Case Study Research

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Agenda

1. Case study research
2. Research design
3. Research execution
   a. Case preparation
   b. Data collection
   c. Data analysis

4. Evaluation case studies
5. Quality assurance

1. Case Study Research

Case Study Research

A **case** is

- A contemporary phenomenon in its real-world context

A **case study** is

- An empirical in-depth investigation of a case

Case study research is

- Theory building using case studies

Properties of Case Study Research

Case study research

- Works even if phenomenon and context are intertwined
- Uses multiple sources of evidence in order to triangulate results
- Benefits from the prior development of theoretical propositions

The sweet spot are contemporary phenomena, but

- Historical cases are possible

The Case Study Research Process

Case study research is linear yet iterative

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

1 Define question
2 Create design
Select case
3 Prepare case
Collect data
4 Analyze data
5 Report findings

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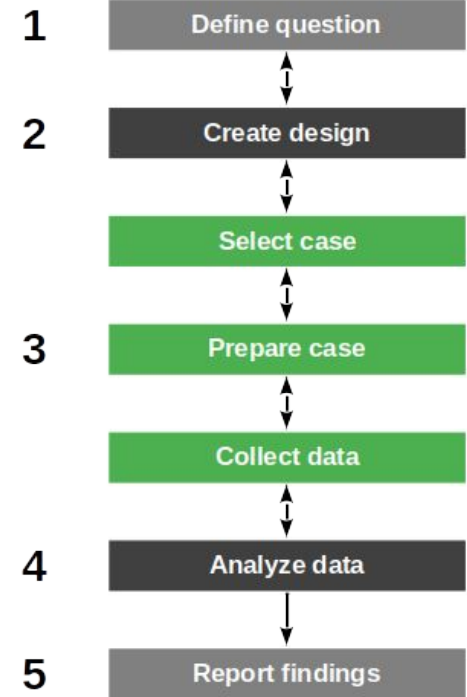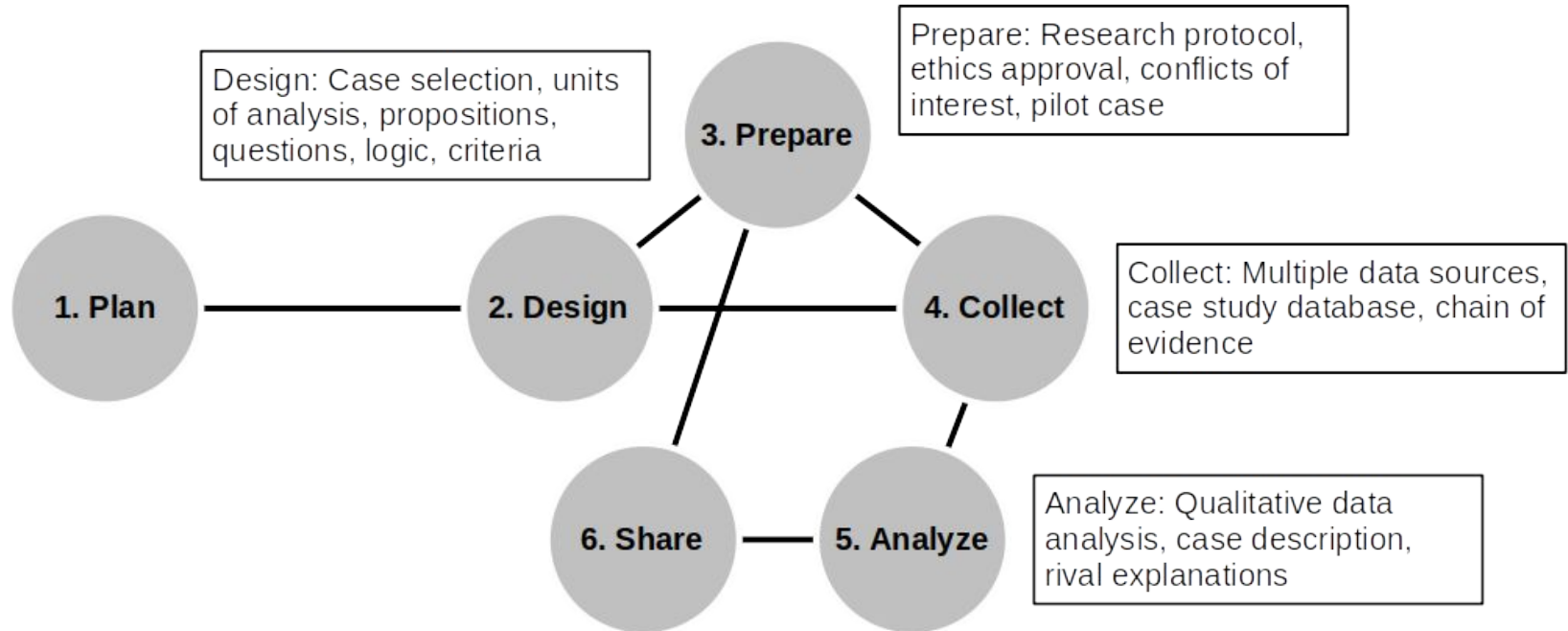
Case Study Research Methodologies

