Challenges and mitigation propositions for effort estimation in large-scale agile development

Karla Eleonore Weigelt, 09.01.2023, Kick-Off Bachelor's Thesis

Chair of Software Engineering for Business Information Systems (sebis)
Faculty of Informatics
Technische Universität München
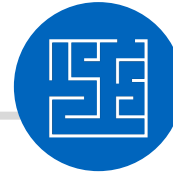wwwmatthes.in.tum.de

Outline

Motivation

Research Questions

Research Methodology

First Findings

Research Roadmap

Motivation (1/2)

Due to their success in small scale, agile methods are becoming more popular in a large-scale organizational context [1], [2]

Applying agile methods on large scale projects increases complexity & maintaining oversight is challenging [2], [7]

Accurate predictions can be a means to support tracking the project's progress and staying within budget and time [4], [6], [10]

[1] Digital.ai.15th State of Agile Survey (2021), [2] K. Dikert, M. Paasivaara, & C. Lassenius (2016)
[7] S. Nerur et al. (2005)
[4] F. J. Heemstra (1992), [6] E. Kula (2021), [10] M. Usman et al. (2018)

Motivation (2/2)

Potential and relevance of accurate predictions [6], [10]

Estimation is **error-prone** (e.g., due to human biases) - *effort and cost estimate errors may lead to a project failure regarding delivery time, budget or features* [6], [10]

Planning & estimation are challenging when applying agile practices at scale [2]

Only little research focusing on:

- Effort estimation and their challenges in large-scale agile environments
- Providing guidance

This thesis tries to fill this gap.

[6] E. Kula et al. (2021), [10] M. Usman et al. (2018)
[2] K. Dikert, M. Paasivaara, & C. Lassenius (2016)

Outline

Research Questions

| RQ1 | How is effort estimation conducted in the case organization? |

| RQ2 | What are challenges in effort estimation in scaling agile environments? |

