

# When Grounded Theory **Methodology** is Not Enough

Additions for Video-Based Analyses  
of Software Engineering  
Process Phenomena

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# Qualitative Research in a Nutshell

## The Qualitative Approach:

- **Naturalistic inquiry of a part of social reality**  
(rather than laboratory settings)
- **Open research design & purposeful sampling**  
(rather than fixed plan & random sampling)
- **Holistic perspective & rich data**  
(rather than simple cause-effect measures)
- **Develop/discover theories**  
(rather than test given theories)



## Grounded Theory Methodology:

-  **Theoretical Sampling**
-  **Theory-Oriented Coding**
  - Open Coding (conceptual labels)
  - Axial Coding (interaction model)
  - Selective Coding (narrative, context)
-  **Constant Comparison**
-  **Memo Writing**
-  **Non-Linear Process**  
of data collection, coding, and writing



as summarized by [Przyborski & Wohlrab-Sahr, 2014]

based on [Patton, 2002] & [Flick et al., 2004]

# Motivation for Amending the GTM

- Basic properties and coding perspectives are useful, *but*:
- **Difficulties of applying GTM**
  - Some due to unspecified aspects
  - Others due to assumptions
- GTM alone is not enough → **Additions**

## Our Research Case:



*"Understand how Pair Programming (PP) works"*

(Why? Meta-analysis of PP effects from controlled studies:

Mere tendencies, lot of unexplained variation)

- Next: Five research stages to illustrate **problems** and **solutions**

# Data Collection: Interviews?

## Data for GTM:

- In principle: *"All is data"* [Glaser, 2007]
- Actual: focus on interview transcripts

## Problem:

- Interviews are not naturalistic
- Can practitioners explain their PP process in an interview?



**Solution:** Combine observations and interviews

- Primary: Record PP sessions (screen, audio, webcam)
  - Capture aspects which the subjects are not aware of
  - Repeatable in-depth analyses
  - Less biased than field notes
- Secondary: Reflective interview with pair afterwards
  - Capture subjects' perspective

# Data Collection: "Smash & Grab"? [Dey, 1999]

## Data Collection in GTM:

- Opportunistic, be open, adjust on site
- Save time to not need to come back

Idea: Visit company, record many sessions

## Problem:

- Lack of context makes interpretation difficult
- PP for researcher's sake: not naturalistic
- What about one-off behaviors?



## Solution:

Stay Around & Come Back

- Don't hurry to finish data collection
  - Stay at companies for longer than just main data collection
  - Water cooler discussions with developers
  - Understand company and team climate in which the PP sessions happen
- Involve participants in study
  - Return with results

# Theoretical Sampling

## Theoretical Sampling in GTM:

- When research need arises: collect additional data with special properties
- But: Purposeful sampling *"can also be difficult if you do not have unlimited access to sites, persons, or documents"* [Strauss & Corbin, 1990]

## Problem:

- Building trust with a company takes time.
- Then: How to find a **PP session** with desired properties?



## Solution:

### Data Repository

- Over time: Build stock of reusable data (naturalistic, rich, with context information)
  - Repository **PP-ind**
  - Since 2007: 13 companies, 57 developers in 67 PP sessions, avg. 1:35 hours [Zieris & Prechelt, 2020b]
- Then: theoretical sampling from repository

# Analysis: How to Code?

## Going through Data in GTM:

- Open Coding: label data as to "*what it is*"
- Filter by (implicitly): theoretical sampling, selective coding, theoretical sensitivity

## Problems:

- What am I looking at?
  - Industrial software development is complex, even more with two experts talking about it
- What am I even looking *for*?
- What *is* it that I see?



## Solution:

### Define a Perspective

- 1. Filter:** In which regards do I expect the data to yield insights?
- 2. Epistemology:** What kind of interpretations do I allow myself to make?
- 3. Goal:** What kind of result do I aim for? (e.g. coding scheme or full theory)

[Salinger et al., 2008]

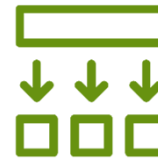
# Analysis: Develop a Theory?

## Goal of GTM:

- Integrated theory with saturated and fully grounded categories
  - from square one to dissertation

## Problem:

- How to integrate work of more than one study and/or researcher?
- Is a full theory really necessary?
  - see ← *Define a Perspective*



## Solution:

### Reusable Concepts

- Develop low-level, generic-but-domain-specific concepts first (this takes time!)
  - Base Layer: ~70 well thought-out concepts, "atoms" of all PP processes [Salinger & Prechelt, 2013]
  - Groundwork for specialized PP topics (e.g. knowledge transfer, decision making)
- Reuse them in later studies when fit
  - Knowledge Transfer Episodes (ESEM '14)
  - Resynchronization Behavior (ICSE-SEIP '16)
  - Overall PP Session Dynamics (ICSE '20)

[Zieris & Prechelt, 2014; 2016; 2020a]



# Filling the Gaps in the Methodology

- Open Aspects in the GTM

- How to perform naturalistic inquiry beyond interviews?

→  Combine Observations & Interviews

- Unclear role of the researcher

→  Stay Around & Come Back

- Assumptions in the GTM

- Access to data

→  Maintain and Sample from Repository

- Easy-to-understand data

→  Define Perspective on Data

- Self-contained research

→  Work with Reusable Concepts

# Thank you!

# References








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- [Zieris & Prechelt, 2020b] [PP-ind: A Repository of Industrial Pair Programming Session Recordings](#) (arXiv:2002.03121 [cs.SE])

# Images

-  Icon "Qualitative research" by Template from the Noun Project
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