General case study research

- Yin (2009)

Case study research in software engineering

- Runeson et al. (2012)

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The Case Study Process (Yin, 2009)

Design: Case selection, units of analysis, propositions, questions, logic, criteria

Prepare: Research protocol, ethics approval, conflicts of interest, pilot case

Collect: Multiple data sources, case study database, chain of evidence

Analyze: Qualitative data analysis, case description, rival explanations

1. Plan
2. Design
3. Prepare
4. Collect
5. Analyze
6. Share

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NYT (2024) vs. Yin (2009)

NYT (2024)	Yin (2009)
Define question	Plan
Create design	**Design**
Select case(s)	**Design**
Prepare case	Prepare
Collect data	Collect
Analyze data	Analyze
Report findings	Share

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Types of Case Study Research (Yin, 2009)

Descriptive case study

- Collects, analyses, and presents cases for documentation purposes

Exploratory case study

- Investigates cases for theory building and hypothesis generation

Explanatory case study

- Tries to establish causal relationships between constructs

2. Research Design

Case Study Research Design

Components of a case study research design

1. The research questions
2. The propositions, if any
3. The unit(s) of analysis
4. The data-to-proposition linking logic
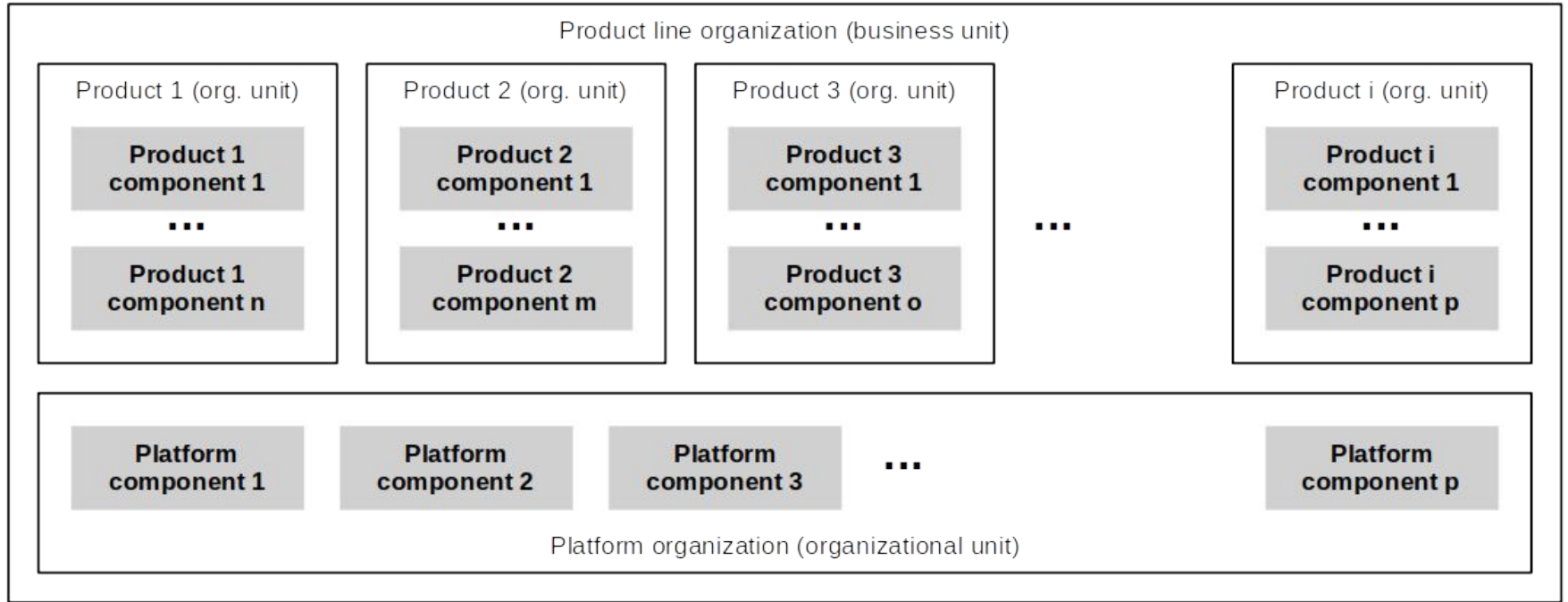5. The interpretation criteria