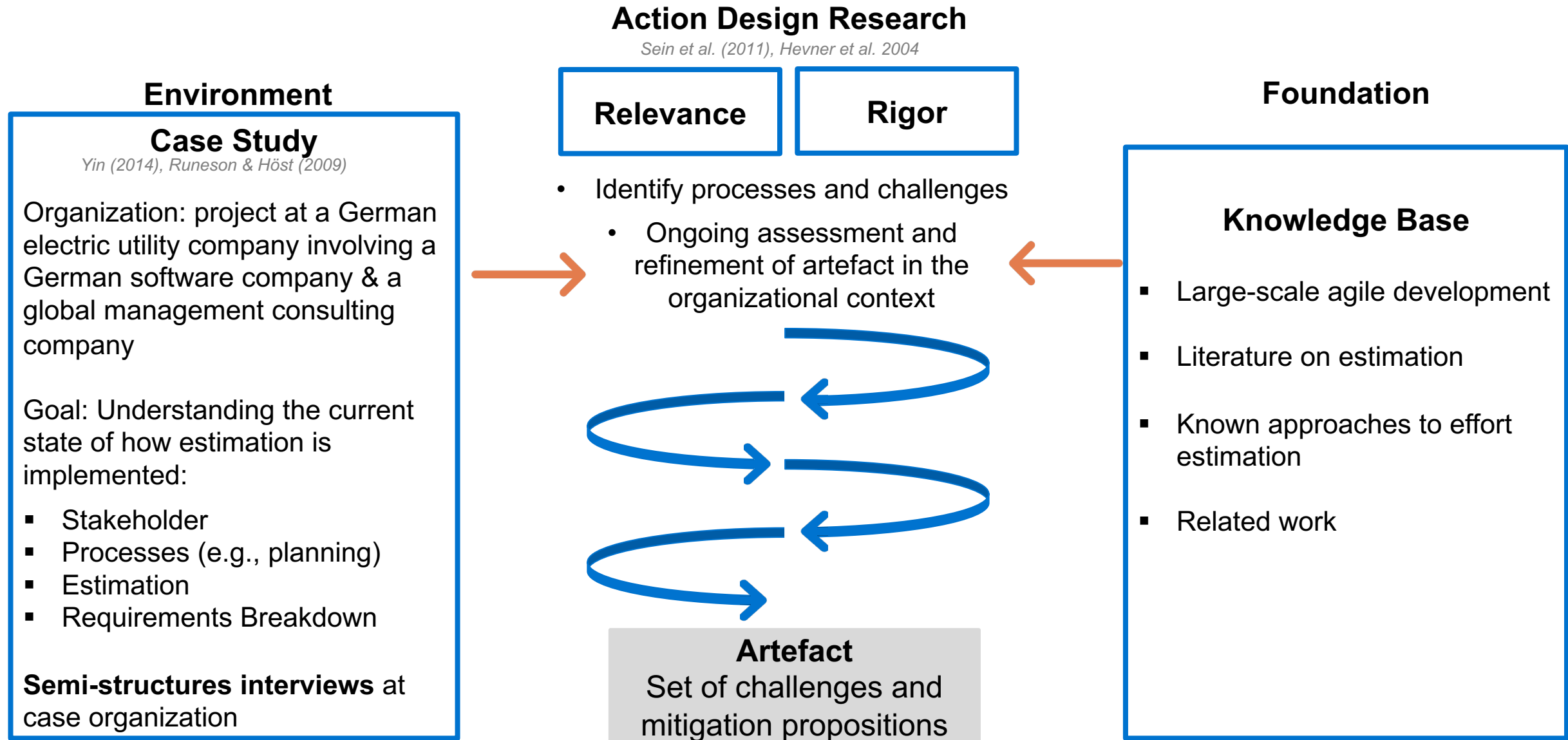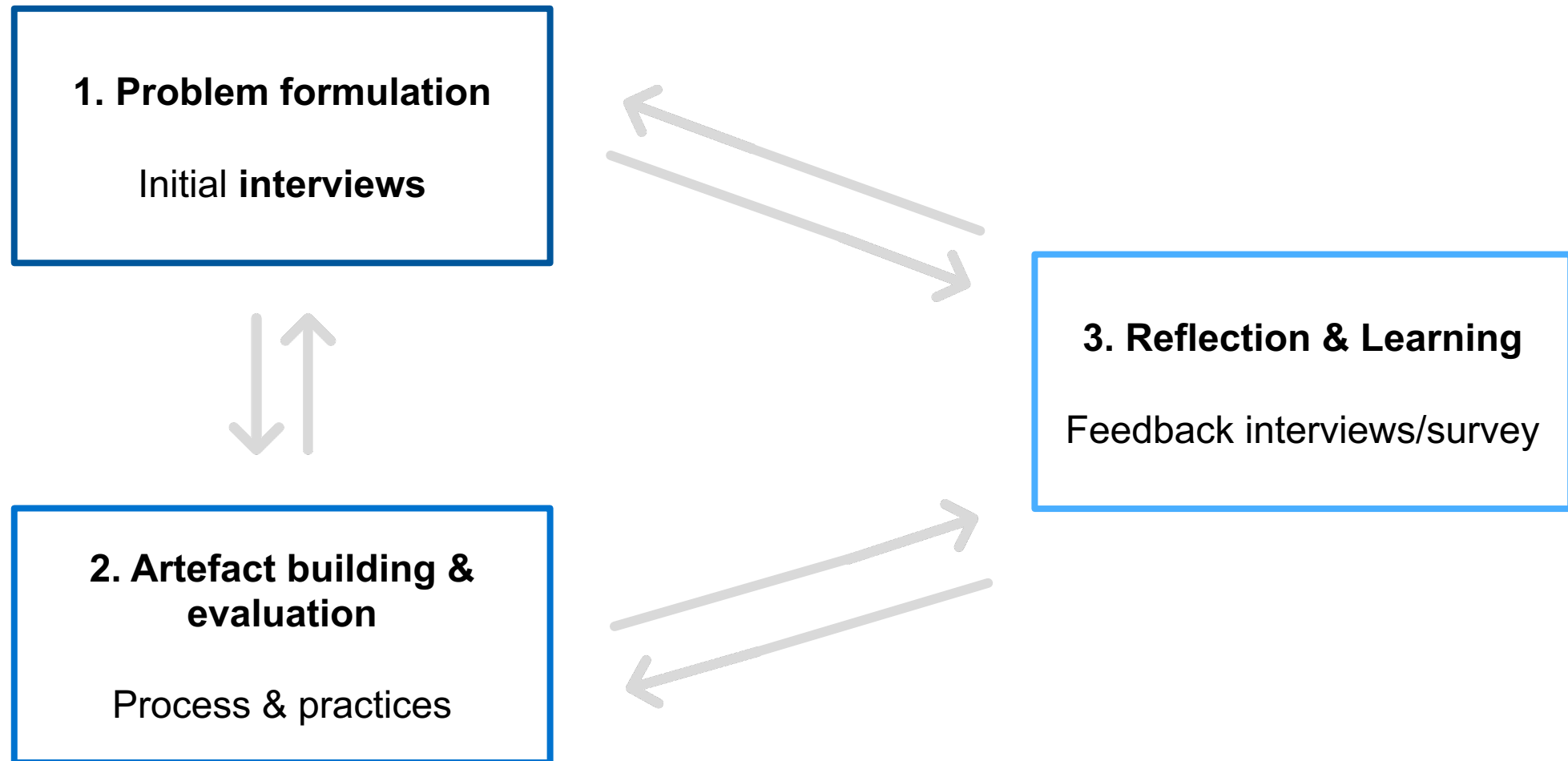| RQ3 | How can these challenges in effort estimation in scaling agile environments be addressed? |

