation

[1] Using the same name for research paradigm and methodology category

4. Multi-Method Research

Multi-Method(ology) Research Designs

A **multi-method research design** is a research design that

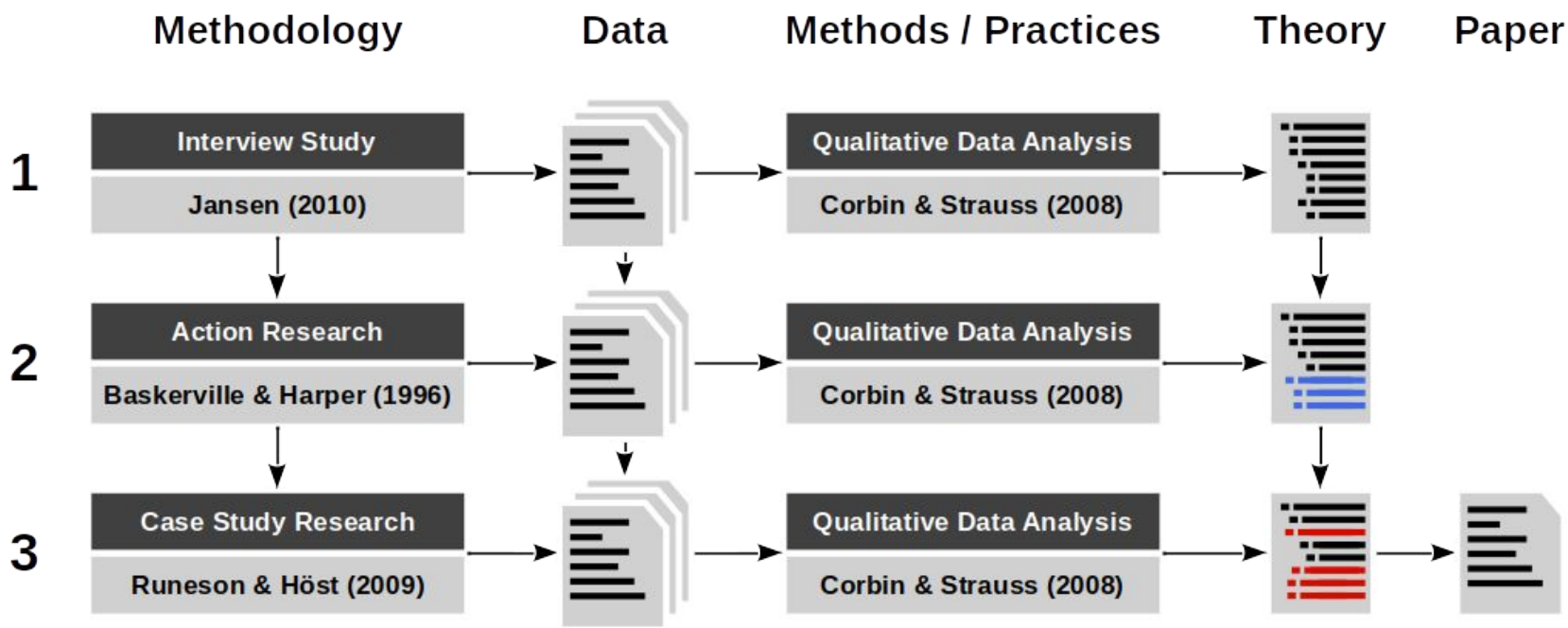
- Uses multiple methodologies and methods
- Within either theory building or validation research

Example Multi-Method Research Design

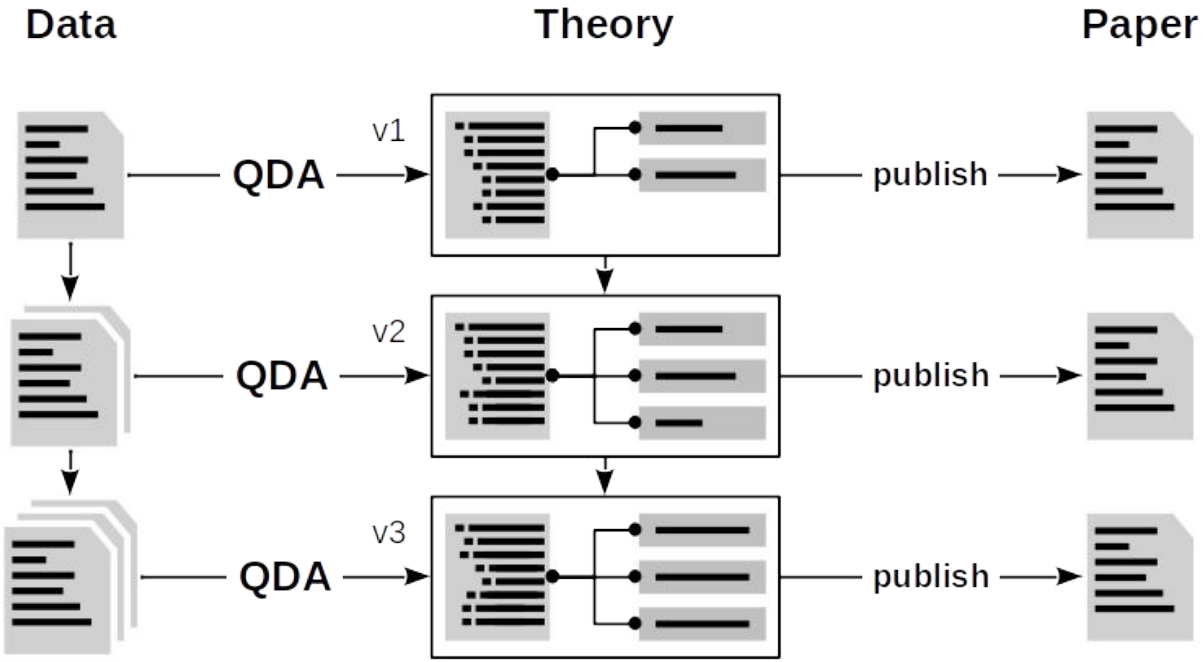
Best practices of microservices integration

