When Grounded Theory Methodology is Not Enough

Additions for Video-Based Analyses of Software Engineering Process Phenomena

Franz Zieris
zieris@inf.fu-berlin.de
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

Our Research Case:

"Understand how Pair Programming (PP) works"

(Why? Meta-analysis of PP effects from controlled studies:
Mere tendencies, lot of unexplained variation)

• GTM alone is not enough → **Additions**

• Next: Five research stages to illustrate problems and solutions
Stage 1

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
Stage 2

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
Stage 3

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
Stage 4

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]
Stage 5

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?
  – Unclear role of the researcher

• Assumptions in the GTM
  – Access to data
  – Easy-to-understand data
  – Self-contained research

Combining Observations & Interviews
Stay Around & Come Back
Maintain and Sample from Repository
Define Perspective on Data
Work with Reusable Concepts
Thank you!
On Qualitative Research

[Dey, 1999] Grounding Grounded Theory: Guidelines for Qualitative Inquiry (Emerald Group Publishing)
[Flick et al., 2004] A Companion to Qualitative Research (Sage Publications)
[Tracy, 2010] Qualitative Quality: Eight “Big-Tent” Criteria for Excellent Qualitative Research (Qualitative Inquiry, Vol. 16, Issue 10)

Our Research

[Salinger et al., 2008] A Coding Scheme Development Methodology using Grounded Theory for Qualitative Analysis of Pair Programming (Human Technology: An Interdisciplinary Journal on Humans in ICT Environments, Vol. 4)
[Salinger & Prechelt, 2013] Understanding Pair Programming: The Base Layer (Books on Demand, Norderstedt)
Images

- Icon "Qualitative research" by Template from the Noun Project
- Icon "Pair Programming" by Creative Stall from the Noun Project
- Icon "combine" by vigorn from the Noun Project
- Icon "Switch positions" by Gregor Cresnar from the Noun Project
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