

Ethnographic Methods in Empirical Software Engineering Research

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works as an associate professor at the IT-University of Copenhagen. Her research interests are use oriented design and development of software, and especially the flexibility of software and software processes in order to accommodate the co-development of work practices and technology. She developed an empirical research approach 'Cooperative Method Development' which relates ethnographic research and problem oriented software process improvement.

Her most relevant references are:

- Y. Dittrich, K. Rönkkö, J. Eriksson, C. Hansson, O. Lindeberg Co-operative Method Development - Combining qualitative empirical research with method, technique and process improvement. *Emp. Soft. Eng.* 13 (2008), 231-260.
- Y. Dittrich, M. John, J. Singer, B. Tessem Editorial for the SI on Qualitative Software Engineering Research. *Inf. & Soft. Techn.* 49 (2007), 531-539.
- K. Rönkkö, O. Lindeberg, Y. Dittrich 'Bad Practice' or 'Bad Methods' Are Software Engineering and Ethnographic Discourses Incompatible? *Proceedings of the 2002 International Symposium on Empirical Software Engineering (ISESE), Nara Japan, October 3-4, 2002.*

The slides and contents have been developed together with:



Helen Sharp is Professor of Software Engineering at The Open University, UK. Her research focuses on investigating the human and social aspects of software practice in order to understand, improve and support practitioners. She have been applying ethnographically informed qualitative studies of software practice since the early 1990s. Her perspective is informed by Interaction Design and workplace studies.



Cleidson de Souza is a researcher at the Vale Technological Institute in Belém, Brazil. He is also a faculty at the Federal University of Pará. His main research interest is in understanding how software engineers work collaboratively to develop software. He has been using ethnographic methods in his research since 2002 and has published in leading conferences and journals, including IEEE TSE, ICSE and FSE.

Roadmap

Lecture 1

- What and Why of Ethnography
- Making Use of Ethnographic Methods in Empirical Software Engineering Research

Lecture 2

- Doing Ethnography: More than Hanging Around
- Making Sense of Data
- Translating Findings into Insights

What is Ethnography

Definition of Ethnography

- Greek:
 1. *ethnos* = nation;
 2. *graphein* = write;→ Writing a culture;
- An approach/ research method to allow one to gain an understanding about the informant's point-of-view;
 - The main focus is on the informant's point of view. What is and is not important, relevant, interesting, painful, exciting to the informant. Not to the researcher.
 - The researcher aims to gain this understanding and write about it. Writing is as important as everything else.

Ethnography

Ethnography's hallmark is the notion of participant observation, the idea that you learn about other people's cultural practices by going there, being there, and by doing it with them. Most traditional anthropologists who would consider themselves to be ethnographers have spent years living in other cultures with people, and not just watching what they do, but actually doing it too.

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Ethnography

- Based on participant observation
- Making the implicit *explicit*, so treat the familiar as strange
 - be surprised – don't just see what you expect to see
 - why are activities done that way?
 - who is involved in activities and who is not?
 - stop and reflect
- Be aware of your own assumptions and question what you see