Example Exploratory Research Question

Problems in Product-Line Engineering (PLE) [1]

- What are current problems in product line engineering and why?

Purpose is building an early theory

[1] Riehle et al. (2016): Inner source in platform development.

Product-Line Engineering

Unit of Analysis

A **unit of analysis** is

- A construct being analyzed

Units of analysis can be

- Tangible (e.g. people, products)
- Intangible (e.g. theoretical constructs like group dynamics)

In the simplest case (no pun intended), the case is the unit of analysis

Example of (Potential) Units of Analysis

Problems in product-line engineering

1. The overall business unit
2. The product organizational units
3. The platform organizational unit
4. The business unit leader
5. Engineering managers
6. Architects / developers

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Dimensions of Case Study Research Design 2 / 2
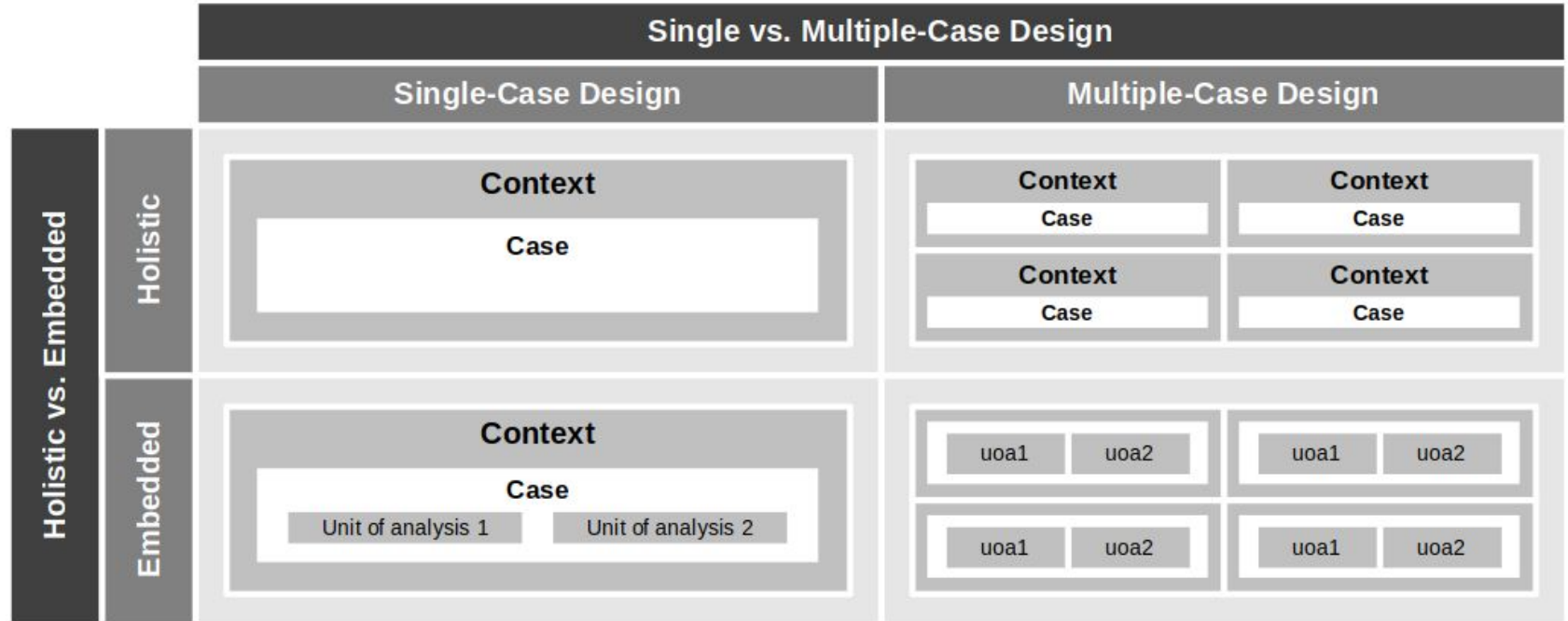
Single-Case Case Study Research

