

Survey Research in Software Engineering

CibSE 2018
Bogotá, Colombia

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 @mendezfe



Who am I?

Technical
University
of Munich



ZD.B ZENTRUM
DIGITALISIERUNG.
BAYERN

Join me this year at...

Primary research areas

- Early development stages and their (Quality) Improvement
- Empirical Software Engineering w/ focus on interdisciplinary, qualitative research

The 12th International Symposium on Empirical Software Engineering and Measurement (ESEM) was held from October 11-12, 2018.

The 26th IEEE International Requirements Engineering Conference (RE@Next!) was held from August 20-24, 2018, in Banff, Alberta, Canada.

Call for RE@Next! Papers

The 26th IEEE International Requirements Engineering Conference (RE@Next!) will host a special track devoted to the presentation of work currently being carried out by RE researchers around the world. We look for short communications (4 to 6 pages) that describe the current status of ongoing research. The goal of the RE@Next! track is to provide a venue to present your work to academic colleagues and potential industry partners and to receive early feedback.

A good RE@Next! contribution will:

- provide in succinct form the information that you would convey in a seminar about your ongoing research work to a fellow academic visiting your department;
- present the long-term directions and prospects of your research endeavors;
- serve as a trigger for establishing new collaborations with like-minded colleagues;
- lead to a full research paper, to be submitted to next year's RE conference.

Evaluation Procedure and Guidance to Authors

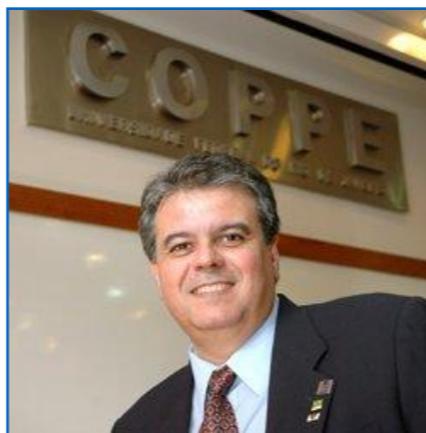
RE@Next! contributions will be rigorously reviewed by the RE@Next! Program Committee, following a double-blind review format. Evaluation criteria include clarity of the submission, especially interest to the conference attendees, also based on the conference theme "Crossing Boundaries and Increasing Impact", and novelty and relevance of the idea. Feasibility, for example, is demonstrated by a reasonably sophisticated approach, or by a demonstration that it can be demonstrated by a reasonable approach.

This tutorial is based on...

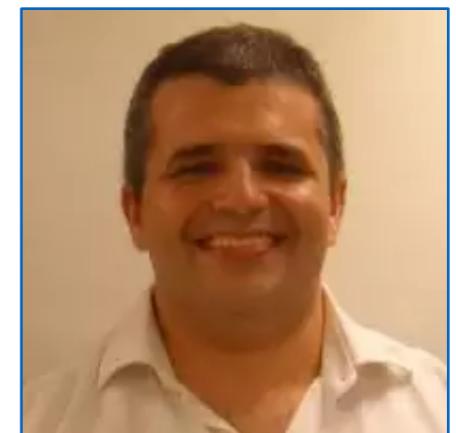
- Previous editions given together with



Marco Torchiano
Politecnico di Torino



Guilherme H. Travassos
COPPE,
University of Rio de Janeiro



Rafael M. de Mello
PUC Rio de Janeiro

- Experiences made in large survey research projects,
e.g.



Naming the Pain in Requirements Engineering
NaPiRE

see www.re-survey.org



Introduction - Who are you?

Quick round...

- Who are you?
- What are your experiences in conducting survey research?
- Are you currently facing any particular challenges?
- What are your expectations?



What do you think?

Why do we need survey research
in software engineering?

This session will be about

Scope

- Brief introduction into survey research and epistemological setting
- Experiences and lessons learnt (Best Practices)
- Discussion / Hands-on session

Out of scope:

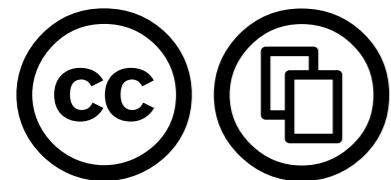
- Statistics
- Fundamentals
- Statistics (this is definitively not about statistics)

Ground rule 1

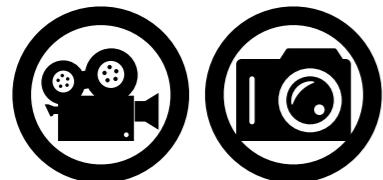
Whenever you have questions / remarks,
don't ask **Google**, but
share them with the whole group.

Ground rule 2

You can...



copy, share and change,



film and photograph,



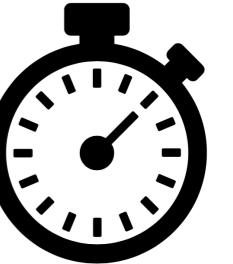
blog, live-blog and tweet



this presentation given that you attribute
it to its author and respect the rights and
licenses of its parts.



Outline



- A brief introduction into survey research

40'-60'

- (Selected) Best practices

40'-60'

- Lean coffee

0' - 40'

Could be extended
to hands-on session



Outline

- A brief introduction into survey research
- (Selected) Best practices
- Lean coffee

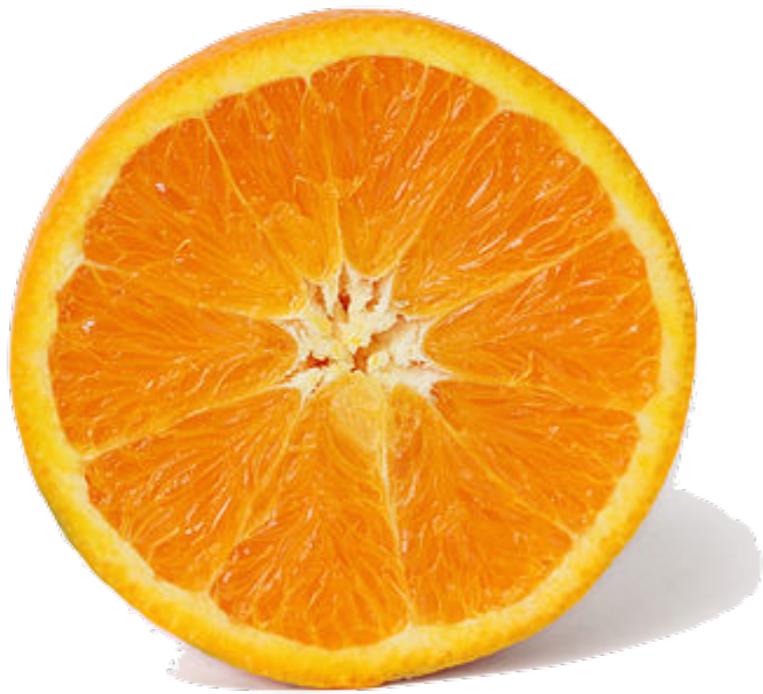
What is survey research?



Systematic observational method to gather qualitative and / or quantitative data from (a sample of) entities to characterise information, attitudes and / or behaviours from different groups of subjects regarding an object of study

- » Observational data with limited control
- » Descriptive and analytic statistics

Observational studies



Surveys
(Cross-sectional)



Case Studies



Experiments

Epistemological setting (very briefly)

Example!

