

Investigating Metric Management in Large-Scale Agile Software Development

Jonathan Frick | 22th November 2021 | Final Presentation Master's Thesis

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1. Motivation

2. Research design

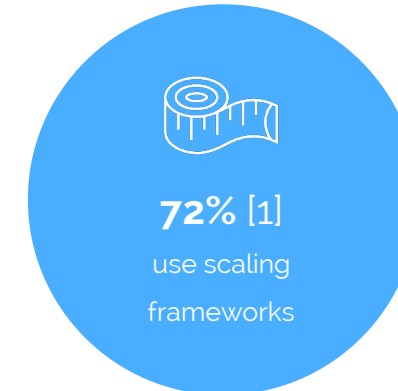
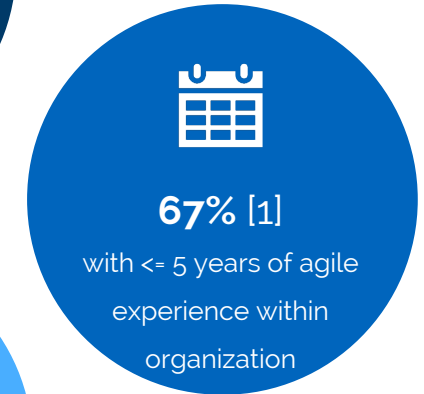
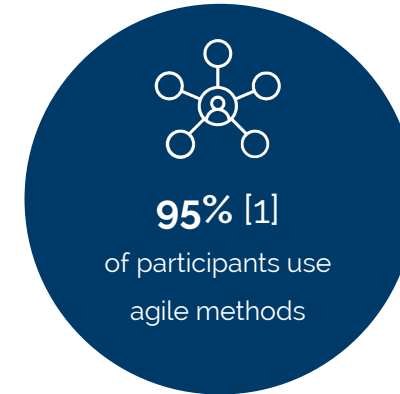
3. Artifacts

- a. Maturity grid
- b. Alternative assessment approach
- c. Web application prototype
- d. Assessor's guide

4. Evaluation

5. Key findings and outlook

- Software has become an important part of products and services [2]
- Originally intended for small teams [3], agile development has been adopted in the last decade also in the scale [1]
- The challenges have not changed in recent years [1] and are numerous
- To overcome challenges, researchers recommend using the example of successful companies as a model [5]
- Maturity models are a proven method for measuring and improving the maturity of an organisation [4]
- While there is research on Agile maturity models [6], there is a lack of research in large-scale Agile [7]



[1] State of Agile Report, Digital.ai, 2020

[2] The effect of moving from a plan-driven to an incremental software development approach with agile practices, K. Peterson and C. Wohlin, 2020

[3] Extending software project agility with new product development enterprise agility, P. Kettunen, 2007

[4] Assessing Organizational Capabilities: Reviewing and Guiding the Development of Maturity Grids, A. M. Maier, J. Moultrie and P. J. Clarkson, 2012

[5] Implementing Large-Scale Agile Frameworks: Challenges and Recommendations, K. Conboy and N. Carroll, 2019

[6] A systematic literature review of agile and maturity model research, V. Henriques and M. Tanner, 2017

[7] Revealing the State-of-the-Art in Large-Scale Agile Development: A Systematic Mapping Study, Ö. Uludag, P. Philipp, A. Putta, M. Paasivaara, C. Lassenius and F. Matthes, 2021

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RQ 1

What is the state of the art in research related to maturity models and maturity models in Agile and large-scale Agile environments in particular?