Types of single-case case study research

- The **typical (representative)** case

- Special cases
  - The **critical** case
  - The **unique / extreme** (rare and/or particularly interesting) case
  - The **revelatory** case

- The **longitudinal** case

Multiple-Case Case Study Research

Case replication

- Theoretical replication to contrast and extend findings
- Literal replication to strengthen findings

Example of Multiple-Case Case Study Research

	Case 1	Case 2	Case 3
Domain	Business	Healthcare	Telco carrier
Age of platform	> 10 years	> 10 years	> 10 years
Number of developers	> 500 developers	> 500 developers	> 500 developers
Distributed (yes/no)	No (same campus)	Yes (same metro area)	No (same campus)
Developer population	Homogeneous	Homogenous	Homogenous
Organization	Profit / cost center	Profit / cost center	Profit / cost center
Age of company	> 20 years	> 20 years	> 20 years
Size of company	> 1000 developers	> 10000 developers	> 10000 developers
Case sponsor	Business owner	Platform organization	Internal consulting group

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Example Process Plan
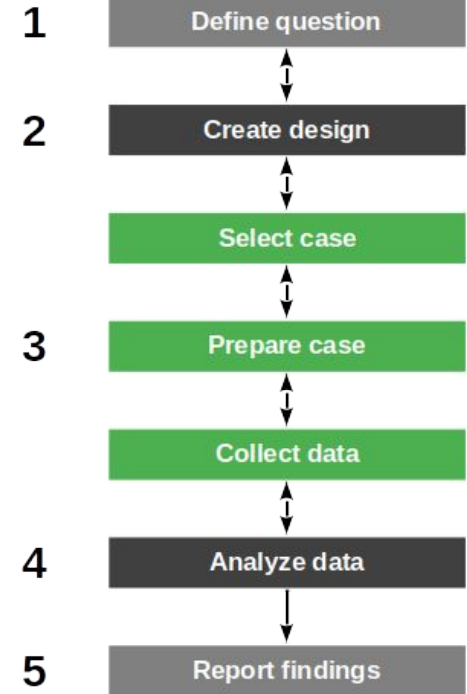
Case 1 → case 2 → case 3

- Incremental build-out

3. Research Execution

Case Study Research Execution

Iterate over

1. Select case
2. Prepare case
3. Collect data
4. Analyze data

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Case Selection

Select case from process plan

- As long as saturation is not reached or
- No cases are left

Example case selection

Problems in product-line engineering

- Case 1 → case 2 → case 3

Case Preparation

Prepare as laid out in research protocol

- Inform participants
- Prepare for data collection
- Build case database

Refine as necessary given specific case

Example Case Preparation

We prepared

- Site visits
- Interview guides
- Documents gathering

Data Collection

Perform data collection as planned in protocol, for example,

- Direct observation ("shadowing")
- Participant observation
- Participant interviews
- Additional materials gathering