Philosophy of science

Principle ways of working

Methods and strategies

Fundamental theories

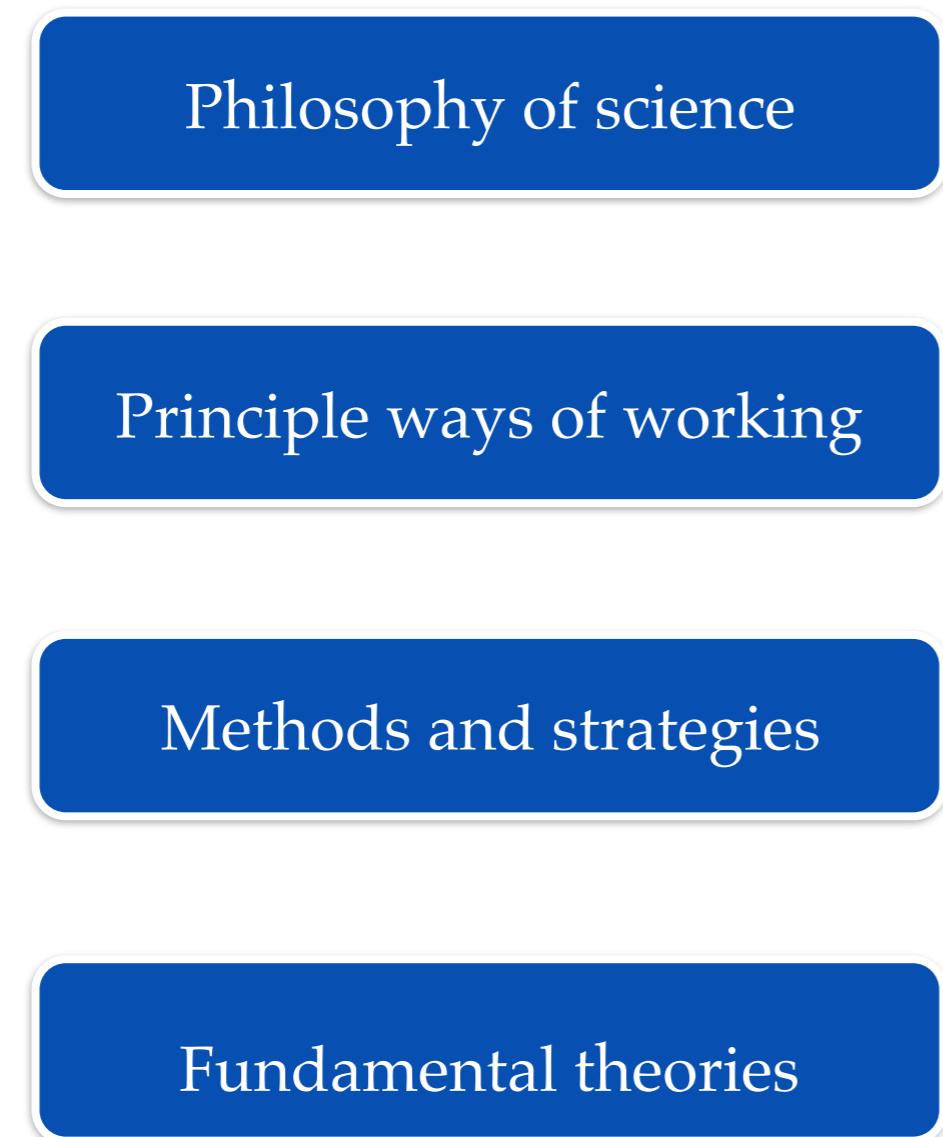
Epistemology

Empiricism

Controlled Experimentation

Hypothesis testing

Statistics



Setting: Empirical Software Engineering

Philosophy of science

Principle ways of working

Methods and strategies

Fundamental theories

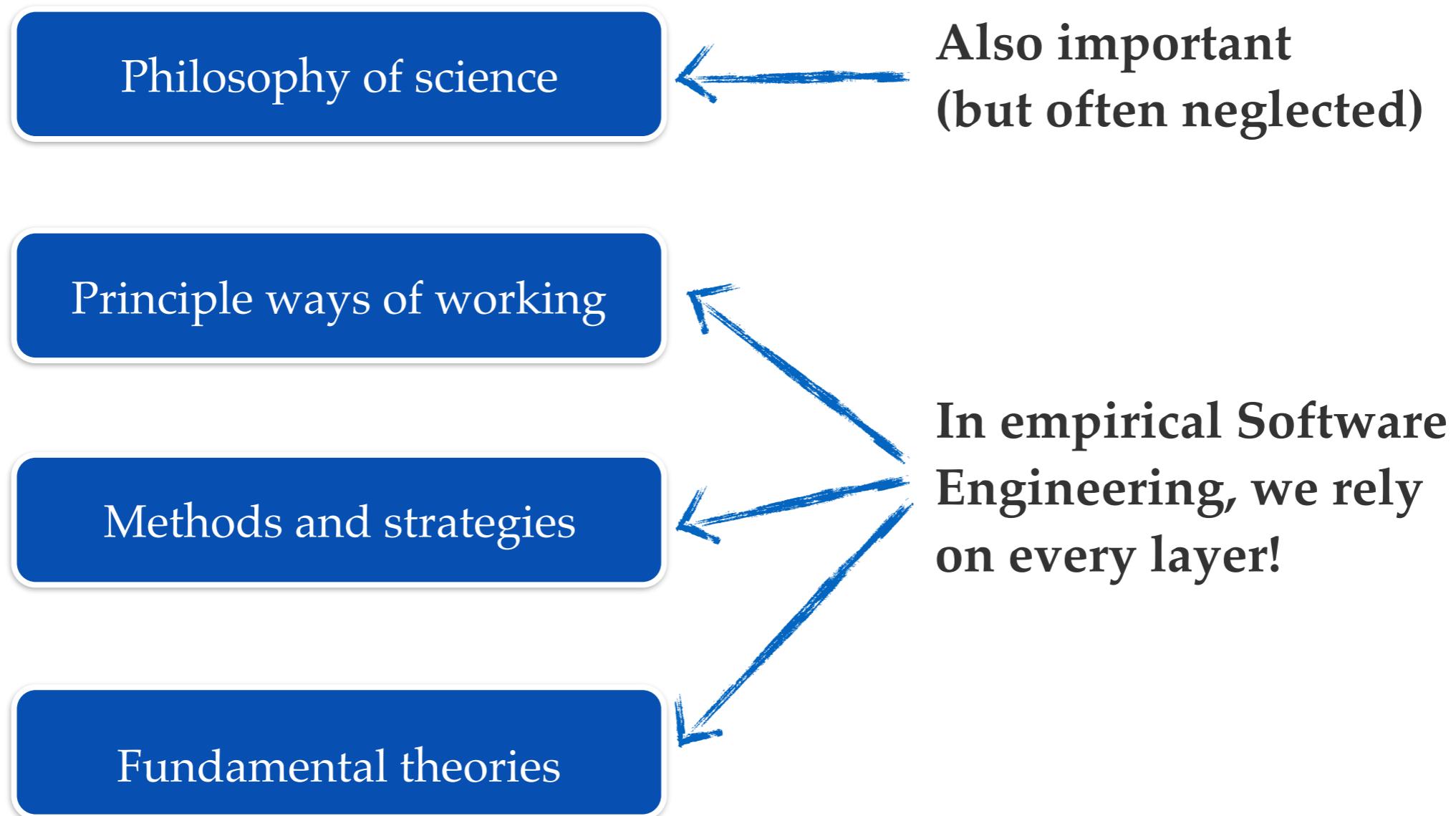
**Theory building
and evaluation**

... are supported by...

**Methods and
strategies**

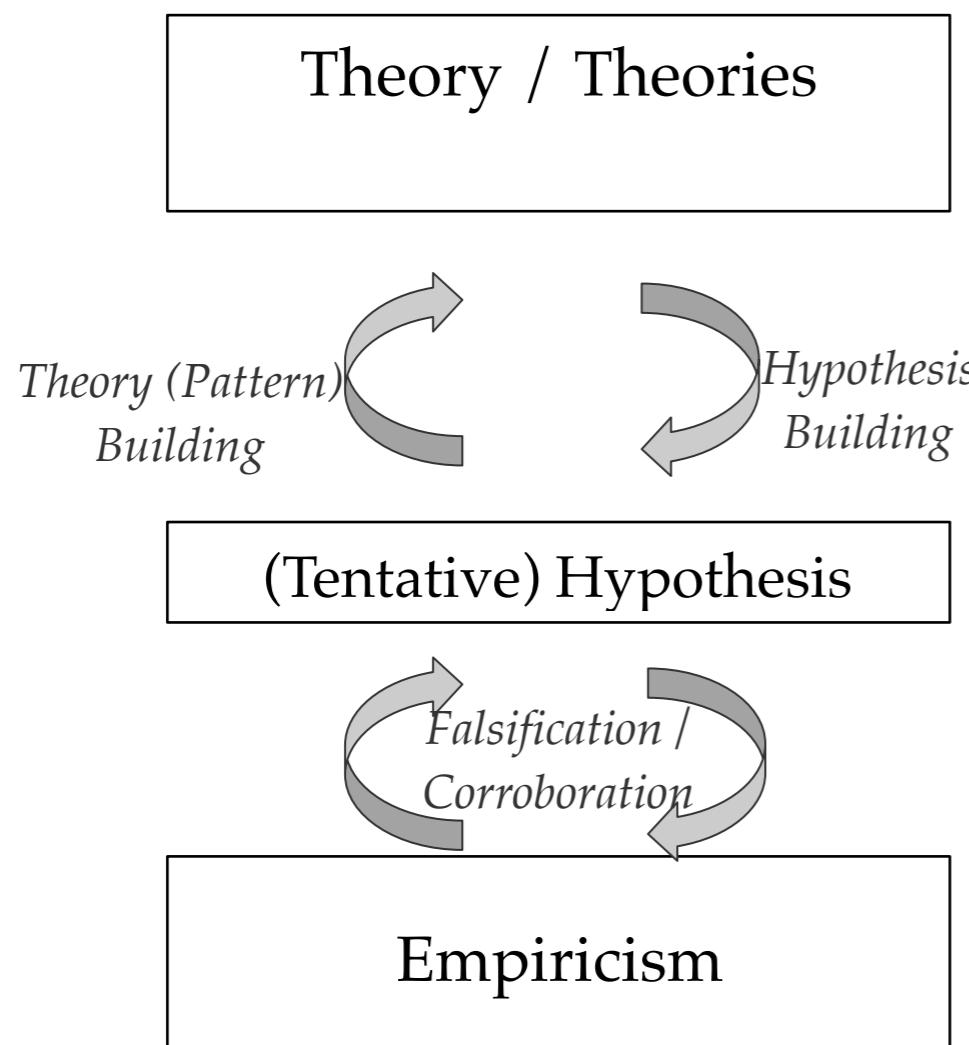
Analogy: Theoretical and
Experimental Physics

Setting: Empirical Software Engineering



A very quick step into the philosophy of science
... and back

Theories and hypotheses



By the way
We don't "test theories", but their
consequences (via hypotheses)

Scientific theory

- "[...] based on hypotheses tested and verified multiple times by detached researchers" (J. Bortz and N. Döring, 2003)

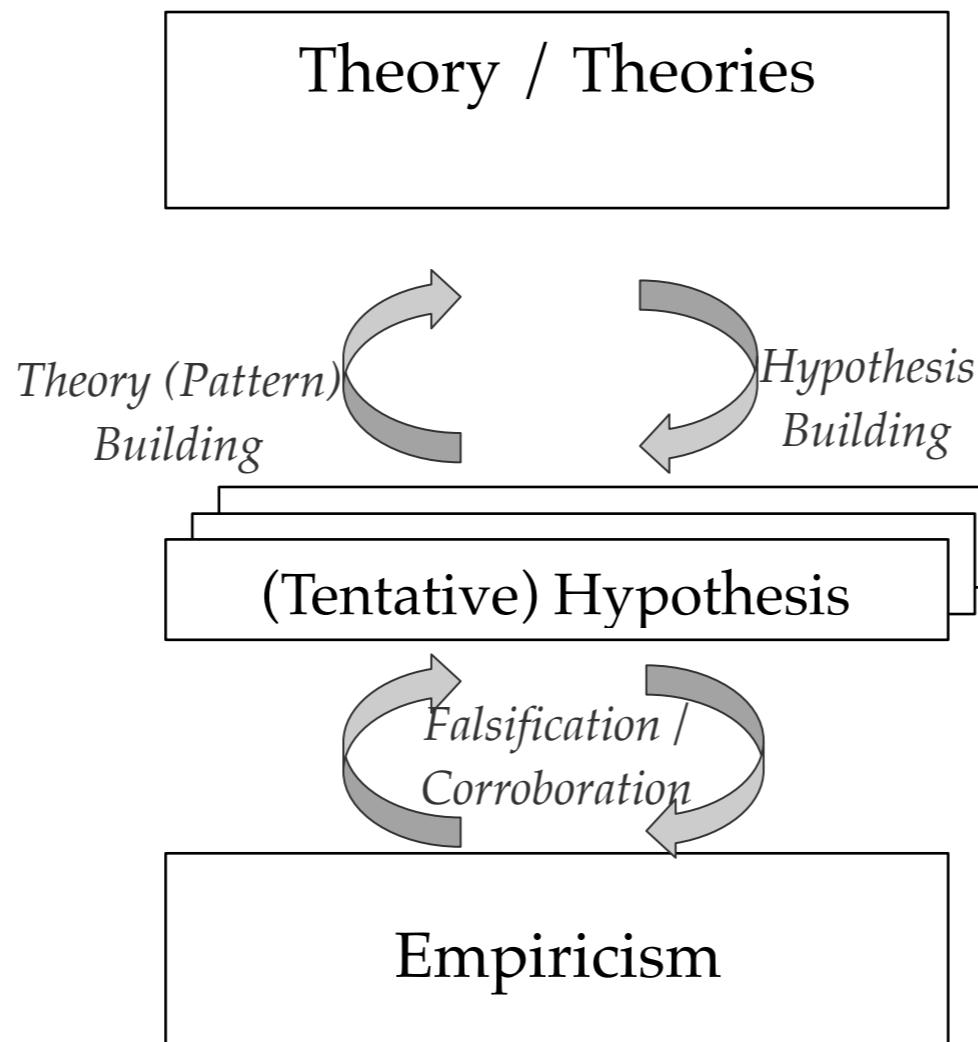
Hypothesis

- "[...] a statement that proposes a possible explanation to some phenomenon or event" (L. Given, 2008)
- Grounded in theory, testable and falsifiable
- Often quantified and written as a conditional statement

If cause/assumption (independent variables)
then (=>)
consequence (dependent variables)