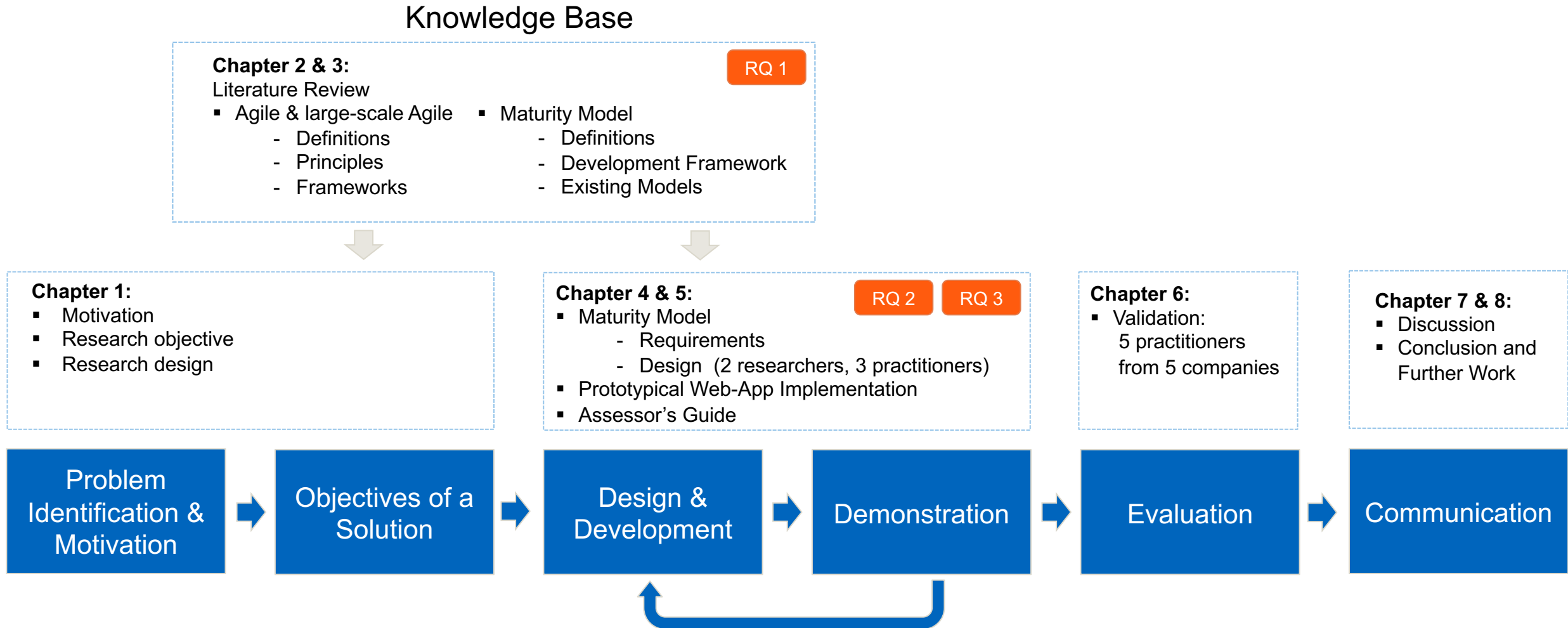
RQ 2

How can a maturity model be designed for large-scale Agile software development?



RQ 3

How can a prototypical implementation support practitioners in the usage of the maturity model?



Design Science Research Process, K. Pfeffers, T. Tuunanen, C. E. Gengler, M. Rossi, W. Hui, V. Virtanen, and J. Bragge ,2006

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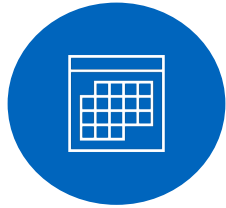
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Artifact: Maturity grid – General Assumptions



The audience for conducting the assessment on program level

- Internal decision-makers (e.g. Management)
- External consultants (e.g. Agile Coaches)



Regular assessment period

- For example, once quarterly
- To measure improvement outcome



Explicitly not targeting

- Inter-company benchmarking
- Aggregation of results
- Completeness due to framework- or organization-specific factors

Artifact: Maturity grid – Example



Artifact: Maturity grid – Level

- 
- 1 Initial:** This is the level that is initially reached without any actions being taken. There are no specific requirements associated with it.
 - 2 Awareness:** It is known that the dimension exists and that improvements need to be made. There is usually also awareness of existing best practices. Basic activities are undertaken to measure or improve.
 - 3 Transformation:** Practices for improvement in this dimension are regularly applied. As a result, managers and team members demonstrate a commitment to achieving this goal, and efforts are made to improve.
 - 4 Breakthrough:** The frameworks and practices for achieving this goal are followed and applied. Finally, the results are internalized so that the positive outcome is consistent.
 - 5 Optimizing:** Continuous improvements are made in the target area that goes beyond the success of best practices. A spirit of creative innovation in improvement is evident. However, this area is never completed. It is an ongoing process.