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Research Methodology – Action Design Approach

Action Design Research

Sein et al. (2011), Hevner et al. 2004

Relevance	Rigor

Environment

Case Study

Yin (2014), Runeson & Höst (2009)

Organization: project at a German electric utility company involving a German software company & a global management consulting company

Goal: Understanding the current state of how estimation is implemented:

- Stakeholder
- Processes (e.g., planning)
- Estimation
- Requirements Breakdown

Semi-structures interviews at case organization

- Identify processes and challenges
  - Ongoing assessment and refinement of artefact in the organizational context

Foundation

Knowledge Base

- Large-scale agile development
- Literature on estimation
- Known approaches to effort estimation
- Related work

Artefact
Set of challenges and mitigation propositions

Research Methodology - Action Design Research

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│                             │
│  1. Problem formulation     │
│                             │
│     Initial interviews      │
│                             │
└─────────────────────────────┘

┌─────────────────────────────┐
│                             │
│  2. Artefact building &     │
│        evaluation           │
│                             │
│     Process & practices     │
│                             │
└─────────────────────────────┘

┌─────────────────────────────┐
│                             │
│  3. Reflection & Learning   │
│                             │
│  Feedback interviews/survey │
│                             │
└─────────────────────────────┘
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Sein et al. (2011)

Research Methodology - Problem Formulation

Semi-structured Interviews

- Understand how estimation is implemented at the case organization
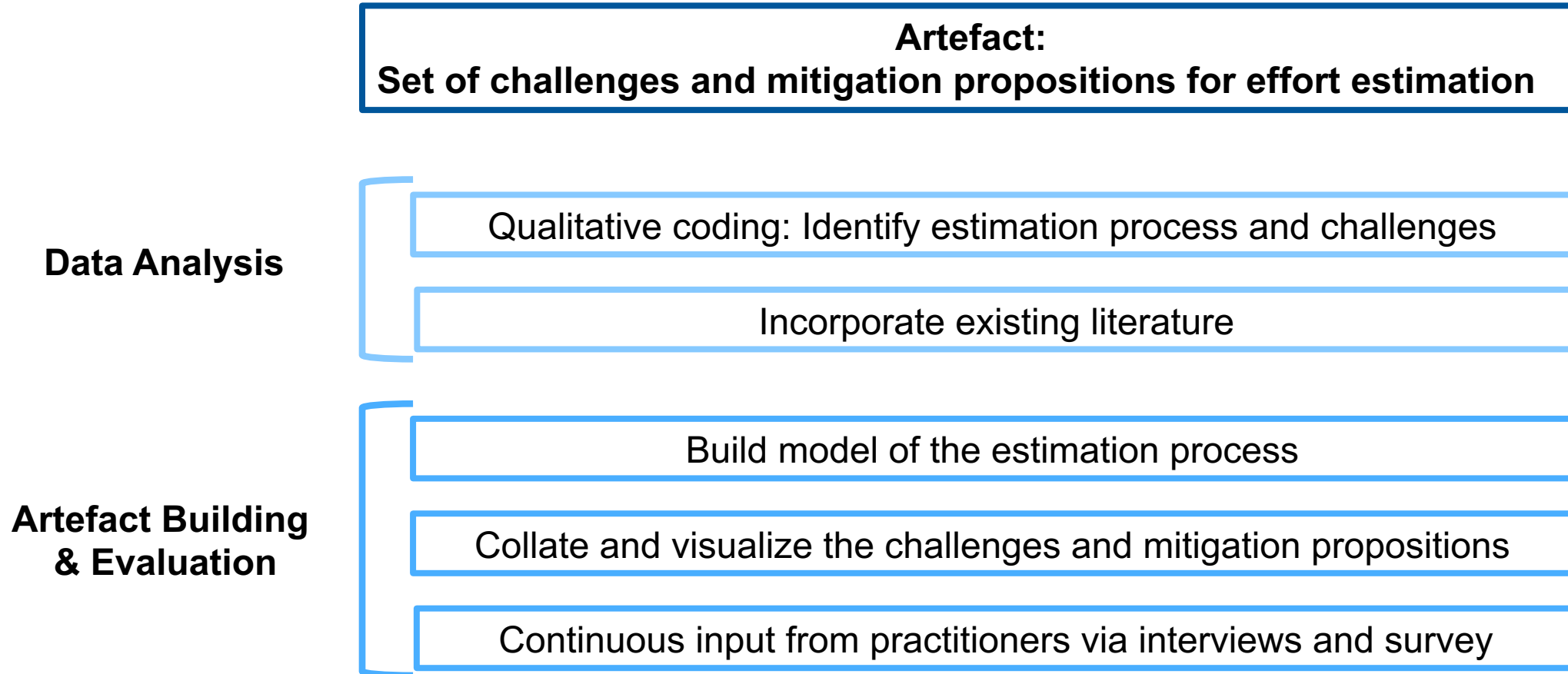- Identify the challenges in effort estimation