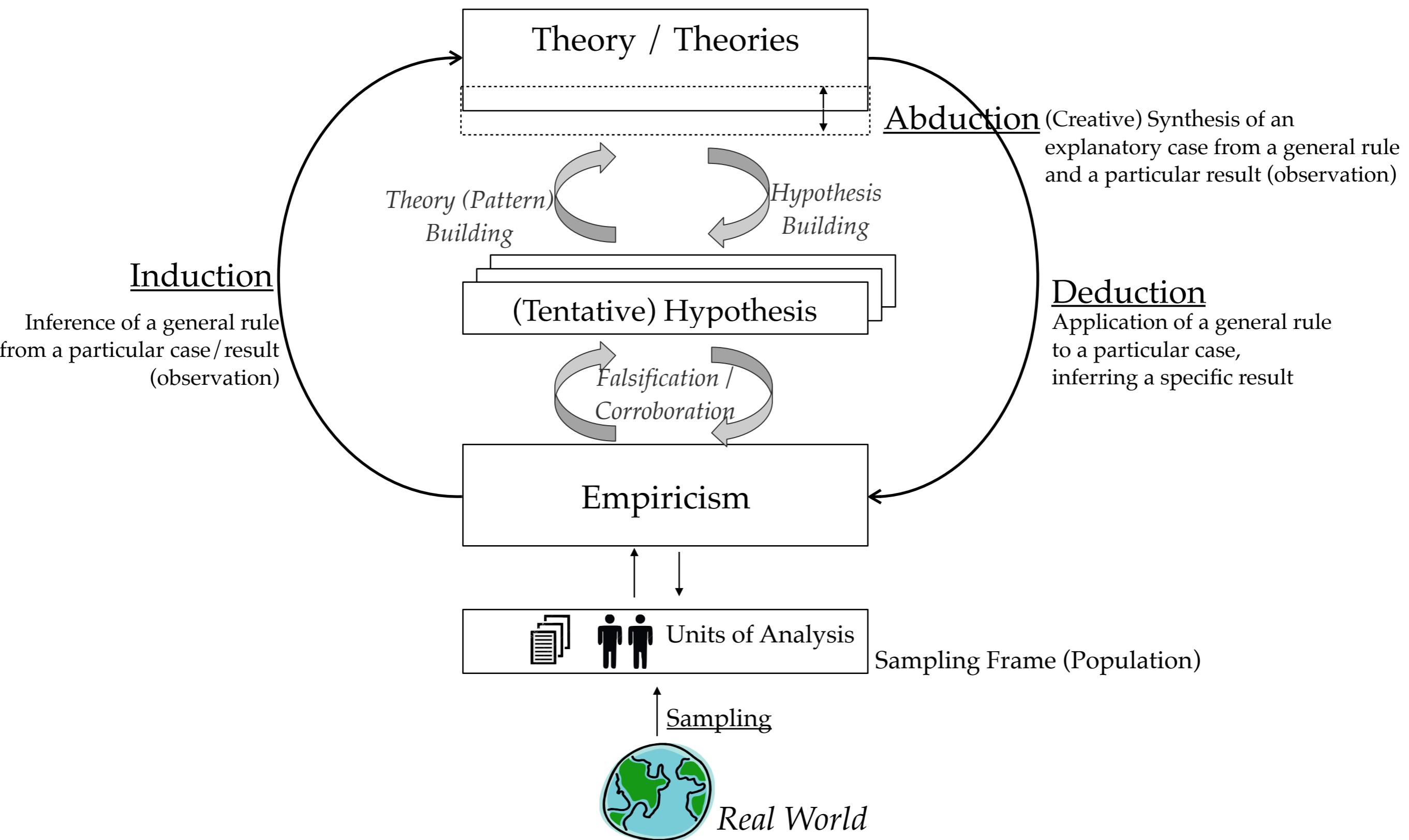
From real world to theories... and back

Principles, concepts, terms



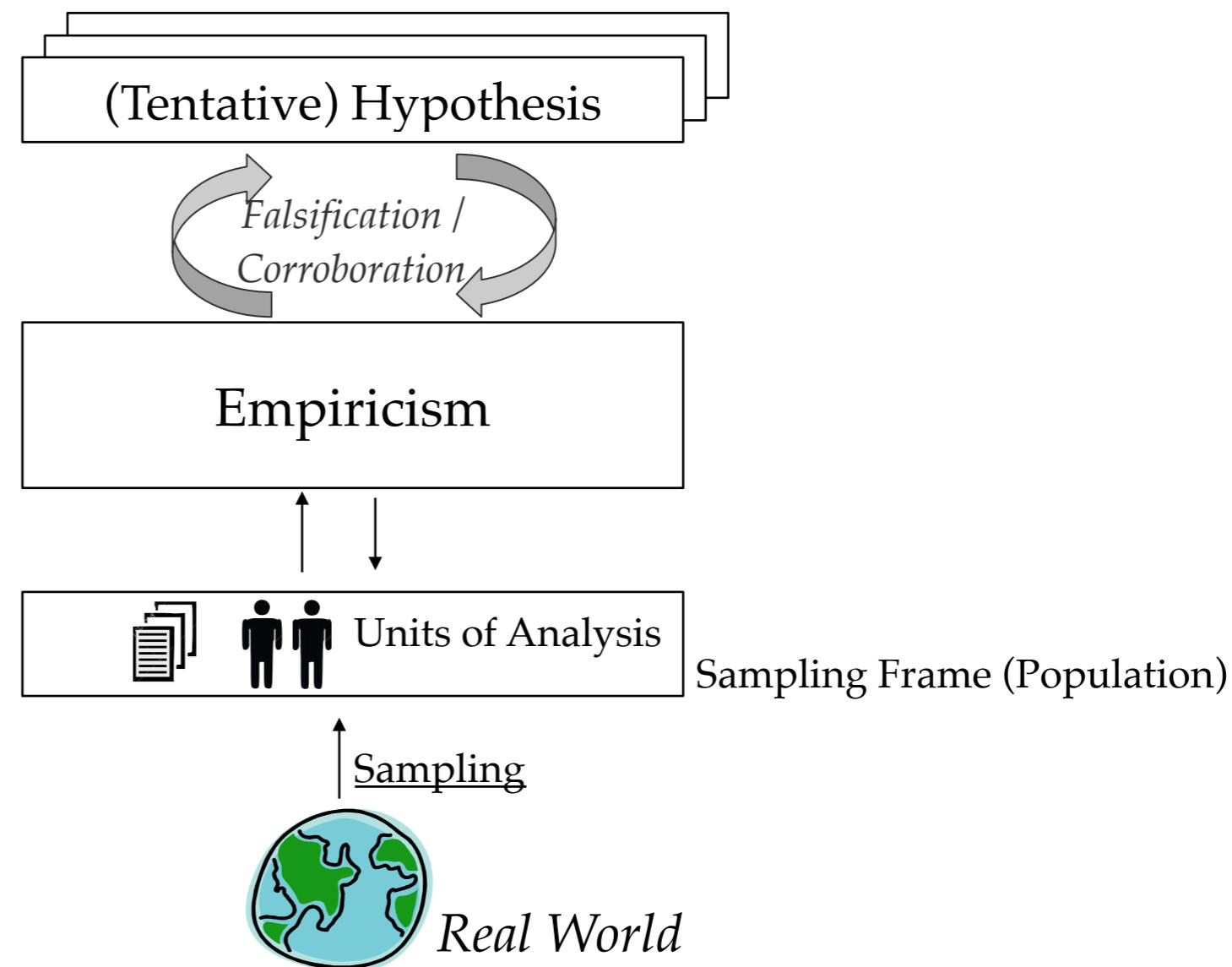
From real world to theories... and back

Principles, concepts, terms



(Empirical) methods

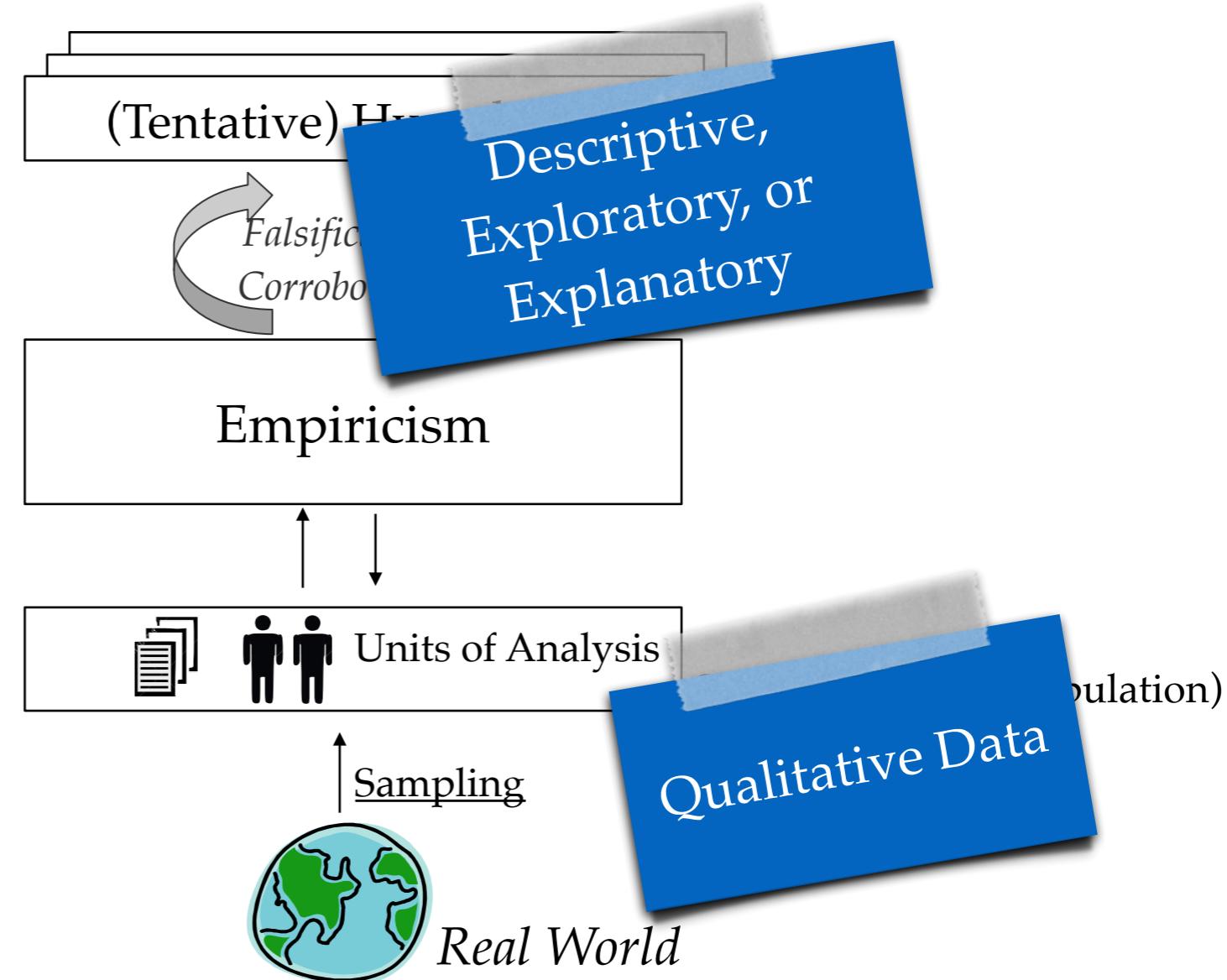
- Each method...
 - ...has a specific purpose
 - ...relies on a specific data type
- Purposes
 - Exploratory
 - Descriptive
 - Explanatory
 - Improving
- Data Types
 - Qualitative
 - Quantitative