Artifact: Maturity grid – Dimensions

- 27 dimensions are grouped into five areas (process & organization, people, technology, finance, product)
- Organization-independent factors only, the organization can add own dimensions
- Derived from success factors, case studies, best practices, design patterns and principles
- Every dimension has conditions per level
- Example:

Area

(e.g. Technology)

Dimension

(e.g. Appropriate tool support)

Level 1

automatically reached

Level 2

(e.g. Are the requirements collected within the teams and an overview about tools exists?)

Level 3

(e.g. Are decisions concerning tools aligned among teams and architects?)

Level 4

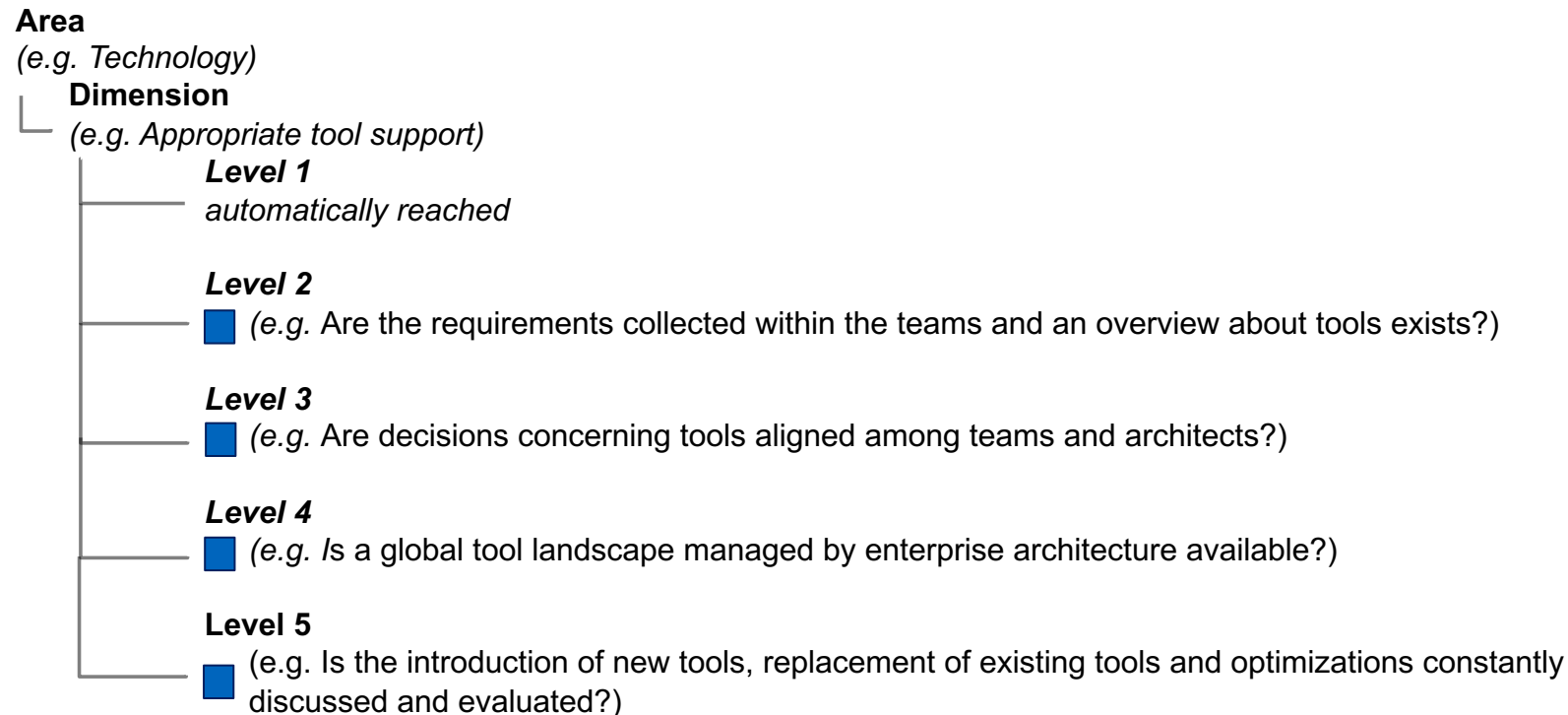
(e.g. Is a global tool landscape managed by enterprise architecture available?)