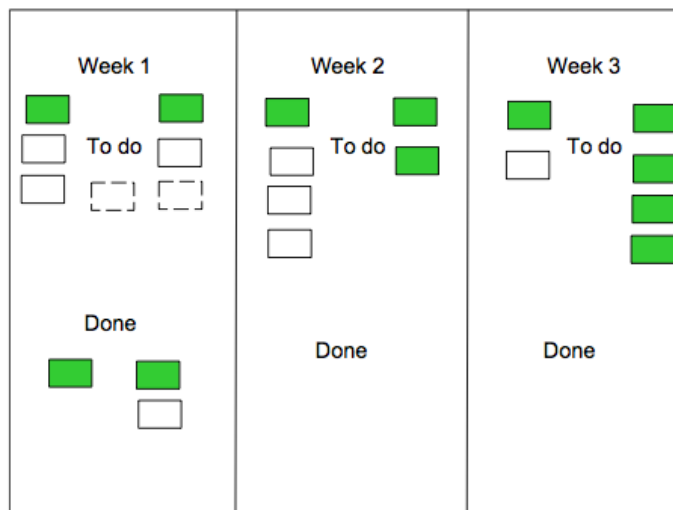


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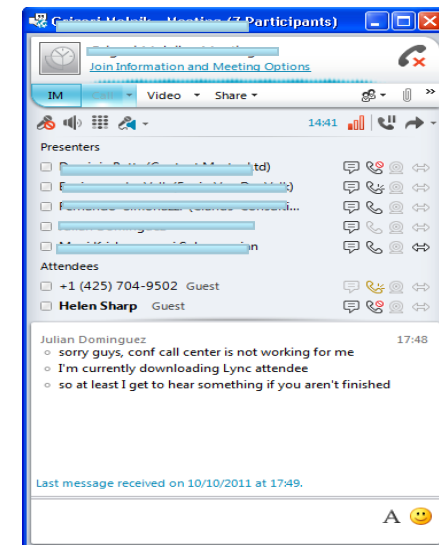
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Example data

Sometimes developers wrote out a new card that was pink in colour and placed it on a separate piece of wall, labelled 'Bugs' with other pink cards. People tended to notice this or remark on it....



(NEW SERVICE)
 I WANT AN AD THAT SHOWS WHAT
 YOU WOULD WIN FOR A £10 BET.
 NOT SHOWING ODDS LESS THAN 4/1
 (ONLY FOR CORRECT SCORE)
 CARLA/DAVID 6/12/01



Why use Ethnography?

Why Use Ethnography

The nature of the enquiry

- Exploratory – no hypotheses or pre-determined questions (but this does not necessarily mean no focus)
- Under-researched area
- Complex environment – want to study practice and situated activity
- To challenge or confirm ‘accepted’ or ‘documented’ account

Why Use Ethnography

Suitable research questions

‘How do software practitioners develop systems using XP?’

rather than

‘Is single programmer coding more productive than pair programming?’

‘Why don’t Financial mathematicians adhere to a company manual of software development practice?’

rather than

‘Does structuring the manual in this way help financial mathematicians produce more lines of code an hour?’

‘What are the characteristics of a technology adoption?’

rather than

‘How did the ideas of Simula develop into Java?’

Making Use of Ethnography For Empirical SE.

Making Use of Ethnography

Understanding the rationalities of SE Practices

Ethnography...

- provides a detailed account of what is taking place,
- highlights the local rationalities of developer's action and behaviour, and thus
- provides a base for process, technique and tool improvement.

Design Research Using Understanding to Inform Tool Design

Making Use of Ethnography

Ethnography and Design

- As mentioned, ethnography is about “writing a culture”. Writing is as important as everything else.
- Then, how to inform the design of [software] tools?
 - A common mistake is to think of the ethnography as a way to provide a list of requirements to be implemented in a [software] tool.
 - “sometimes the point it to point out how things are” [Dourish, 2006];
 - Maybe, the ethnography is one more evidence in a body of evidence.

Making Use of Ethnography

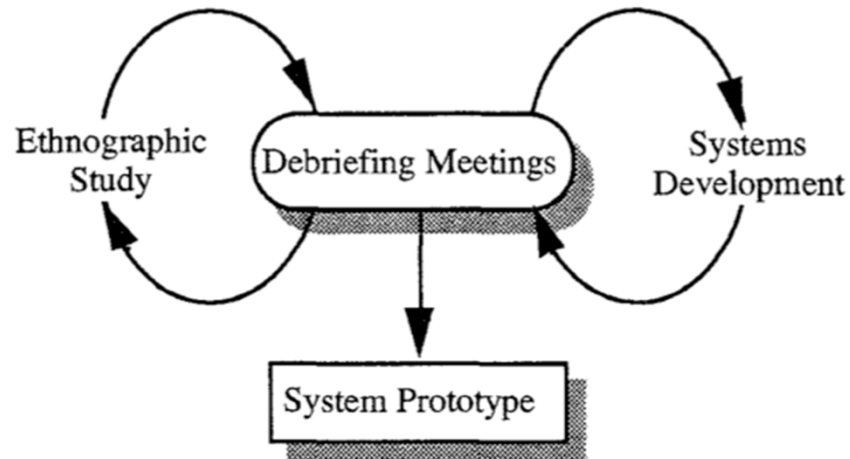
Ethnography and Design (2)