(Empirical) methods

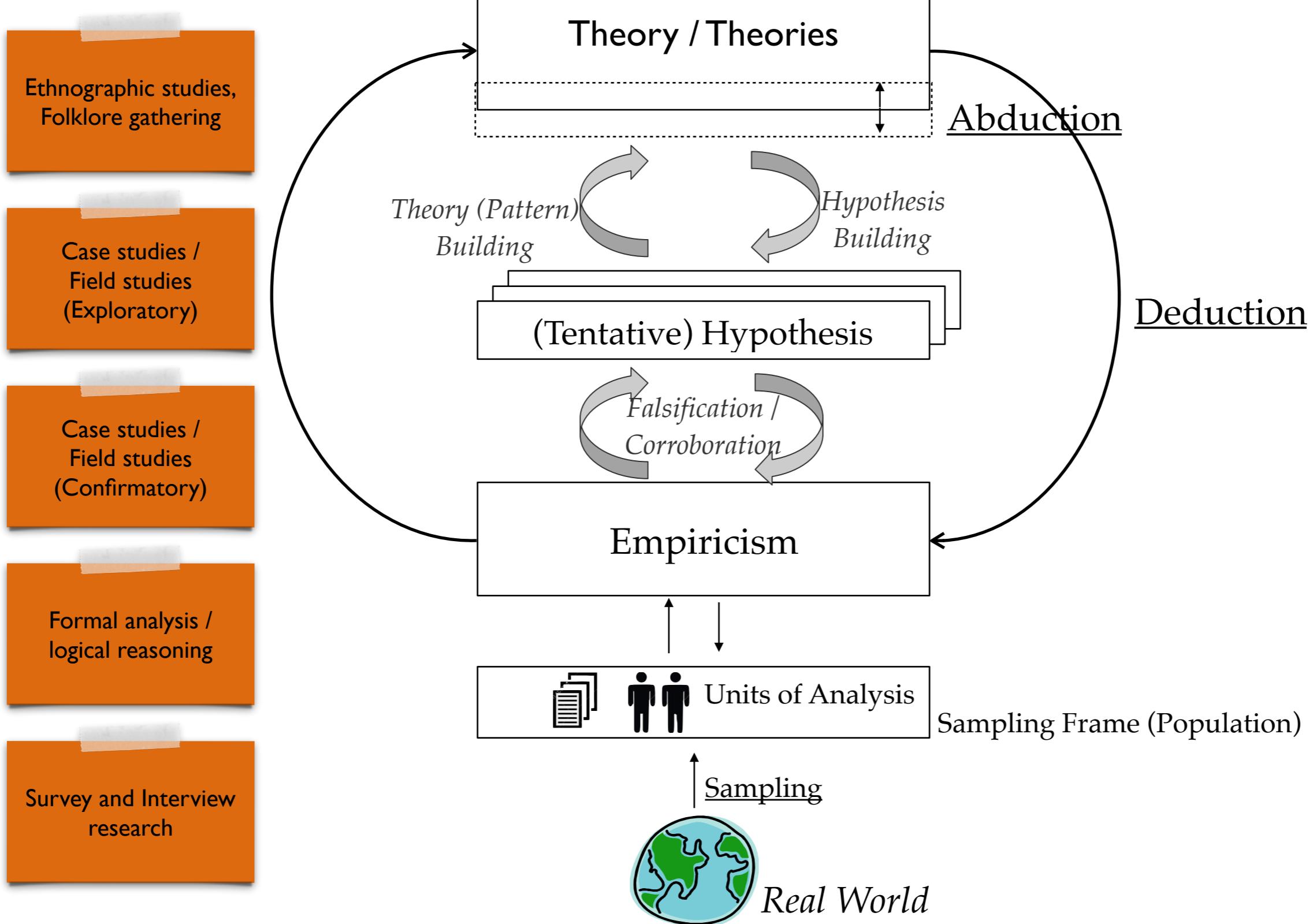
- Each method...
 - ...has a specific purpose
 - ...relies on a specific data type
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 - Exploratory
 - Descriptive
 - Explanatory
 - Improving
- Data Types
 - Qualitative
 - Quantitative

“Grounded Theory”

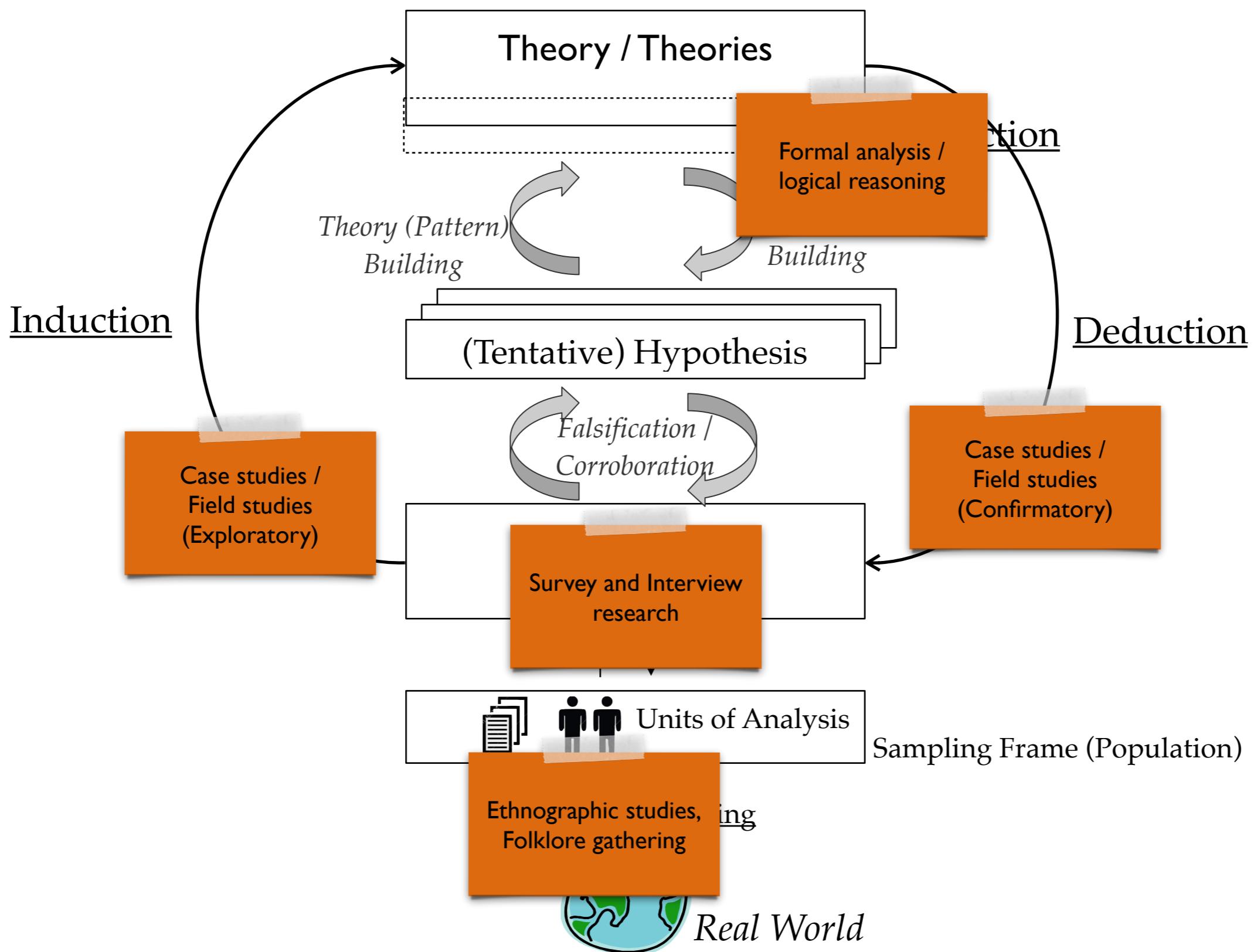


Example!

(Empirical) methods - where do they belong?



(Empirical) methods - where do they belong?



Survey research in a nutshell

Surveys

- allow for observational studies
- can have different purposes
- rely on both qualitative and quantitative data
- can employ different data analysis methods
- are (often) used in combination with multiple empirical methods (“research programmes”)

A very simplified process for survey research

* And some examples based on



Naming the **Pain** in Requirements Engineering
NaPiRE

Survey Planning

Defining Research Objectives

Characterising Target Population

Sampling

Questionnaire Design

Recruiting & Measuring

Survey Execution

Data Coding & Editing

Post-survey Adjustments

Data Analysis & Interpretation

Packaging & Reporting

Data Curation & Disclosure

Reporting

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Reporting

- Scoping overall endeavour via objectives and (research) questions
- Basis for:
 - target population
 - questionnaire design

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- Basis for:
 - target population
 - questionnaire design

Example!

Objective

Understand what problems practitioners experience in their Requirements Engineering.

Research Questions

- (1) *Which contemporary problems exist in RE?*
- (2) *What are observable patterns of problems and context characteristics?*
- (3) *What are their perceived causes and effects?*

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Data Curation & Disclosure

Reporting

- Target population: abstract definition of set of units to be studied
- Frame population: All units in the (envisioned) sampling frame
- Sample: Actual set of (eligible) future respondents

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- Sample: Actual set of (eligible) future respondents

Example!

Target Population

Practitioners working with requirements:

- Requirements Engineers
- Software Architects
- ...

in domain X and region Y

Frame Population

- Requirements Engineers in domain X and region Y, registered in association Z
- ...

Sample

- [Role] working with requirements for [x] years
- ...

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Reporting

- Design of questionnaire used to answer the research questions
- Implementation / Realisation

Survey Planning

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Questionnaire Design

Re

D

Pos

Data Analysis

Packaging

Data Curation

Rep

- Design of questionnaire used to answer the research questions
- Implementation / Realisation

Example!

The screenshot shows a software interface for survey design. At the top, there's a table with columns for 'Parts', 'No.', 'Question', and 'Type'. One row is visible: 'Demographics' under 'Parts', 'Q 1' under 'No.', 'What is the size of your company?' under 'Question', and 'Closed(SC)' under 'Type'. Below this is a main panel titled '400193 NaPiRE 2017/18'. It includes various buttons like 'Page', 'Filter', 'Dynamics', 'Scoring', and 'Preview'. A message says 'Participants can take part.' There's also a search bar. The main area lists survey components with columns for 'TITLE', 'ID', 'INFO', and 'ACTIONS'. Components include 'Language Selection', 'Instructions', 'Start Page and Consent', 'Metadata', 'Country Selection', 'Team Size', 'Sector', 'System Class', 'Quality Attributes', 'Team Distribution', 'Main Role Respondent', 'Experience Respondent', and 'Certification Role Respondent'. Each component has a unique ID and a set of actions (Edit, View, Delete) listed in the 'ACTIONS' column.

Parts	No.	Question	Type
Demographics	Q 1	What is the size of your company?	Closed(SC)

400193 NaPiRE 2017/18

Participants can take part.