Level 5

(e.g. Is the introduction of new tools, replacement of existing tools and optimizations constantly discussed and evaluated?)

Artifact: Alternative Assessment Mode

- Not all levels are hard pre-conditions for the previous ones
- To improve call-to-actions, we propose checkbox-based selection
- Example:



Artifact: Alternative Assessment Mode

- Benchmarking should still be possible
- Attributes of levels are set according to the maturity
- Achieved maturity is calculated until first non-achieved item

Satisfied	Level	Question
✓	2	Are the requirements collected within the teams and an overview about tools exists?
✓	3	Are decisions concerning tools aligned among teams and architects?
✗	4	Is a global tool landscape managed by enterprise architecture available?
✓	5	Is the introduction of new tools, replacement of existing tools and optimizations constantly discussed and evaluated?



3

Achieved Maturity Level

Artifact: Alternative Assessment Mode

- Not each goal is desirable for each company
- To improve call-to-actions, single goals can be disabled
- Target maturity is calculated similar to achieved maturity

Goal	Level	Question
✓	2	Are the requirements collected within the teams and an overview about tools exists?
✓	3	Are decisions concerning tools aligned among teams and architects?
✗	4	Is a global tool landscape managed by enterprise architecture available?
✓	5	Is the introduction of new tools, replacement of existing tools and optimizations constantly discussed and evaluated?