Focus on the “meaning”, not on the details of the ethnography. After all, ethnography is also an **analytical** method;

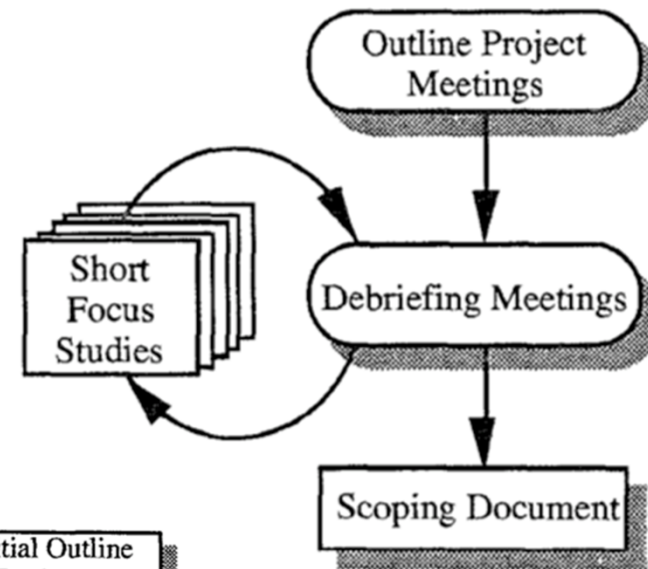
Example: (de Souza and Redmiles, 2008)

- **Details:** Software developers share information about their changes before checking-in their code.
 - Should we integrate CVS with email?
- **Analysis** (“meaning”): developers try to anticipate the impact of their work in their colleagues and even suggest courses of action to minimize this impact.
 - How can I facilitate information sharing among the developers?