Preview

Page Filter Dynamics Scoring

Survey language: "English"

Search

TITLE	ID	INFO	ACTIONS
Language Selection	2420013		
111 Language Selection	4423789		
Instructions	2401449		
998 Start Page and Consent	4381586		
Metadata	2401450		
131 Country Selection	4381885		
141 Team Size	4381710		
111 Sector	4381702		
111 System Class	4381714		
121 Quality Attributes	4381722		
111 Team Distribution	4381731		
111 Main Role Respondent	4381764		
141 Experience Respondent	4381823		
141 Certification Role Respondent	4381849		

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Packaging & Reporting

Data Curation & Disclosure

Reporting

- Actual data collection conducted through the survey
 - » Respondents invitation
 - » Continuous Control

Survey Planning

Defining Research Objectives

Characterising Target Population

Questionnaire

Recruitment

Survey

Data

Post-survey

Data Analysis

Packaging & Reporting

Data Curation & Disclosure

Reporting

- Actual data collection conducted through the survey

InvitationTextAnonymous.txt

Dear colleagues,

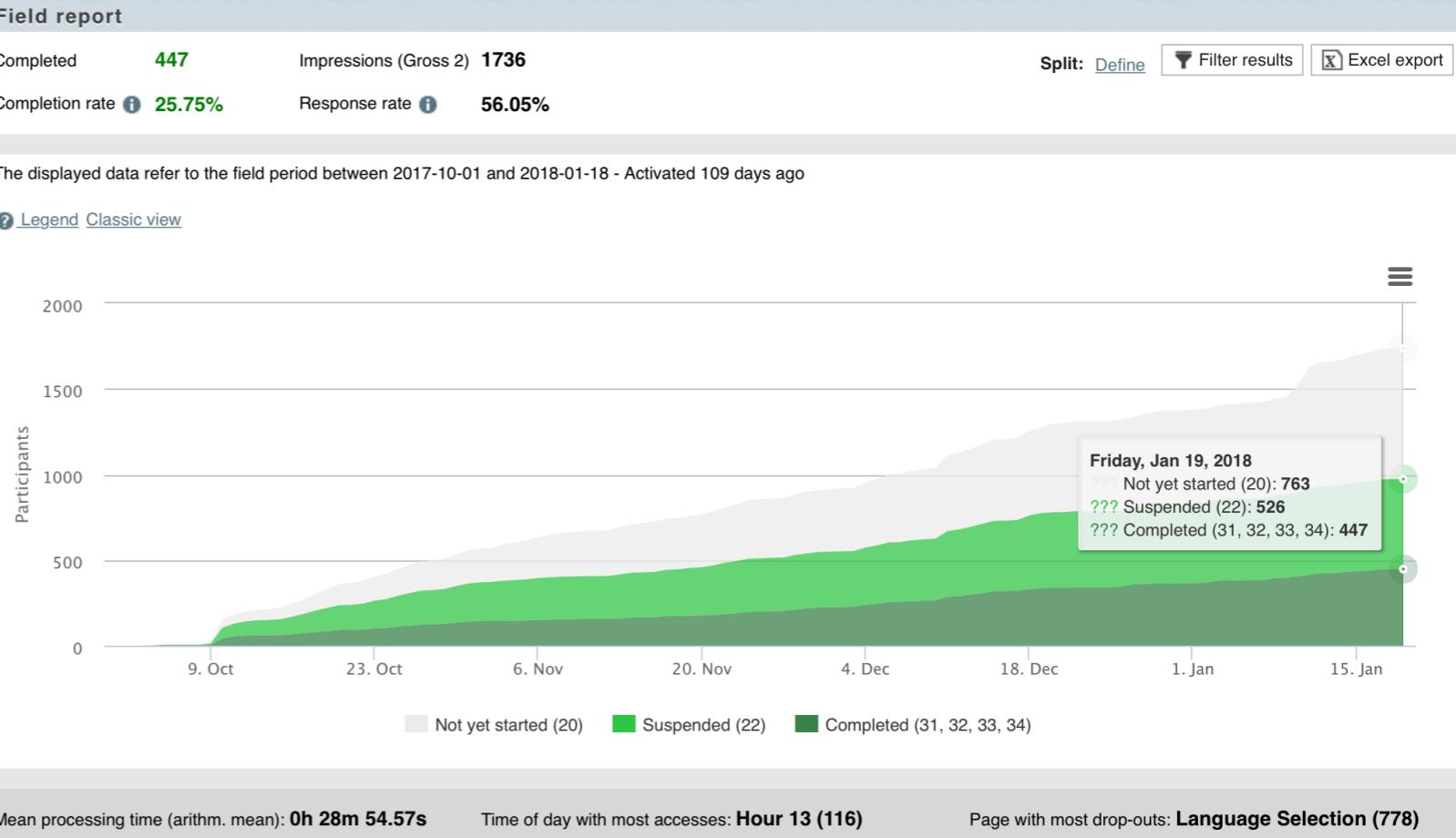
We are launching the 3rd replication of our bi-yearly conducted survey on Requirements Engineering (RE) to explore trends in industrial practices and problems in RE. The survey forms part of the large-scale Naming the Pain in Requirements Engineering (NaPiRE) initiative [1], started in 2012, and it is conducted by an internationally distributed alliance of software engineering researchers with the goals to

(1) help the research community getting a better understanding of general industrial trends in Requirements Engineering (RE) and problems faced therein and, thus, strengthen the practical relevance of research outcomes.
(2) help practitioners assessing their current RE situation in context of overall trends.

We would like to cordially invite practitioners to participate in this survey, and researchers to further distribute the invitation.

Most important facts in a nutshell:
* This survey is conducted worldwide.
* We pose a set of questions structured according to the categories:
-- General information about the research area
-- Status Quo on requirements elicitation and management
-- Current problems experienced in the process
* The survey is anonymous, because we are interested in critical opinions.
* The focus of the questions is on experiences and problems in practice.
Redistribution of the survey invitation is highly appreciated.
* The overall initiative is run by the NaPiRE team and made publicly available after the survey period.

The link to the survey is <http://participate.napire.org>.
We would highly appreciate your consideration of the survey.
Thanks and best regards,
The NaPiRE Team



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Post-survey Adjustments

Data Analysis & Interpretation

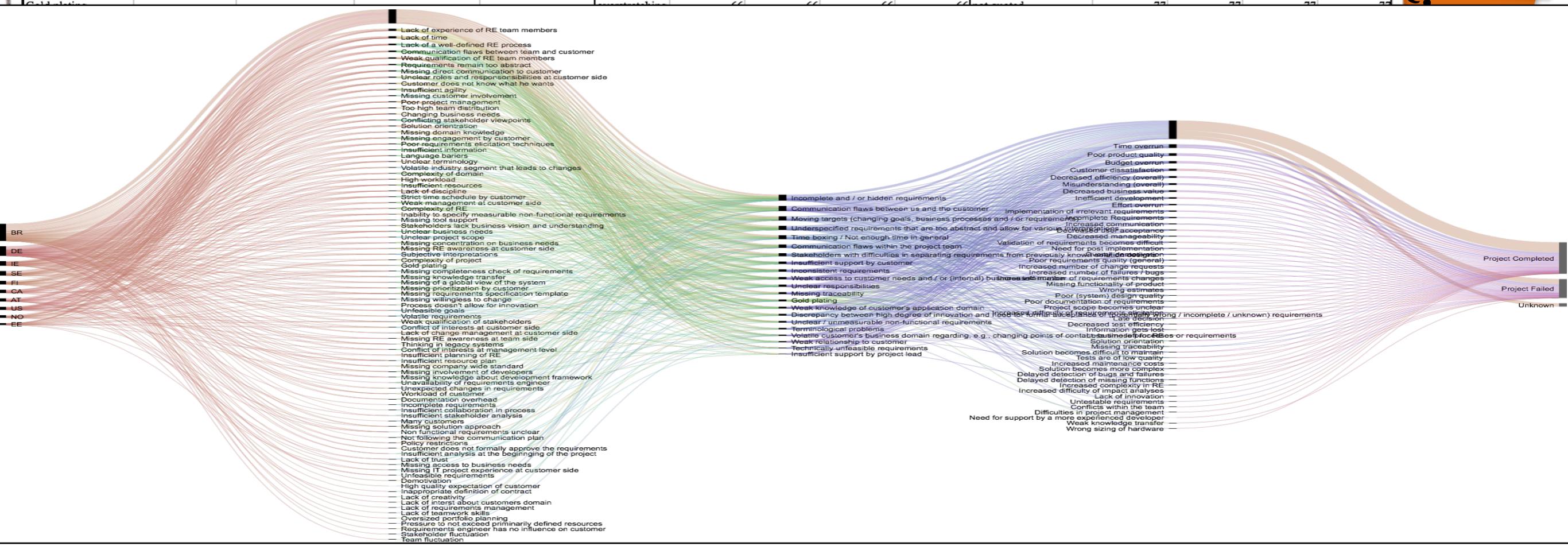
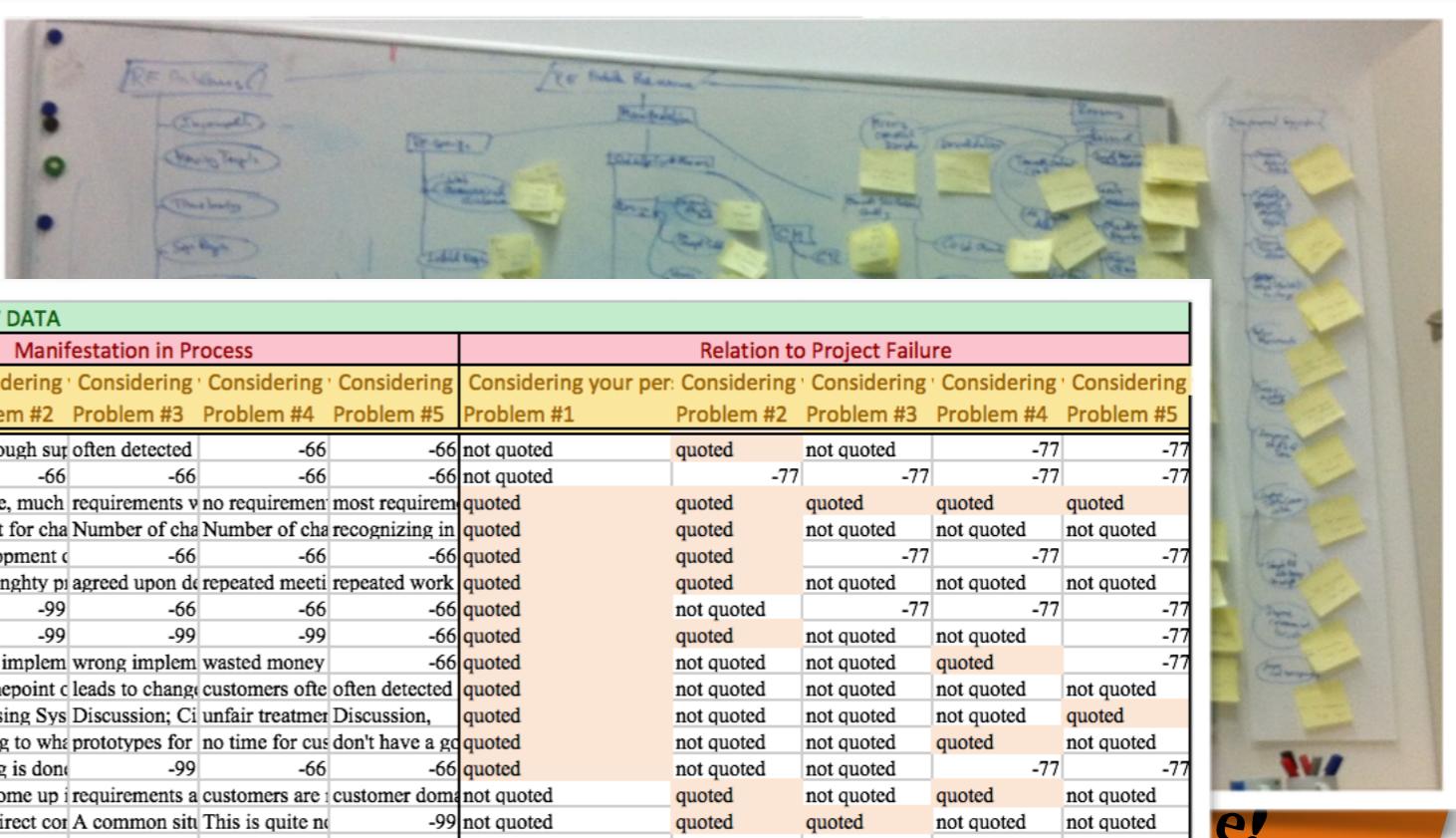
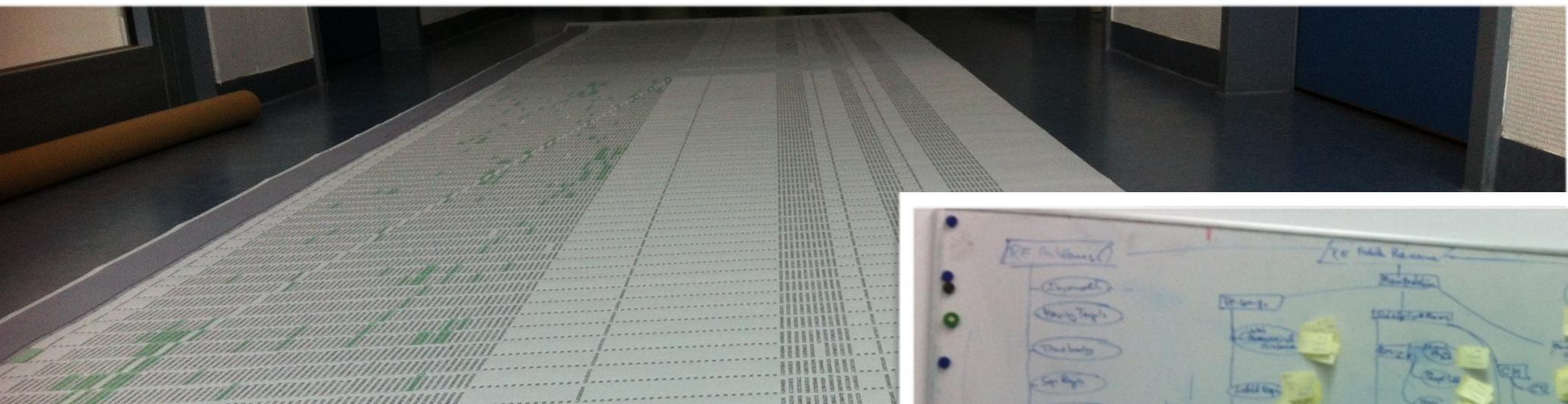
Packaging & Reporting