**3****Target Maturity Level**

Artifact: Web Application

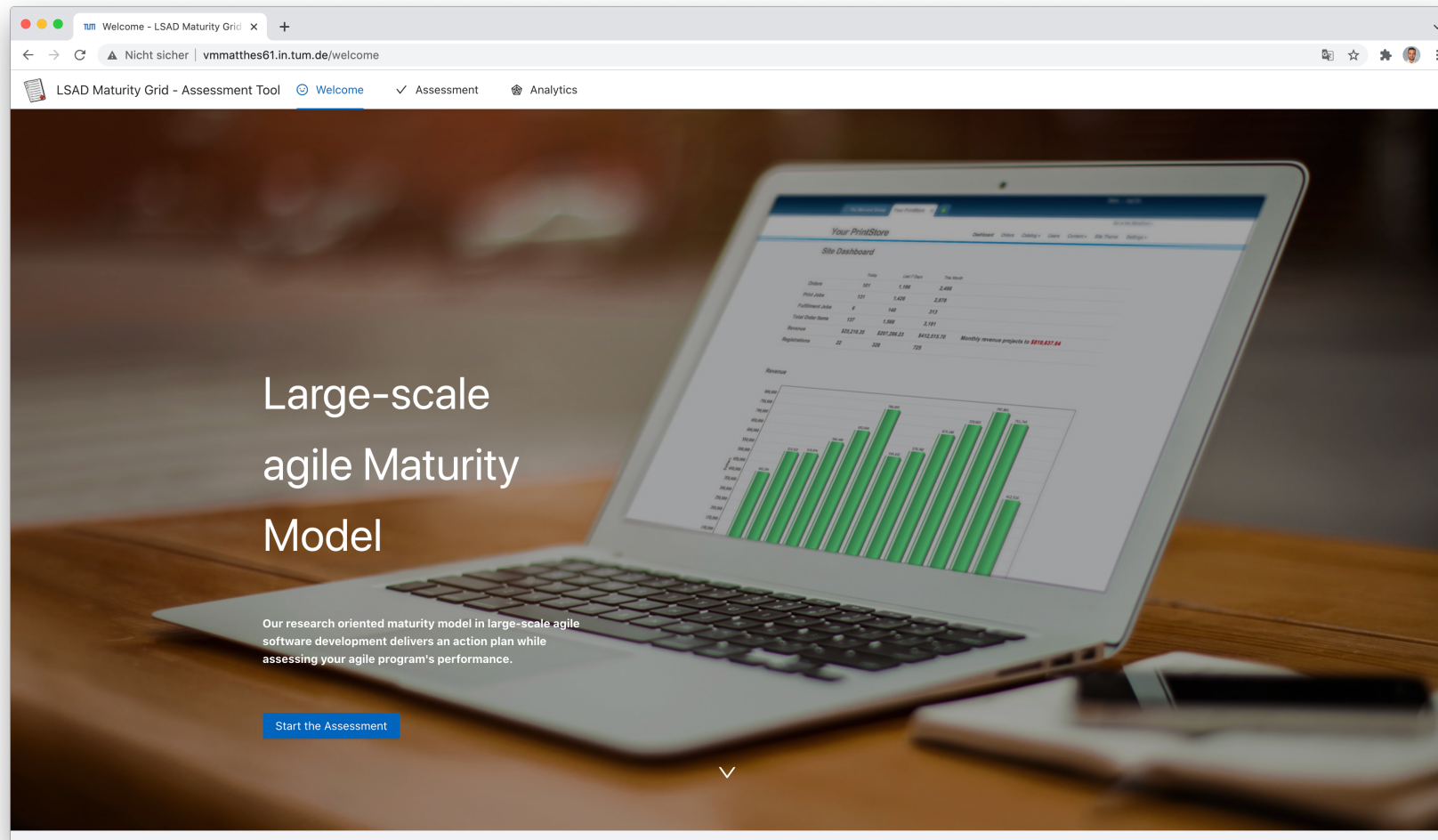
Challenges:

- Excel was getting more complex
- Checkbox-based approach with a combination of maturity levels is novel to our knowledge
- No known software with those capabilities was found
- Industry partners were requesting something easier to conduct the assessment with

Solution:

- A web-based prototype for conducting the assessment
- Simple UI for assessing
- Open for further enhancements, such as collaborative assessments

Artifact: Web Application



Live Demonstration

Artifact: Assessor's Guide

- Assumptions described in this presentation must be transferred to the assessor
- Further explanations on dimensions
- A guideline on how to conduct the assessment should be provided regarding industry partners



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Source: Assessor's Guide

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Goals:

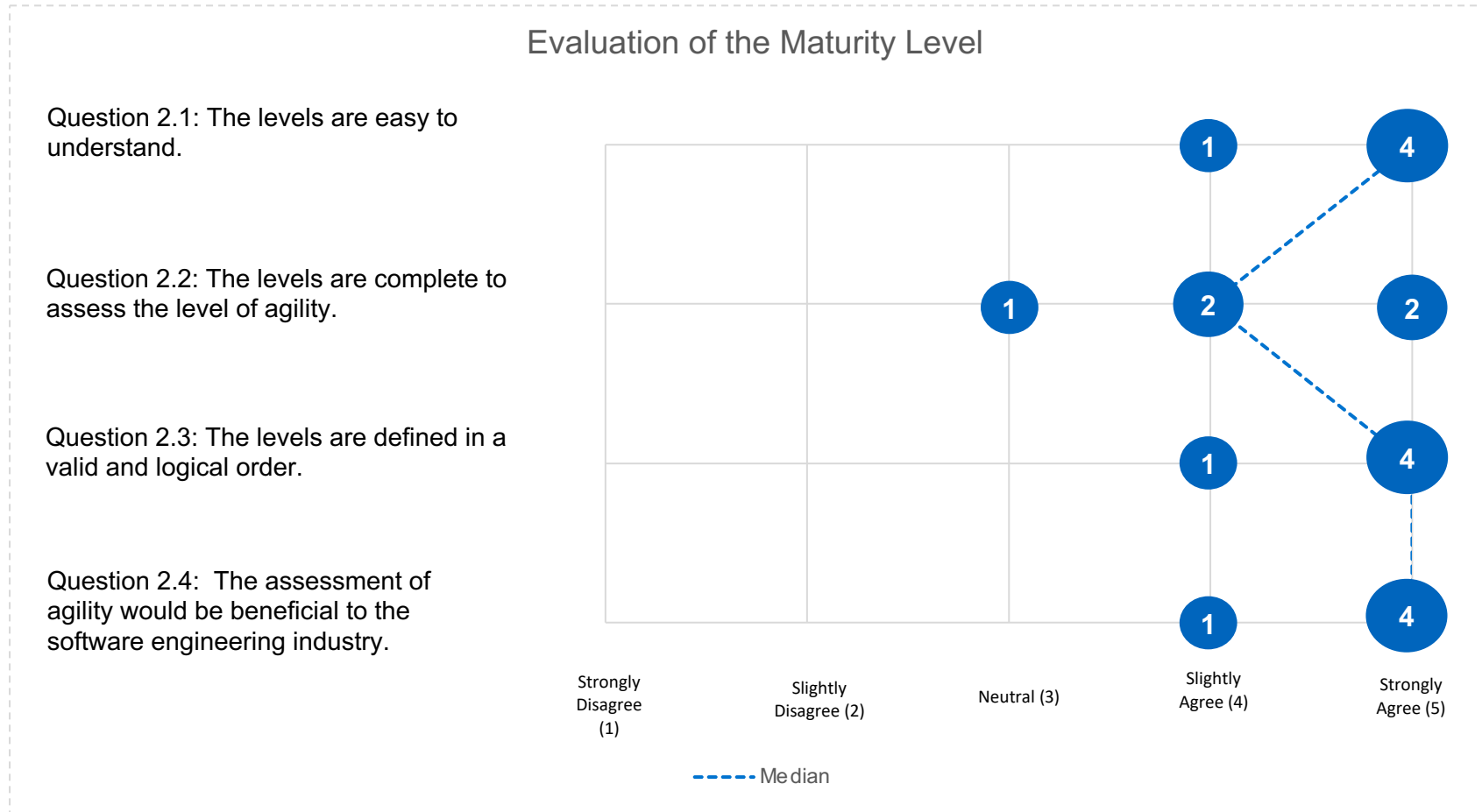
- Assess the artifacts in terms of understandability, practicality, relevance, objectivity, completeness
- Collect further feedback

