Understanding the Impact of Artefact-based RE

Design of a Replication Study

Joint work with
B. Penzenstadler, University of Irvine
J. Eckhardt, Technische Universität München

Daniel Méndez
@mendezfe
Technische Universität München
Germany

ESEM 2013
Baltimore, USA
11.10.2013
Context: Artefact-based Requirements Engineering

Activity Orientation

Artefact Orientation

VS
Paradigms
Current State of (reported) Evidence

Activity Orientation

Artefact Orientation

- Current view based on experiments & isolated case studies
  ➡ Indicate to benefits for artefacts quality and process flexibility

- Current view based on mapping study (EASE’ 13)
  ➡ Only 2 out of 64 papers report on empirical evaluation

- Current view based on experiments & isolated case studies
  ➡ Indicate to benefits for artefacts quality and process flexibility

(EASE’ 11)
Paradigms

The ugly truth remains...
Need for Replication Studies

Continuous replications necessary to steer (problem-driven) research

"Close enough. Let’s go."
Contribution: Design of a Replication Study

Overall Process

Initial Case Study / Baseline

- Case Study
- Reference Model
- Assessment Criteria

Replication

- Replication Study Design
- Assessment Criteria
- different contexts
- Replication of the case study
- Reference Model

Synthesis
Contribution: Design of a Replication Study

Overall Process

(Working) Hypotheses

A higher level of detail in an artefact model...

H1: ... increases the syntactic quality in the artefacts
H2: ... decreases the ease of use of the approach
Case Study Design(s)

Cases

- **RE Reference model** with underlying paradigm-associated meta model
- **Project setting** that can be reproduced and analysed after the fact (comparative study)

Subjects

- **Industry Participants** (including at least a Requirements Engineer)
- **External Researchers**
- **External Reviewer**

Data Collection (via canonical action research)

- **Knowledge Transfer**
  - Workshop 1

- **Application artefact-based RE Reference Model**
  - Workshop 2
  - Workshop ...
  - Workshop n

- **Assessment**
  - Workshop n+1

Industry Participants

External Researchers

Questionnaire

RE Artefacts

RE Legacy Artefacts
Instrument for Assessment

Research questions

Does the artefact-based RE approach improve...

1. ... the *usability* of the RE reference process?
2. ... the *syntactic quality* of the created artefacts?
3. ... the *semantic quality* of the created artefacts?

- Questionnaire for evaluating 14 criteria
- Closed and open questions
- Full questionnaire and templates on demand!
Currently ongoing Studies

Two replication studies for embedded reactive systems
Currently ongoing Studies

Two replication studies for embedded reactive systems

1. Replication at BMW
Currently ongoing Studies

Two replication studies for embedded reactive systems

2. Replication at Cassidian
Currently ongoing Studies

Two replication studies for embedded reactive systems

Presented at: RESER 3rd International Workshop on Replication in Empirical Software Engineering Research

• Assessment currently supports working hypotheses
• Observations and lessons from CAR (simplified)
  • Diversity of information demands from different disciplines in automotive and avionics sector
  • Strong influence by political acceptance / organisational willingness to change
  • Learning curves not covered in simplified metrics like “ease of use”

Further studies
• Investigation of artefact orientation in context of agile RE
• Long-term evaluation of artefact-based RE in context of organisational change management
Threats to Validity

- (Action research) case studies strongly influenced by “soft aspects” / skills
- Criteria for evaluation initially chosen in an opportunistic manner

⇒ Re-adjustment of evaluation criteria in controlled setting necessary

- Studies rely on current views and understanding of paradigms

⇒ Long-term objective: Understand effects of paradigms to steer basic research
Future work

**Replicate, learn, replicate, learn, ...**

Maximising internal & construct validity

- Controlled experiments
  - Evaluation of criteria based on family of surveys in RE ([www.re-survey.org](http://www.re-survey.org))
  - Initiation of series of (lab) experiments in lectures/tutorials

➡ Re-adjustment of instrument
➡ Control of bias in subjects (resulting from nature of action research)

Maximising external validity

- Further replications in industrial contexts planned
➡ Continuously learn
You are cordially invited to join us!

We can provide
- Evaluation sheets
- Models & Tools
- Project data

Daniel Méndez
Daniel.Mendez@tum.de
@mendezfe