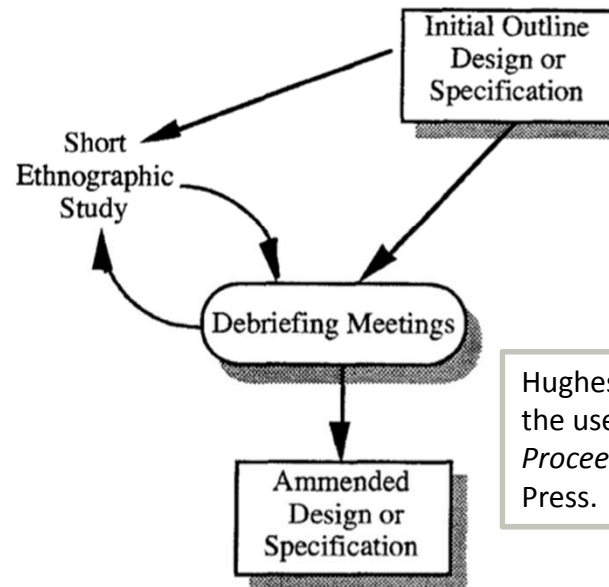
Making Use of Ethnography



Concurrent Ethnography



"Short Term" ethnography



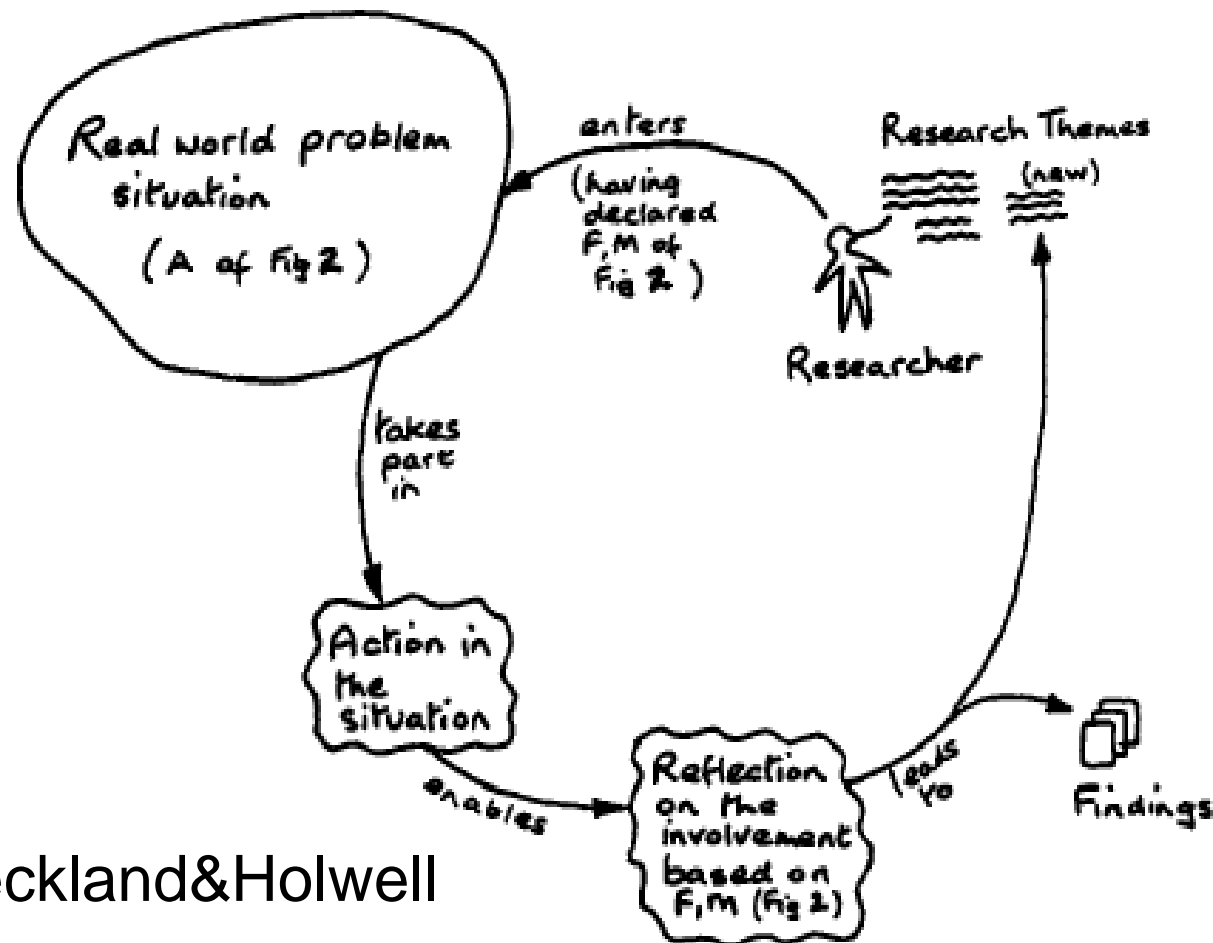
Evaluative Ethnography

Hughes, J. A., et al. (1994). Out of the control room: the use of ethnography in systems design. In *Proceedings of CSCW'94*, Chapel Hill, USA, ACM Press.

Action Research Combining Understanding and Change.

Making Use of Ethnography

Checkland's Action Research Cycle



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Making Use of Ethnography

First experiences with action research

- We entered the organisation as software engineers. The practitioners expected recommendations!
- It became important to whom we reported. We had to answer for our action, even as we only observed.
(Suchman, L, 1995. "Making Work Visible" Comm. Of the ACM 38, 9, 56-64)
- Who are our members, and what do we base our recommendations on?