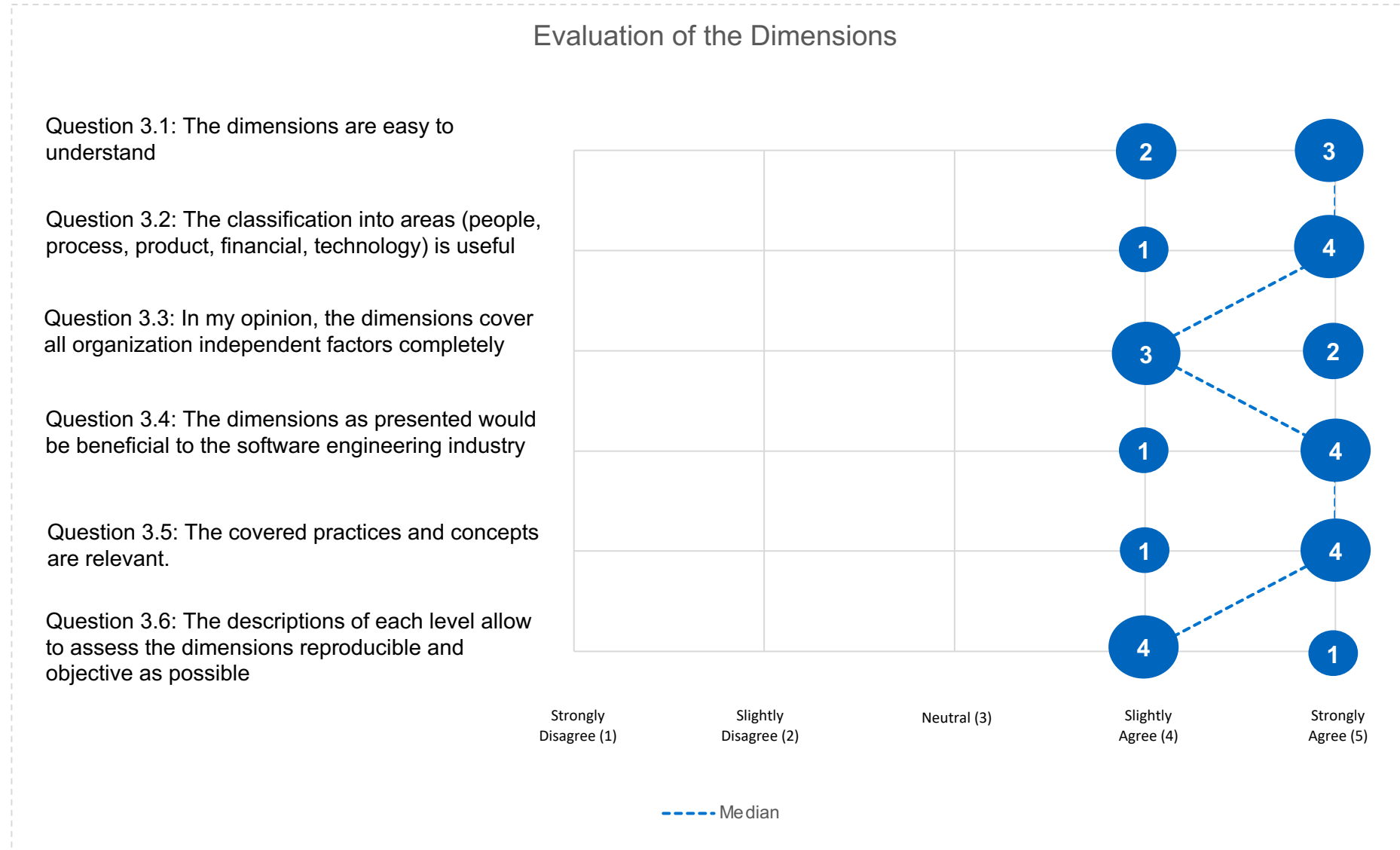
Method:

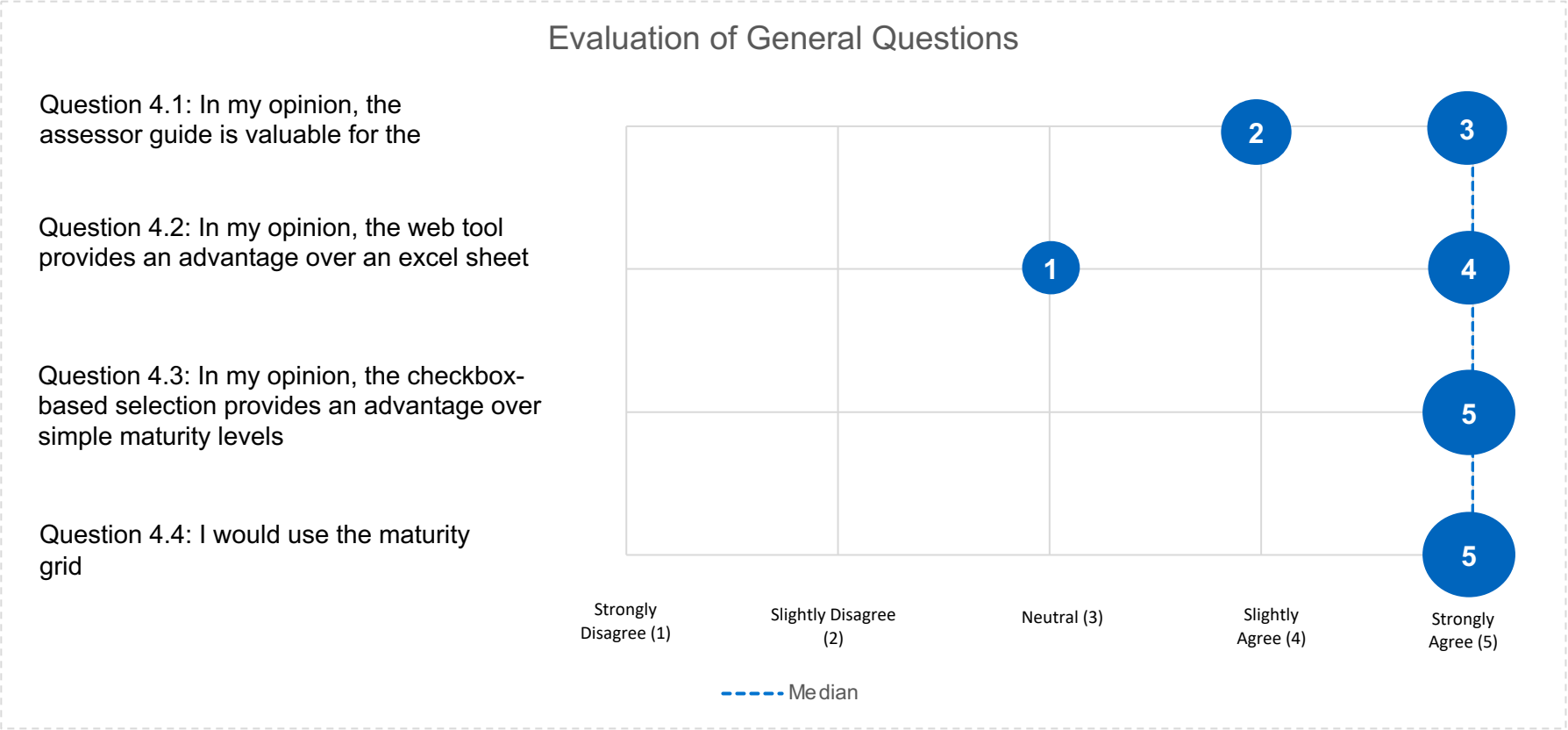
- Guided Evaluation with standardized agenda
- Questions with rating on Likert scale and open feedback



Person	Role	Experience Software Development (years)	Experience Agile Development (years)	Experience LSAD Development (years)	Familiarity with Process Improvement (1-7)	Organization (anonymized)
1	Agile Coach	16-20	11-15	6-10	7	ConsultingCo 1
2	Product Owner	11-15	6-10	6-10	5	InsuranceCo
3	Product Owner	3-5	3-5	3-5	4	AutomotiveCo
4	Manager	16-20	6-10	6-10	6	ConsultingCo 2
5	Product Owner	16-20	3-5	3-5	6	ConstructionCo







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Key findings and outlook

Key findings:

- There is an urgent need for an improvement-oriented maturity model in large-scale Agile software development
- Combination of checkboxes and stage-based maturity model is perceived positively
- Distinguishing between different perspectives is critical
- Improvements to the dimension descriptions are needed
- A web app can support different approaches to assessment

Outlook:

- Application of checkbox-based approach for assessment could be adopted in other areas as well
- Web application could be developed further
- More interviews are scheduled, a long-term case study would possibly be interesting



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