1. Theory creation
    a. Jansen (2010): The qualitative survey
2. Theory build-out
    a. Baskerville & Harper (1996): Participatory action research
3. Theory evaluation
    a. Runeson & Höst (2009): Case study research

Theory Building and Triangulation Using Multiple Methods



The Importance of Qualitative Data Analysis



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5. Mixed-Methods Research

Mixed-Methods Research Design

A **mixed-methods research design** is a research design that

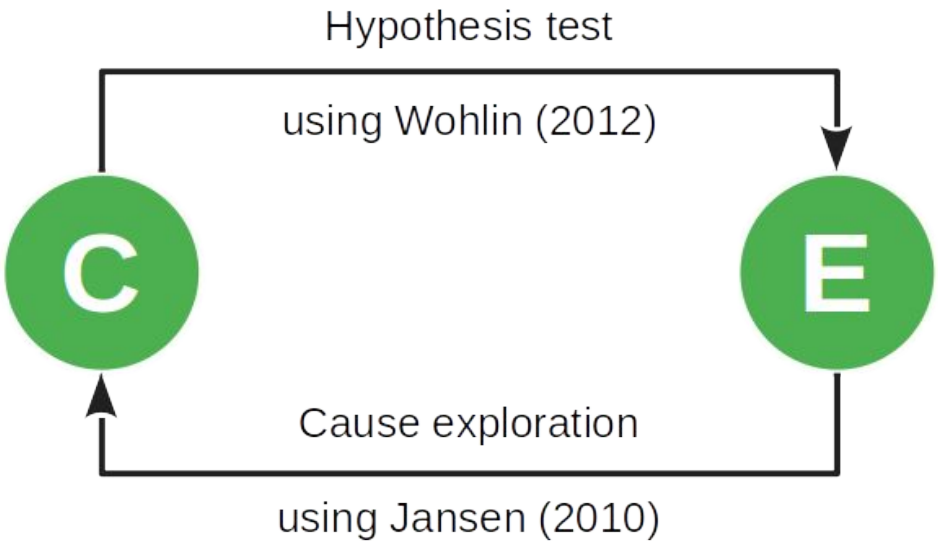
- Combines qualitative with quantitative research methods

Example Mixed-Method Research Design

Novel programming language feature

1. Hypothesis creation
   a. Jansen (2010): The qualitative survey
2. Hypothesis test
   a. Ko et al. (2015): Controlled experiment
3. Theory building
   a. Jansen (2010): The qualitative survey

Causal Analysis / Correlation and Causation



6. Quality Assurance

Quality Criteria for Research Methods (Recap)

Intuition	Qualitative research	Quantitative research
Truth value	**Credibility**	Internal validity
Applicability	**Transferability**	External validity
Consistency	**Dependability**	Reliability
Neutrality	**Confirmability**	Objectivity

Trustworthiness

Credibility is

- The degree of confidence in the truth of the findings

Transferability is

- The degree to which findings can be transferred to another context

Dependability is

- The degree to which findings are stable over time

Confirmability is

- The degree to which the findings can be confirmed by other researchers

Establishing Quality (Not Assuring it)

Quality in qualitative research is “established”

- Quality is proactively baked into the methods

Practices for Establishing Quality [1]

Credibility

- Prolonged Engagement
- Persistent Observation
- (Different forms of) triangulation
- Peer debriefing
- Negative case analysis
- Referential adequacy
- Member-checking

Transferability

- Thick description

Dependability

- Inquiry audit

Confirmability

- Confirmability audit
- Audit trail
- Triangulation
- Reflexivity

[1] See Guba & Lincoln (1982): Naturalistic inquiry.

Summary

1. Theory building
2. Qualitative research
3. Example methodologies
4. Multi-method research
5. Mixed-methods research
6. Quality assurance

Thank you! Any questions?

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