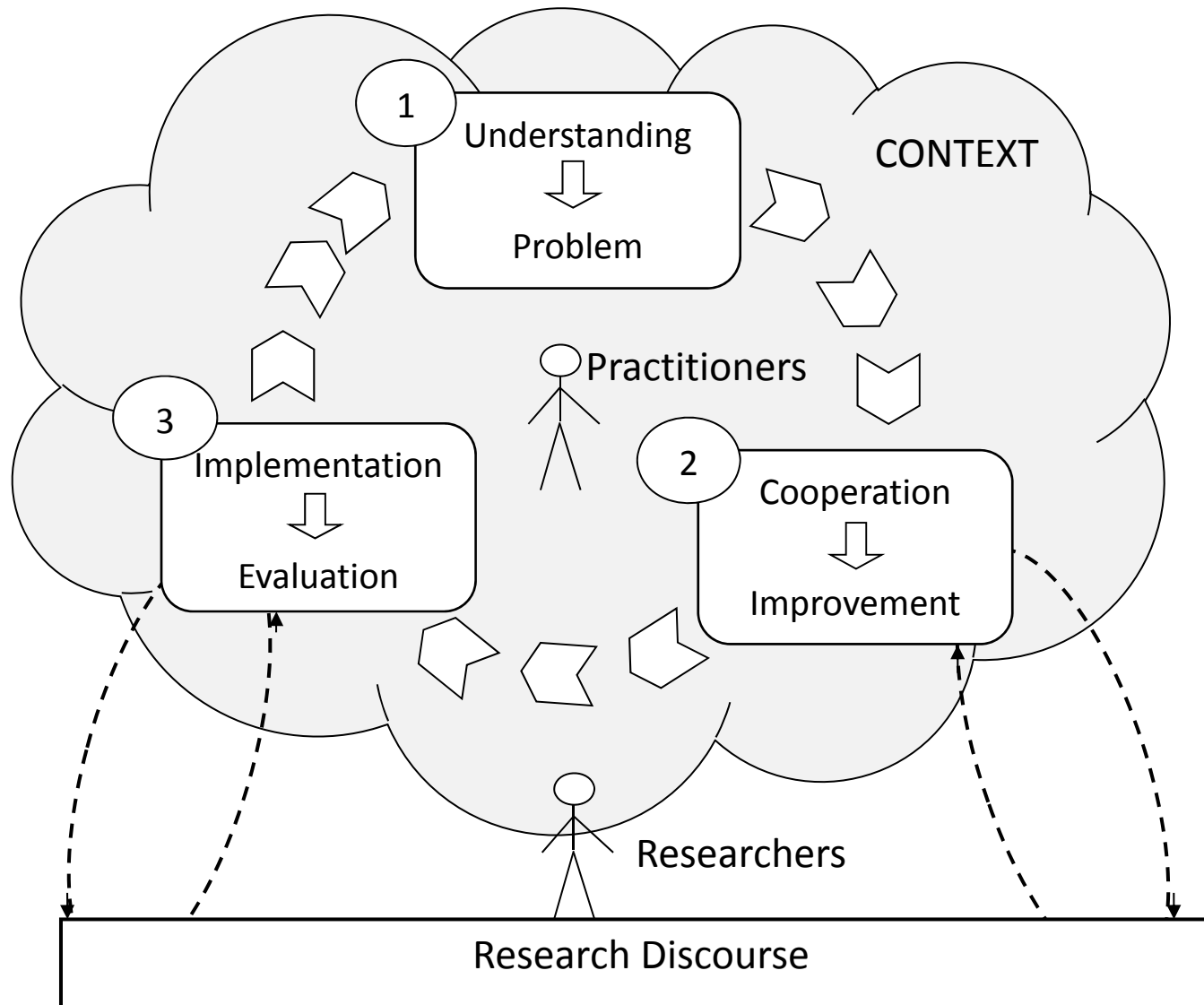
Solution: Making the own role explicit!

Making Use of Ethnography

Cooperative Method Development

1. Action research consisting:
 - Understanding
 - Deliberating Change
 - Implementing and Evaluating Improvements
2. Ethnomethodological and Ethnographical Inspired fieldwork.
3. Focusing on Shop Floor Software Development Practices.
4. Taking the Practitioners Perspective when improving the practice.
5. Deliberating change with the Practitioners involved.

Dittrich, Y., Rönkkö, K., Eriksson, J., Hansson, C., Lindeberg, O. (2008) Cooperative Method Development. Combining qualitative empirical research with method, technique and process improvement. *Empirical Software Engineering* 13, 231-260. .



Thanks to Jeanette Eriksson

Making Use of Ethnography

Case I: Design for Change
together with the IT unit of a Telecom provider

Case II: End-User Tailoring of Infrastructures
together with the same IT unit

Case III: Agile Development for e-Government
together with 2 small consultancies

Case IV: Interaction Design and Software Eng.
UI framework development for mobile devices

Case V: Architecting for Evolvable Software Products for
Hydraulic Simulation Software.