Example Data Collection

	Case 1	Case 2	Case 3
Date	2012	2013	2013
No. interviews	11	6	4
No. workshop notes	5	None	3
Additional materials	Yes	Yes	Yes

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Examples of Additional Materials

Case materials

- Letters
- Calendars
- Meeting minutes
- Workshop notes
- Admin. documents
- Progress reports
- Written reports
- …

Archival materials

- Public records
- …

Physical artifacts

- Works of art
- Tools and devices
- Furniture
- …

Data Analysis

Data analysis depends on the type (and hence purpose) of the case studies

1. Descriptive case study research
   - Little to no analysis

2. Exploratory case study research
   - QDA for theory building

3. Explanatory case study research
   - QDA linking data to propositions

windows [Running] - Oracle VM VirtualBox

F:\FORSCHUNG\ARCHIVE 2012\OPEN SOURCE DEVELOPER COMPETENCIES\Analysis NK DR v120622 Codesystem.mx5 - MAXQDA 11 (Release 11.0.2)

Project   Edit   Documents   Codes   Summaries   Memos   Variables   Analysis   Mixed methods   Visual tools   Windows   MAXDictio   Toolbars   ?

Document Browser: Entwickler\Transkript Hahn - Korrigiert Riehle

Documents	555
Entwickler	276
Transkript Hahn - Korri...	104
Interview Marowsky-Br...	172
Entwicklungsleiter	125
Interview Gohmann - K...	0
Istinie Interview Transk...	125
Personalverantwortliche	154
Transkription Bischoff - ...	0
2011-11-02 - Nadine Pi...	154
Sets	0

Code System	555
Committrechte drücken Ve...	1
Kunde ist König	1
Draht zu anderen Committ...	1
Zunehmende Bedeutung v...	1
Bedeutung Open-Source f...	0
Einfluss auf Produkte ...	2
Open-Source-Engage...	1
Branchenkenntnisse	2
Kompetenzentwicklung du...	2
Verantwortungsbewus...	1
Beiträge zu einer unbe...	1
Schnelle Einarbeitung i...	1
Auseinandersetzung ...	1
Kommunikationsfähigke...	1

15 H: Das habe ich von mir aus gesagt, das stand auch in der Bewerbung drin, weil es ist eben schon eines der größeren und bekannteren Projekte und damit kann man auch hausieren gehen will ich es mal nennen. Von daher ist es natürlich immer so das Problem, das andere eben auch an der Uni eben viel mit Open Source gearbeitet Linux eben auch als Betriebssystem hatten. Wir hatten eine Arbeitsgruppe damals gemacht, wobei da natürlich das Problem war, man hat gesagt okay Sie waren jetzt acht Jahre an der Uni, was haben Sie eigentlich gemacht? Wie sieht das jetzt eigentlich mit Industrieerfahrung aus oder so etwas. Von daher war es also auch gehaltsmäßig erstmal ein Rückschritt oder so was. In der Uni habe ich mehr verdient, aber das hat sich inzwischen eben auch sehr schnell wieder gegeben.

16 R: Ich wollt grade sagen, das wäre ja ungewöhnlich!

17 H: Ja also am Anfang war es dann erst mal: Ja, okay, da kommt jetzt irgendjemand, Univention kannte mich nicht. Wir haben dann geguckt, was mach ich im Debian Projekt so, wo bin ich vielleicht mal aufgefallen. Wir haben eben hier in der Firma einfach auch, jährlich also halbjährlich setzten wir uns zusammen und gucken eben auch so wie läuft es und da habe ich eben auch die Rückmeldung bekommen. Ja also für einen Uni-Abgänger erstaunlich erfahren sozusagen, ich habe mich auch sehr zügig eingearbeitet, also da war jetzt eben nicht nur theoretisches Wissen, sondern eben auch schon sehr viel Praxiswissen.