Data Curation & Disclosure

Reporting

- Data coding & editing: Review process before using data and harmonisation (e.g. consistency checks, outlier detection)
- Post-survey Adjustments based on actual responses
- Analysis of quantitative and qualitative data

: Review



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Data Curation & Disclosure

Reporting

- Data curation and disclosure:
Preparation of data for reproducible disclosure (e.g. anonymisation, codebooks)
- Reporting
 - To respondents (e.g. via technical reports, blog posts)
 - Paper writing (very different audience)

Survey Planning

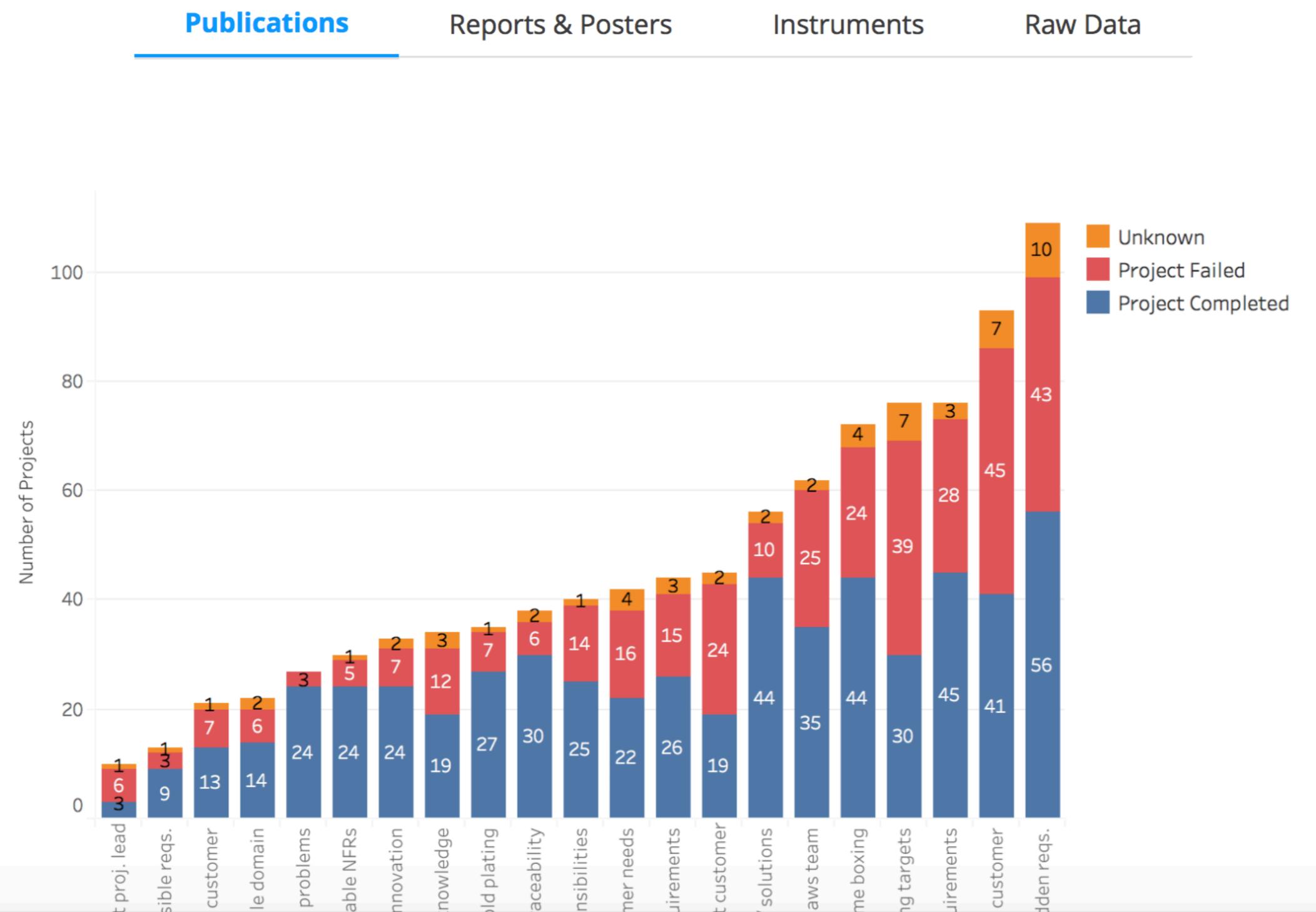
Defining Research Objectives

Characterising Target Population

Sampling

- Data curation and disclosure:
Preparation of data for reproducible disclosure (e.g. anonymisation,

1 1 1 1



Technical
example!
cent

Questions?



Outline

- A brief introduction into survey research
- **(Selected) Best practices**
- Lean coffee

Example - What could be wrong here?

Dear Dr. Fernández,

We are conducting a survey to evaluate an updated standard model that will be used to [REDACTED].

[REDACTED] This survey will help to ensure the suitability and validity of this model and ensure its usefulness in meeting a specific class of problems in the analysis of multi-agent systems. Also, it could point to some important missing details and weak points in the updated model structure.

We are inviting you to participate in this research study. You will be asked to go through the model sections using a few real scenarios and then take a survey to answer a few questions regarding your experience using the updated model. On this email, you will find attached the updated model file.

This survey has no risk to participants, and it will not require any personal information. It will be only known by my advisor and me. Your participation is voluntary, and you are not likely to have any direct benefit from being in this research study. The expected time to complete the entire task is 20 minutes.

The following is the online survey that needs your participation: [REDACTED]

Thank you for participating.



--

Best Regards



SRS Standards
for MAS.pdf

Example - What could be wrong here?

Dear Dr. Fernández,

We are conducting a survey to evaluate an updated standard model that will be used to [REDACTED]. This survey will help to ensure the suitability and validity of this model and ensure its usefulness in meeting a specific class of problems in the analysis of multi-agent systems. Also, it could point to some important missing details and weak points in the updated model structure.

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The following is the online survey that needs your participation: [REDACTED]

Thank you for participating.

Best Regards



SRS Standards
for MAS.pdf

(“Automated”?)

Where did they get my contacts from?
Why have I been invited?
Why should I participate?

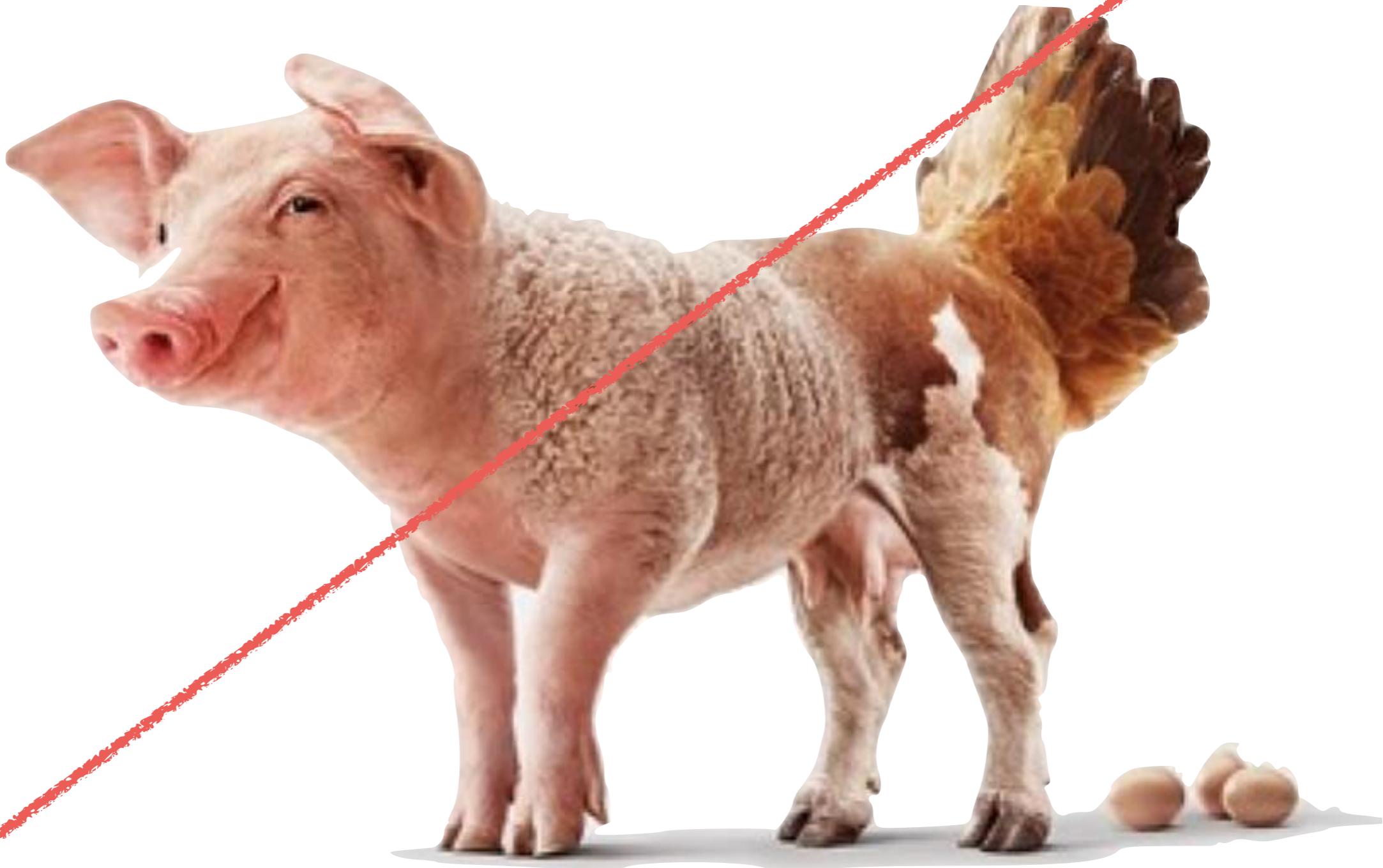
Who are they?