Doing Ethnography: More than Hanging Around.

Doing Ethnography

Key principles

- Don't take anything for 'normal'
 - Question why?
 - Stop and reflect
- Members' point of view
 - Developer themselves – why do that?
- No *a priori* expectations
 - Non judgmental
 - Data analysis and changing plans continuous
- BUT know your focus

Doing Ethnography

Before the main study

- Pilot/pre-study
- Recruiting participants
- Ethical issues
- Complementary methods



OBSERVATION



Doing Ethnography

Types

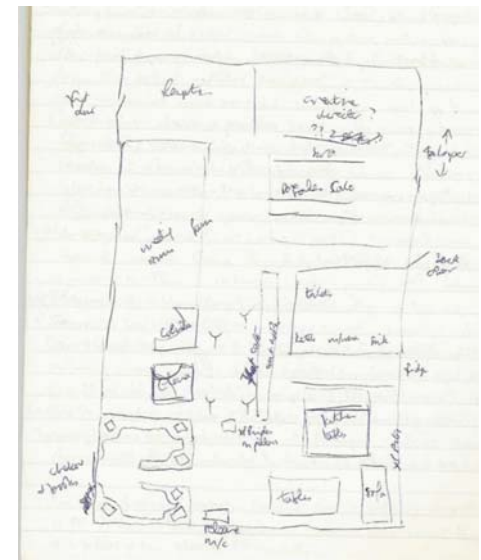
- According to the researcher engagement:
 - Participant: the researcher takes part in the observed activity: writes code, attends meetings, discusses solutions. Example: Sharp et. al. (2004)
 - Non-Participant: the researcher only observes the informants. He is “fly in the wall”. Example: De Souza et. al. (2004);
- In either case, the researcher must document as much information as possible in his/her field notes;

Doing Ethnography

What data to collect? (1)

The following is an illustrative list (Crabtree, 2003, p. 53):

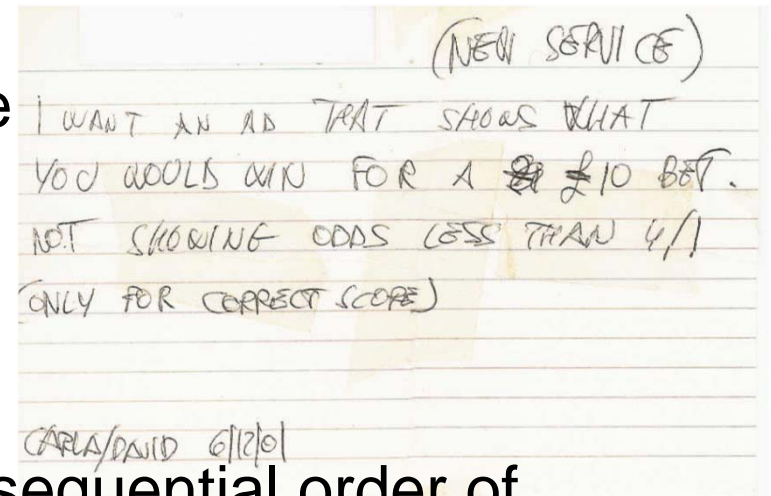
- Activity or job descriptions.
- Rules and procedures (etc.) said to govern particular activities.
- Descriptions of activities observed.
- Recordings of the talk taking place between parties involved in observed activities.
- Informal interviews with participants explaining the detail of observed activities.
- Diagrams of the physical layout, including the position of artefacts.



Doing Ethnography

What data to collect? (2)

- Photographs of artefacts (documents, diagrams, forms, computers, etc.) used in the course of observed activities.
- Videos of artefacts as used in the course of observed activities.
- Descriptions of artefacts used in the course of observed activities.
- Workflow diagrams showing the sequential order of tasks involved in observed activities.
- Process maps showing connections between activities.