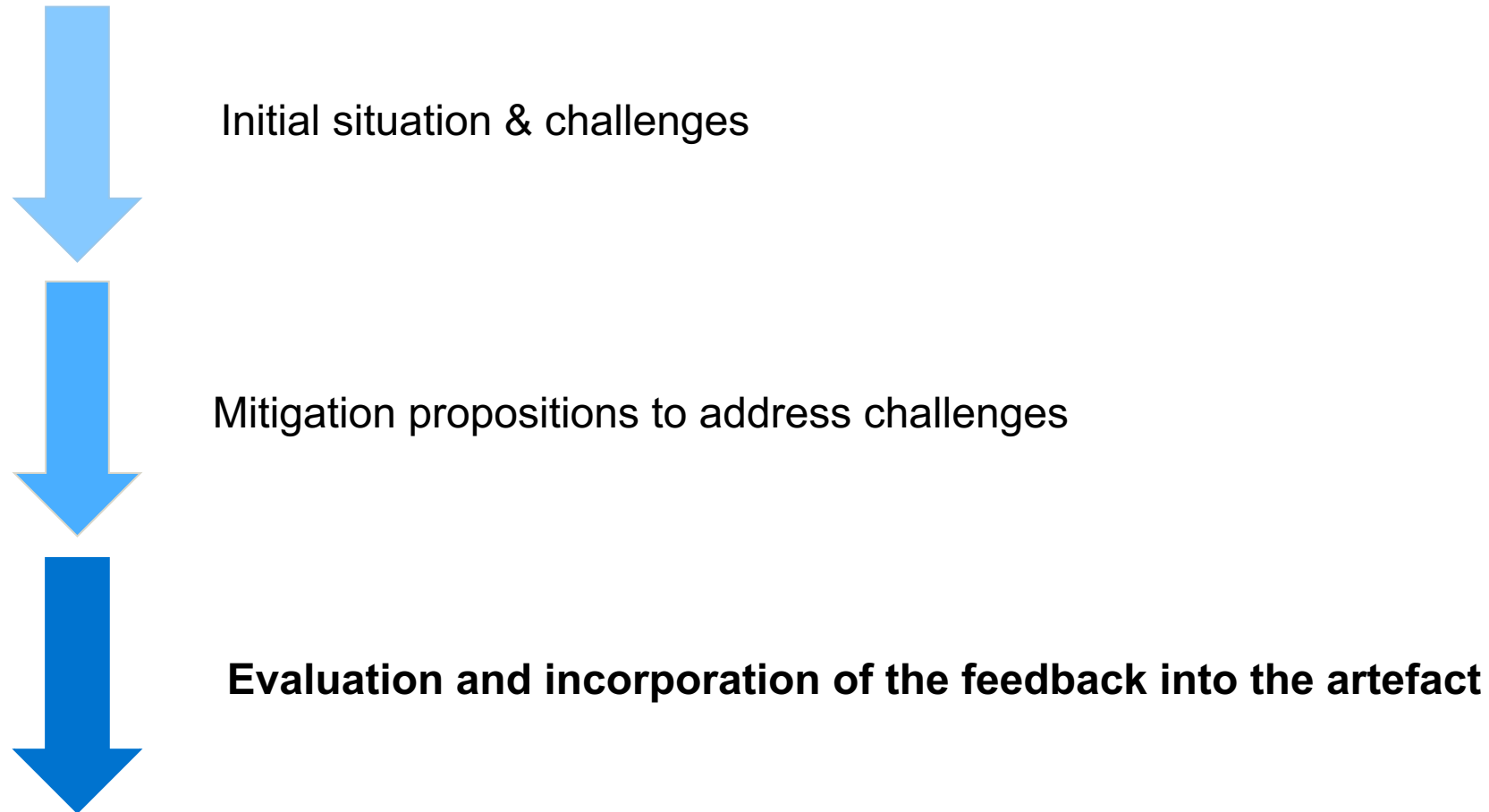Conducted 16 Interviews (~ Duration 60 minutes):