18 R: Also man hat Sie als jemanden mit Diplom wahrgenommen trotz ihrer Tätigkeiten an einem Lehrstuhl.

19 H: Ja also das zählt erstmal gar nicht also von daher hab ich eben erst mal angefangen mit gerade

4. Explanatory Case Studies

Explanatory Case Study Research

Tries to identify causal connections between constructs

- By qualitatively evaluating propositions

Thereby evaluates proposed theory
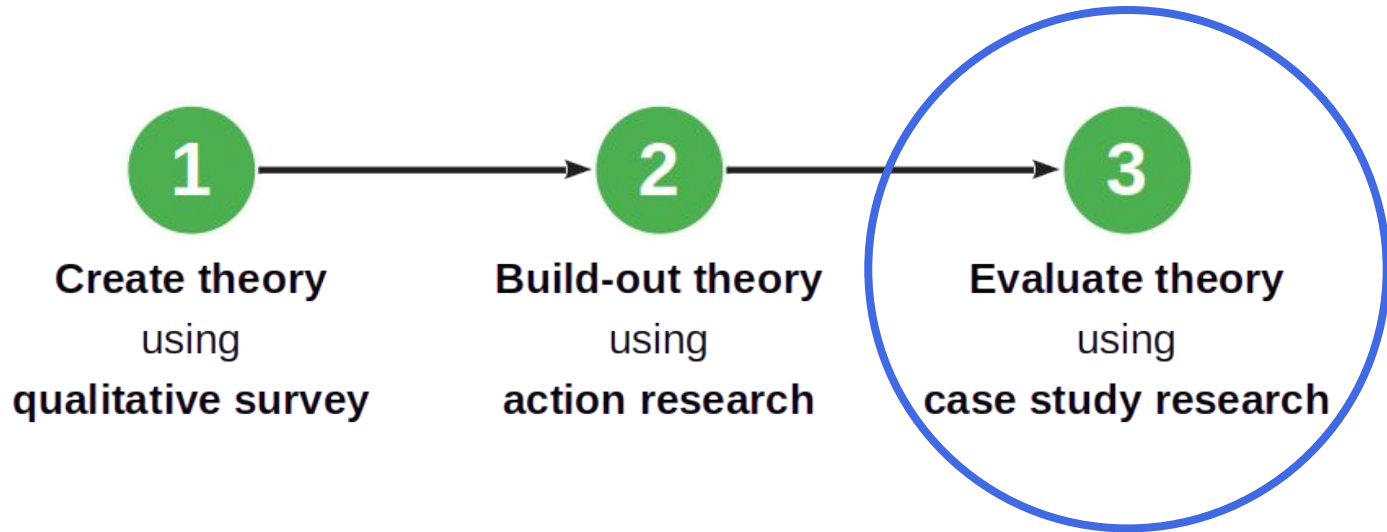
- By poking holes into propositions

Guidelines for Explanatory Case Study Research (Yin, 2009)

Use data triangulation (evidence from multiple types of sources)

Use method triangulation (different methods on same data)

Emphasize rival theories and explanations

Case Study Research in a Larger Research Design

Exploration vs. Explanation Revisited

Exploratory case study research prefers

- Theoretical replication **to go broad**

Explanatory case study research prefers

- Literal replication **to go deep**

Example Explanatory Case Study Research

Inner source platform development [1]

- Is inner source more effective for building platforms? If so, why?