Doing Ethnography

Field Notes

- A description of events, people, interactions, tool usage, things listened to, heard, experiences, impressions;
- Be detailed, i.e., write down details even if they in the beginning do not look relevant;
- Separate observations and quotes from the informants from impressions and comments from the researcher (colours, symbols...);
- A private document that can only be shared within the research team.

Doing Ethnography

Structuring frameworks to guide observation

- *The person*. Who?
- *The place*. Where?
- *The thing*. What?

The Goetz and LeCompte (1984) framework:

- *Who* is present?
- *What* is their role?
- *What* is happening?
- *When* does the activity occur?
- *Where* is it happening?
- *Why* is it happening?
- *How* is the activity organized?

Doing Ethnography

When should I stop observing?

- No obvious ending.
- Schedules often dictate when your study ends.
- Otherwise, when you stop learning new things.
(Saturation)
 - when you start to see similar patterns of behaviour being repeated, or
 - when you have listened to all the main stakeholder groups and understand their perspectives.

Doing Ethnography

Quality assurance

Pilot study

Learn from your mistakes

Member checking

Replay your observations – you may have it wrong (e.g. red bar)

Triangulation

By data collection method

By analysis approach

Making Sense of Data

Making Sense of Data

Approaches to data analysis

- Writing ethnography
 - Narrative
- Critical incident analysis
- Identifying Themes
 - Confirming and disconfirming
 - Many voices
- Theoretical lenses
 - Distributed cognition, activity theory, ...?

Making Sense of Data

Writing ethnography

An ethnography is a **post hoc** representation or account of what has been seen, heard and found **in the field**. Writing the ethnography is **not just writing up** the field notes. It involves their **interpretation** and **analysis**.

(Dourish 1994, highlight by us)

Making Sense of Data

Critical incident technique

- Focus on specific incidents
- Explore situation, actions, reactions etc
- From US Army Air Force (Flanagan 1954)
- Two principles:
 - reporting facts regarding behaviour is preferable to the collection of interpretations, ratings and opinions based on general impressions;
 - reporting should be limited to those behaviours which, according to competent observers, make a significant contribution to the activity

Making Sense of Data

Thematic analysis

- Immersion in the data
- Identify concepts of interest to your focus
- Propose theme(s)
 - check for confirming and disconfirming evidence
- **Example: ethnographic study of XP**
(Sharp & Robinson, 2004)
 - Shared purpose, understanding and responsibility
 - Coding and quality of code matters
 - Sustainability
 - Rhythm
 - Fluidity

Making Sense of Data

Using Theoretical Lenses

- Theories often provide a set of concepts
- They can be used as a starting point when analysing the data.
- They provide a way to scope the unit of analysis

Translating findings into insights

Making Sense of Data

Findings

will indicate:

- what frustrates participants,
- stops progress,
- makes the team work well,
- what notations are actually used,
- complexity of interactions,
- consequences of office layout
- ...

Making Sense of Data

Insights

depend on your research question:

- How do developers manage?
- What is important to not change?

The reason a project did not use the notification system of the bug tracking tool in a distributed setting was that the members wanted to have the possibility to express their appreciation to each other (Dittrich, Giuffrida 2011)

- Explanation of problems, conflicts, successes
- What does compliance, non-compliance and innovative behaviour tell us about tools methods and techniques?

Making Sense of Data

Theoretical Lens

can help to identify findings.

Examples:

- Activity Theory focuses on contradictions: between tools and objectives, between tools and division of labour, and between other elements of the activity system.
- Distributed Cognition focuses on information flow and transformations, hubs, bottlenecks, what if?
- Ethnomethodology focuses on the detailed interaction and how it contributes to how a task gets done.

Making Sense of Data

Using the Insights as a Starting Point for Improvement

‘Problem Oriented SPI’ (Nørbjerg et al.)

Cooperative Method Development (Dittrich et al.)

As part of Design Research (De Souza et al.)

Focusing on the

Rationalities

of Practice

Reporting results

Reporting results

- Who to? What is the purpose?
- Include data
 - Photos, video, artefacts
 - Diagrams, excerpts from notes
 - Quotes (captured contemporaneously or recorded)
- Include clear description of data collection and analysis approach
- Deal with the 'so what?' question
- Written narrative, story
- Formats or conventions related to theoretical lens