- Scrum Master (4)
- Product Owner (4)
- Solution Architect (4)
- Developer (3)
- Program Manager (3)
- Product Manager (3)
- Business Process Expert (1)

Finished the transcription of the interviews

Research Methodology - Artefact Building & Evaluation

Artefact:
Set of challenges and mitigation propositions for effort estimation

Data Analysis

Qualitative coding: Identify estimation process and challenges

Incorporate existing literature

Artefact Building & Evaluation

Build model of the estimation process

Collate and visualize the challenges and mitigation propositions

Continuous input from practitioners via interviews and survey

Sein et al. (2011)

Research Methodology - Reflection & Learning

Initial situation & challenges

Mitigation propositions to address challenges

Evaluation and incorporation of the feedback into the artefact

Sein et al. (2011)

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First Findings – Effort Estimation Process

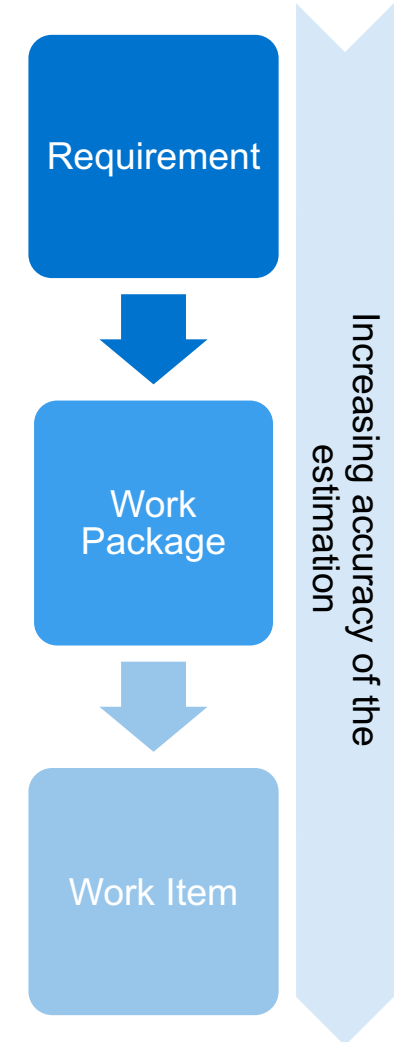1. Effort Estimation of the Requirements (in Effort Points):
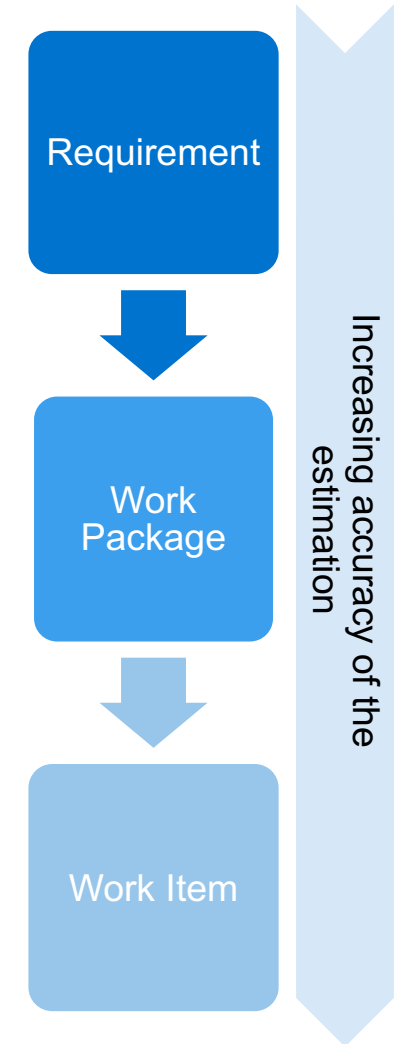
   - Effort Estimation is performed once a year
   - Rough estimation
   - Involved stakeholder: Product Owners, SolAr & Subject-Matter Experts