Example Multiple-Case Design With Replication Logic

		Inner source approach (IS)		
		Unit of analysis 1, case 1	Unit of analysis 1, case 2	Unit of analysis 1, case 3
Dedicated organization approach (DO)	Unit of analysis 2, case 1	[1] Direct comparison of IS and DO from case 1	[a] Cross-case 1 + 2 IS analysis	[b] Cross-case 1 + 3 IS analysis
	Unit of analysis 2, case 2	[x] Cross-case 1 + 2 DO analysis	[2] Direct comparison, [i] Replication of case 1	Not planned
	Unit of analysis 2, case 3	[y] Cross-case 1 + 3 DO analysis	Not planned	[3] Direct comparison, [ii] replication of case 1 + 2

Direct comparison = [1], [2], [3]
Cross-case unit-of-analysis comparisons = [a], [b], and [x], [y]
Replication of case analyses = [i], [ii]

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5. Quality Assurance

Quality Criteria According to Yin (2009)

Internal validity

- "Do pattern matching"
- "Do explanation building"
- "Address rival explanations"
- "Use logic models"

External validity

Construct validity

Reliability

…

I am confused. Maybe this applies to case study research that is trying to pose as theory validation research (hypothesis testing). However, this will never meet the rigor of controlled experiments; it is better to use the quality criteria of naturalistic inquiries. [DR]

Quality Criteria Following Runeson et al. (2012)

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Research Methodologies in Comparison
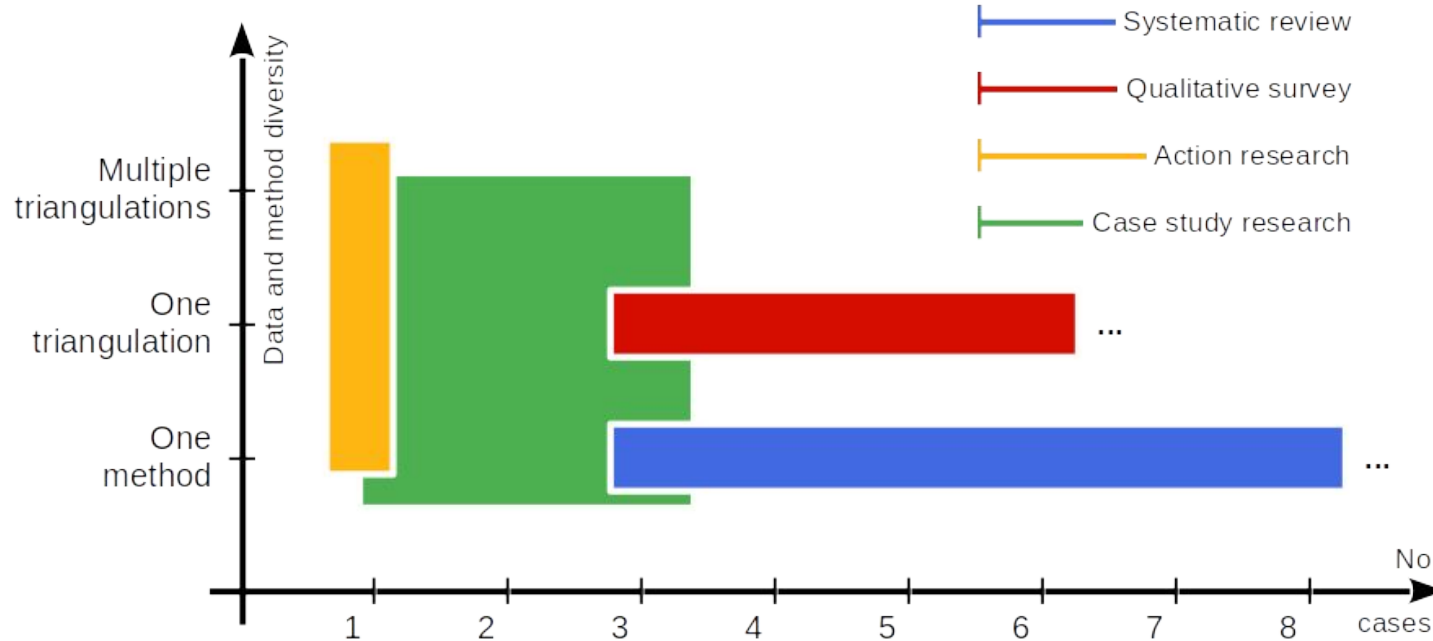
Thank you! Any questions?

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