17 pages attachment to read...
20 minutes to answer the survey...

Disclaimer



Disclaimer (Bavarian edition)



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Data Coding & Editing

Post-survey Adjustments

Data Analysis & Interpretation

Packaging & Reporting

Data Curation & Disclosure

Reporting

- There are too many pitfalls to be handled in a short tutorial.

» Recommended reading:

Torchiano, M., Méndez Fernández, D., Travassos, G.H., de Mello, R. M. (2017). Lessons Learnt in Conducting Survey Research. In: Proc. 5th International Workshop on Conducting Empirical Studies in Industry (CESI). ICSE 2017.

Available at <https://arxiv.org/abs/1702.05744>

Lessons Learnt in Conducting Survey Research

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Abstract—Context: Surveys constitute an valuable tool to capture the knowledge of the state of the practice. Apparently trivial to adopt, surveys hide, however, several pitfalls that might hinder rendering the result valid and, thus, useful.

Goal: We aim at providing an overview of main pitfalls in software engineering surveys and report on practical ways to deal with them.

Method: We build on the experiences we collected in conducting many studies and distill the main lessons learnt.

Results: The eight lessons learnt we report cover different aspects of the survey design ranging from the design of initial research objectives to the design of a questionnaire.

Conclusions: Our hope is that by sharing our lessons learnt, combined with a disciplined application of the general survey theory, we contribute to improving the quality of the research results achievable by employing software engineering surveys.

Keywords—survey, software engineering, lessons learned

I. INTRODUCTION

Software engineering (SE) concerns the systematic development of software products and over the last decades the SE communities have developed a plethora of methods and tools used to build software. Unlike disciplines focused more with the production of physical products, the focus in software engineering is on development yielding in outcomes that are typically intangible. Since the design and development of software thus mostly follows an essentially unique process, it is difficult to derive general principles and laws for software engineering.

To reason about our discipline as well as to recognise and understand the effects of tools, methods, and approaches in this inherently complex socio-technical environment, we need different empirical research methods. These allow us to explore the state of practice and validating new tools or approaches. Some of these methods, such as experiments, enable us to investigate isolated phenomena in contexts detached from reality; others, in turn, broaden the scope while taking a wide-angle snapshot of the state of the practice. One research method to be named here is survey research. Surveys have received much attention in research and practice for many years as a tool to systematically analyse opinions, experiences, expectations among the investigated populations. They allow us to ask descriptive questions ("what is happening?") or

explanatory questions ("why is this happening?"), mostly in an exploratory way to get an initial, broad picture about the state of the practice. Exploratory surveys have been conducted in different software engineering research topics [1], many of them serving the purpose of gathering opinions from SE professionals. The selection of the most appropriate research method depends on the expected outcome, the purpose, and the epistemological approach [2].

Surveys seem apparently trivial to design and fast to conduct, yet survey research hides various pitfalls that might hinder rendering the result valid and, thus, having conducted a survey might quickly become a waste of time or, worse, lead to false conclusions. The issues most often criticised by peers [3] are: the lack of novelty in the research questions addressed, the potential limitation of the geographic scope, and the limited representativeness of the sample.

As many misconceptions and pitfalls still dominate survey research, we still need a better understanding of various facets for applying it in our field [4][5]; for instance, key challenges include ensuring the representativeness of samples including the search for adequate populations and stimulating their participation, especially among practitioners in the industry [6], or how to address the effective participation of subjects when preparing suitable questionnaires [7].

In this experience report, we discuss practical challenges and selected lessons we learnt in conducting survey research in industry. Our work emerges from the organisation of the 14th International Advanced School of Empirical Software Engineering, which the authors held in conjunction with the International Symposium on Empirical Software Engineering and Measurement (ESEM) in 2016. Our goal is to provide a summary of the most important lessons we learnt ourselves while conducting surveys in the industry to help especially inexperienced researchers facing their first surveys in industry.

After a brief introduction to the basic concepts of survey research, we subsequently report on our experiences made along the phases: (i) defining research objectives and the target population, (ii) sampling, (iii) designing a questionnaire, and (iv) recruiting.

Our experiences emerge from a series of different surveys we conducted in industrial settings and cover, in particular,

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Packaging & Reporting

Data Curation & Disclosure

Reporting

We concentrate on 4 issues, instead
(I personally find highly important)

Defining research objectives

Challenge

Know the limitations of survey research

- Survey research opts for answers that rely on experiences, opinions, and observations (folklore) of the respondents
- Respondents' bias is our natural environment
 - » Develop internal questions to help you depict the research objective and target population
 - » Opt for descriptive questions ("what is happening?") or explanatory questions ("why is this happening?") rather than normative questions ("what should we do?")

Characterising the target population

Challenge

Identify the real target population

- Do not restrict the target population by factors like availability or expected number of responses!
- » Based on the research objectives, answer the question:

“Who can best provide you with the information you need?”,
not

“Who are probably available to participate?”

Characterising the target population

Challenge

Identify the units of analysis (1/2)

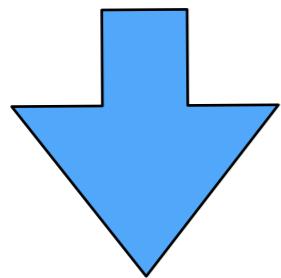
- Individuals? Groups? Teams? Companies?
- For instance, investigating *Java developers' programming practice* is a research objective different from investigating *Company practice for Java programming*

Characterising the target population

Challenge

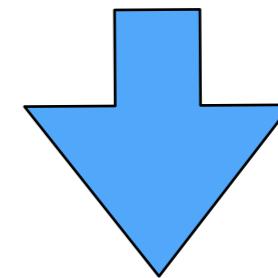
Identify the units of analysis (2/2)

“How do developers perform code debugging?”

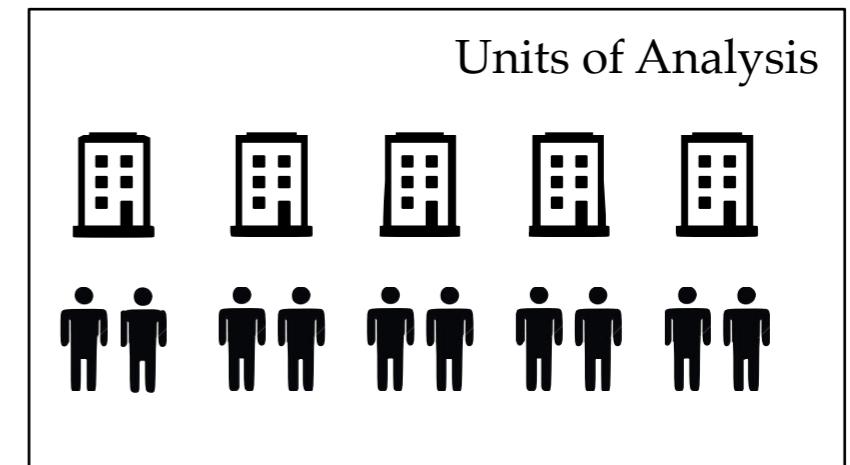
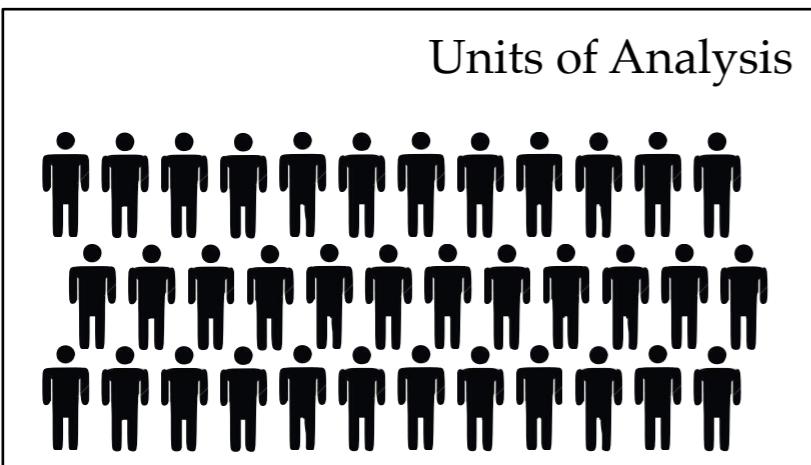


List of developers

“How is code debugging performed in companies?”



List of companies



Characterising the target population

Challenge

Characterise the subjects and units of analysis

- Different research objectives may demand different attributes to characterising individuals/ groups of individuals
 - » Use standard reference models (e.g. in context of process tailoring):
 - Individuals: experience in the research context, experience in SE, current professional role, location and higher academic degree, ...
 - Project teams: team size, client/ product domain (avionics, finance, health, telecommunications, etc.) and physical distribution, ...
 - Organisations: size, industry segment, location, type (government, private company, university, etc.), ...

Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

- Bad questionnaires can lead subjects initially willing to participate to give up!
 - » Use simple and appropriate wording for the survey questions
 - » Avoid technical terms as much as possible or define them in the questionnaire, according to the survey target population
 - » Take preference to design short questions regarding a single concept
 - » Avoid double barreled questions
 - » Avoid vague sentences while writing survey questions

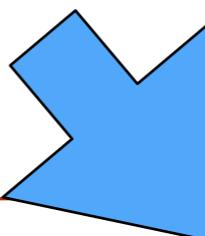
Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

In your opinion, do you agree or disagree that code refactoring is a need? And what about code smell detection?

- a) I strongly agree
- b) I partially agree
- c) I agree
- d) I disagree



Code refactoring is an essential practice for improving the understanding of object-oriented code.