2. Effort Estimation of the Work Packages (in Story Points & optional in Value Points):

   - Effort Estimation is performed quarterly in Wave planning events
   - Estimation become more precise after adjusting
   - Involved stakeholder: responsible Scrum Team, Product Manager & Scrum Master

3. Effort Estimation of the Work Items (in Story Points):

   - Effort Estimation is performed every three weeks in Sprint planning events
   - Estimation of Work Items are most accurate
   - Involved stakeholder: responsible Scrum Team, Product Manager & Scrum Master

Requirement

Work Package

Work Item

Increasing accuracy of the estimation

First Findings – Effort Estimation Process

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Requirement

Work Package

Work Item

Increasing accuracy of the estimation

First Findings – Effort Estimation Process

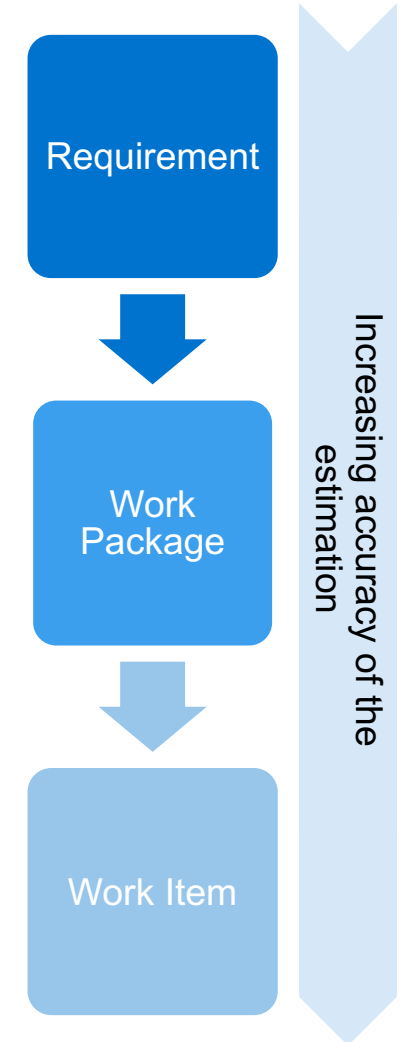1. Effort Estimation of the Requirements (in Effort Points):