- a) Totally agree
- b) Partially agree
- c) Neither agree nor disagree
- d) Partially disagree
- e) Totally disagree

Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

- » Avoid biased questions

Do you prefer working in projects following agile methods or those following usual non-agile approaches?

- » Avoid asking about events too far in the past

Considering the main characteristics of the last 10 software projects you have worked on, please answer the following questions:

Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

- » Avoid asking sensitive questions unless you really need to (and if you need to, make explicit why you ask these questions)

What is your gender?

What is your income?

What is your age?

Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

- » Avoid asking too demanding questions (w.r.t. time, effort)

After reading the attached papers regarding non functional requirements (NFR), please answer the following questions:

1. Which of the following NFR do you disagree are not relevant in the context of real-time systems?

...

Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

- » Select the appropriate response formats and scales

How much experience do you have in Java programming?

I have been working with Java programming at companies since 2011. Before, I got my first Java certification in 2009, when I started working in personal projects. But I have difficult with object-oriented parts...

How much experience do you have in Java programming?

5 years

Do you have experience in Java programming?

() Yes

() No

Response formats and scales

	Nominal scale	Ordinal (and “Likert”) scales	Interval scale	Free-text responses	Numeric values
Characteristic	<ul style="list-style-type: none">• Closed questions	<ul style="list-style-type: none">• Closed questions• Not always equally distributed• No distance measure	<ul style="list-style-type: none">• Closed questions• Considered equally distributed	<ul style="list-style-type: none">• Open questions• Allow “coding”	<ul style="list-style-type: none">• Open questions
Analysis	<ul style="list-style-type: none">• Statistical analysis based on frequency	<ul style="list-style-type: none">• Significantly restricts statistical analysis	<ul style="list-style-type: none">• Statistical analysis less restrictive	<ul style="list-style-type: none">• Content analysis• High effort on data analysis	<ul style="list-style-type: none">• Allow a wide range of statistical analysis

Questionnaire design

Challenge

Design a clear, simple and consistent survey questionnaire

- **Remember: you have one shot only!**
(Once you started the survey, there is usually no way back.)
- » Pilot the survey instrument with respondents characteristic for your population!
- » Pilot the data (quantity and quality) by applying the planned data analysis techniques!

Data curation and disclosure

Challenge

A survey needs to be reproducible

- Reporting on a survey without background information is asking for too much credit from the reader (and the reviewers)!
 - » Report on details of all data collection with a study protocol
 - » Disclose the instrument used: Questionnaire, reference documents
 - » Disclose the anonymised data and the codebooks
 - » Do not use your institution websites (prone to changes)
 - » Instead, use open repositories like Figshare (providing DOIs)

Besides all methodological issues...
there is more.

Every survey needs a proper project plan

1. Plan for methodological challenges (✓)
2. Find a proper project organisation early
3. Set up a proper project infrastructure
4. Develop a good project dissemination plan
5. Organise an efficient data collection
6. Organise an efficient data curation and analysis
7. Develop a good packaging and reporting plan

Are there any particular best practices you would like to share?

Further reading

- Torchiano, M., Méndez Fernández, D., Travassos, G.H., de Mello, R. M. (2017). Lessons Learnt in Conducting Survey Research. In: Proc. 5th International Workshop on Conducting Empirical Studies in Industry (CESI). ICSE 2017.
Available at <https://arxiv.org/abs/1702.05744>
- Groves, Fowler, Couper, Lepkowski, Singer and Torangeau, (2009). “Survey Methodology – 2nd edition” John Wiley and Sons
- Conradi R., Li J., Slyngstad O. P. N., Kampenes V. B., Bunse C., Morisio M., Torchiano M. (2005). “Reflections on conducting an international survey of CBSE in ICT industry” IEEE 4th International Symposium on Empirical Software Engineering November.
- Linåker, J. Sulaman, S. M., de Mello, R. M. and Höst, M. (2015). Guidelines for Conducting Surveys in Software Engineering. TR 5366801, Lund University Publications. <http://lup.lub.lu.se/record/5366801/file/5366839.pdf>
- de Mello, R. M. and Travassos, G. H. (2016). Surveys in Software Engineering: Identifying Representative Samples. Proc. of 10th ACM/IEEE ESEM, Ciudad Real.

Further “reading”

Technische Universität München 

Research Methods in Software Engineering

**An Introduction into Philosophy of Science
for Software Engineers**

Based in parts on material from a joint work with:
Antonio Vetrò (Nexa Center for Internet and Society, Politecnico di Torino)
Andreas Jedlitschka (Fraunhofer Institute for Experimental Software Engineering)
Natalia Juristo (Politecnic University of Madrid)

Daniel Méndez
 @mendezfe

Technical University of Munich
Germany

www.mendezfe.org

**14th International Advanced School of
Empirical Software Engineering**

**Surveys in
Software Engineering**

Marco Torchiano


POLITECNICO
DI TORINO
Dipartimento di
Ingegneria dell'Informazione

Further coaches

Rafael Maiani de Mello Daniel Méndez Guilherme H. Travassos


PUC
RIO


Centro Multidisciplinar de
Pesquisa e Ensino de Engenharia
COPPE
UFRJ

See www.mendezfe.org/talks/ (or approach me)

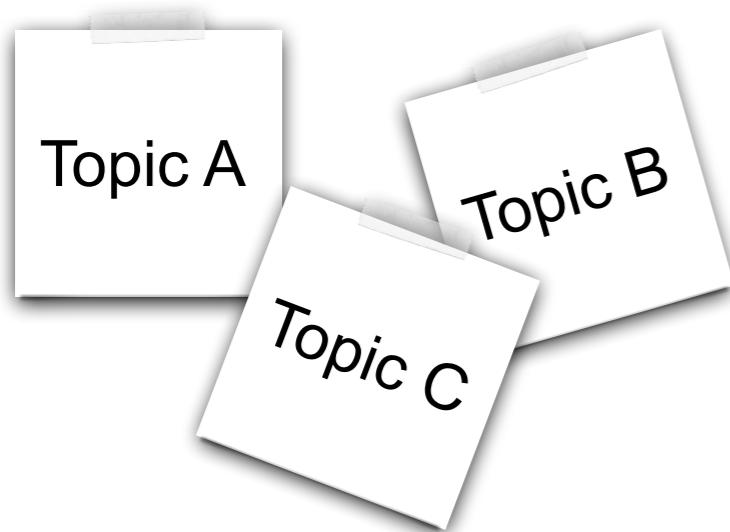


Outline

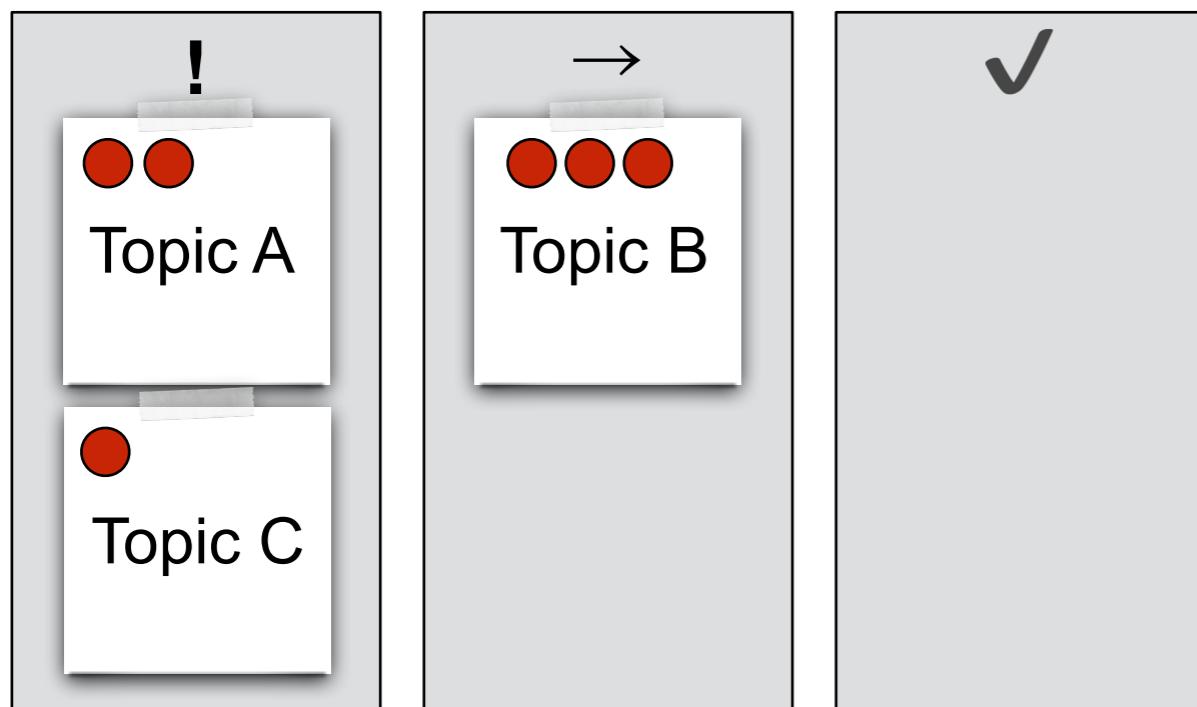
- A brief introduction into survey research
- (Selected) Best practices
- **Lean coffee**

Lean Coffee

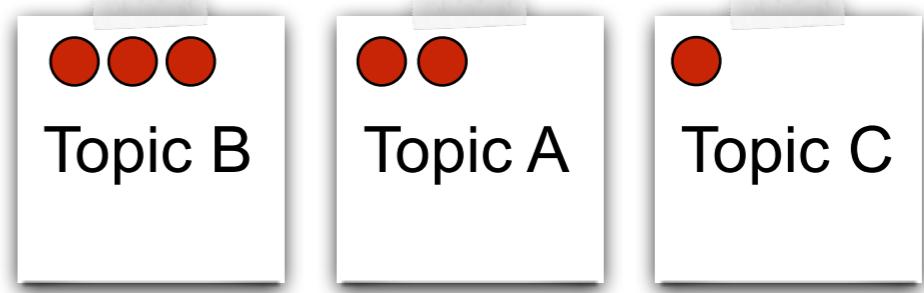
1. Collect topics



3. Discuss topics in the group

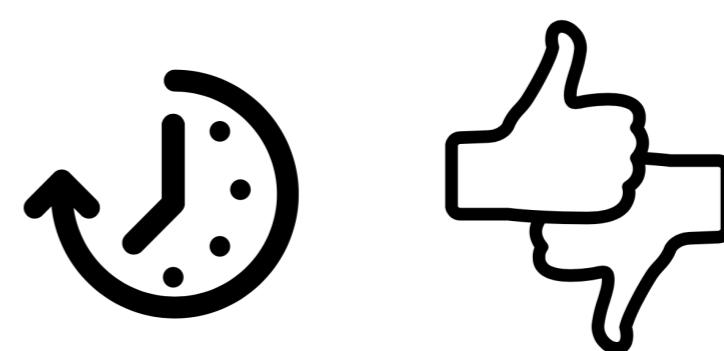


2. Rank by interest



4. Revise

(Continue with B or move on to A?)



Thanks for your participation!

👉 In case of questions, approach me any time!

Daniel Méndez
Technical University of Munich

www.mendezfe.org
 @mendezfe