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Requirement

Work Package

Work Item

Increasing accuracy of the estimation

First Findings – Challenges in Effort Estimation

Challenges

1. Estimation is a very time intensive process

2. Estimation is mostly based on subjective criteria

3. Dependency between workstreams

4. Vague and unclear definition of requirements

Mitigation Propositions

Automation with Artificial Intelligent

More exchange among each other e.g., in workshops/meetings
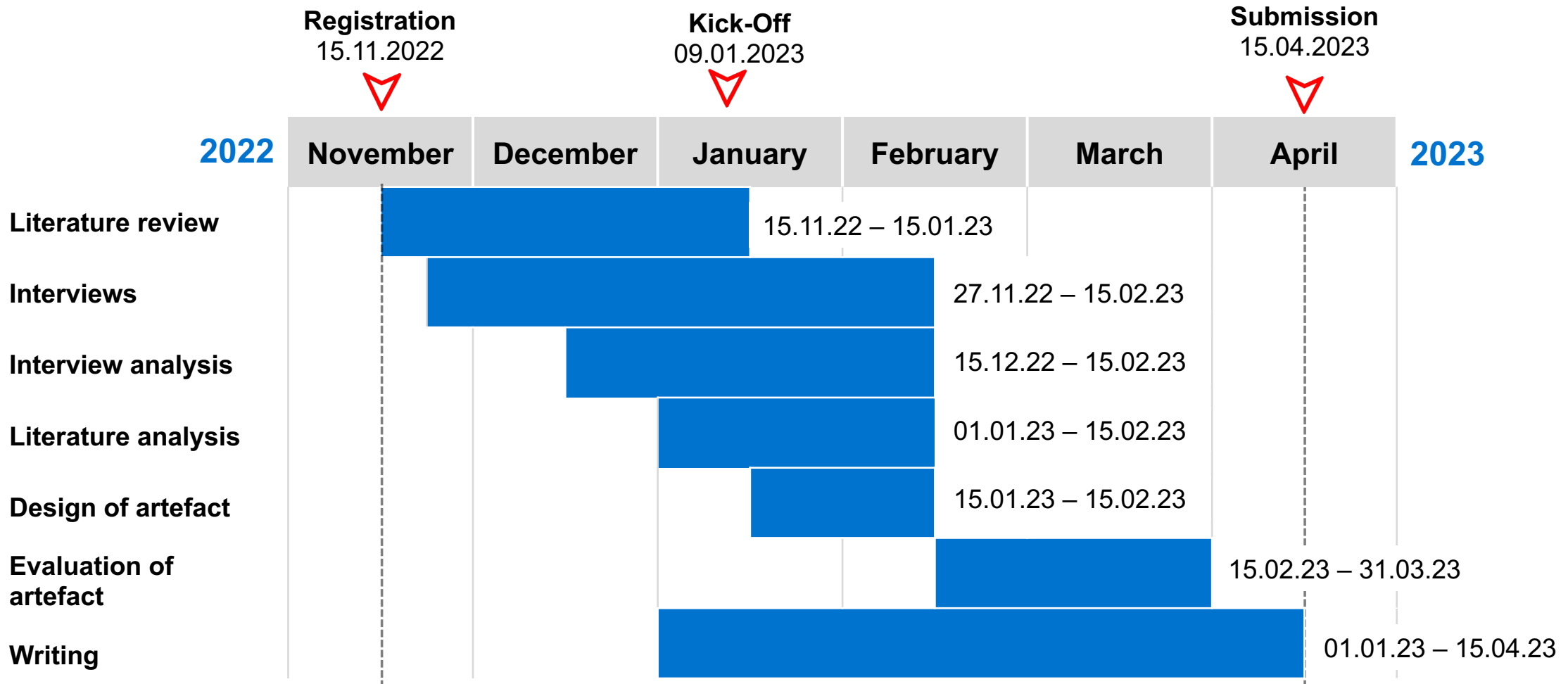
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	2022	November	December	January	February	March	April	2023

Registration 15.11.2022

Kick-Off 09.01.2023

Submission 15.04.2023

Literature review — 15.11.22 – 15.01.23

Interviews — 27.11.22 – 15.02.23

Interview analysis — 15.12.22 – 15.02.23

Literature analysis — 01.01.23 – 15.02.23

Design of artefact — 15.01.23 – 15.02.23

Evaluation of artefact — 15.02.23 – 31.03.23

Writing — 01.01.23 – 15.04.23

References

[1] Digital.ai.15th State of Agile Survey 2021, https://info.digital.ai/rs/981-LQX-968/images/SOA15.pdf (Last Access 05.01.2023)

[2] Dikert, K., Paasivaara, M., and Lassenius, C. 2016. "Challenges and success factors for large-scale agile transformations: A systematic literature review". Journal of Systems and Software 119, pp. 87–108.

[3] Icons: https://www.flaticon.com/de/suche/2?word=agile&color=gradient&order_by=4 (Last Access 05.01.2023)

[4] Heemstra , F. J. 1992. "Software cost estimation" .Information and Software Technology Vol. 34, pp. 627-639.

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B.Sc.

Karla Weigelt
Bachelor Student Information Systems

Technische Universität München
Fakultät für Informatik
Lehrstuhl für Software Engineering
betrieblicher Informationssysteme

Boltzmannstraße 3
85748 Garching bei München

Tel   +49.89.289.17132
Fax   +49.89.289.17136

karla.weigelt@tum.de
wwwmatthes.in.tum.de