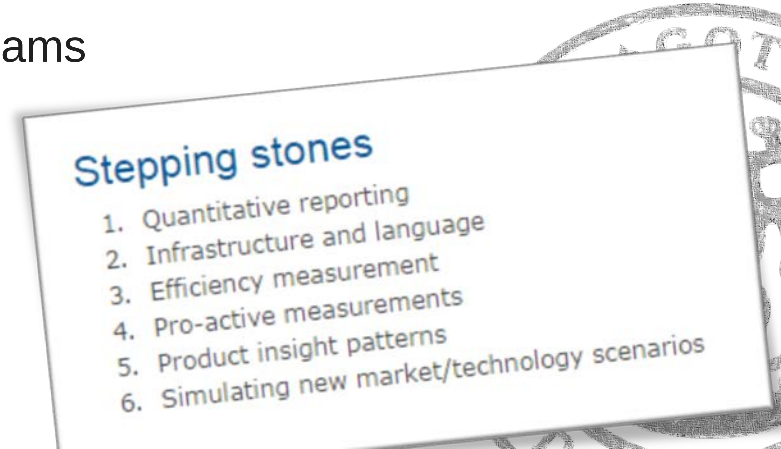
SOFTWARE CENTER THEME #3

Software Center Metrics Program
Goals and wanted position

- Goal
  - Rapidly empower the company (at all levels) to become excellent in measuring

- Wanted position
  - Evolving existing accurate predictions
  - Enhance release readiness assessments
  - Increase robustness of measurement programs



Stepping stones

1. Quantitative reporting
2. Infrastructure and language
3. Efficiency measurement
4. Pro-active measurements
5. Product insight patterns
6. Simulating new market/technology scenarios

Active projects in sprint #11

- Metrics
  - KPI quality model evaluation
  - Measuring speed of software development: review speed

- Quasar@Car
  - Extending the MEFIA method to other meta-models

- Measuring size
  - Exploring new ways of measuring software size

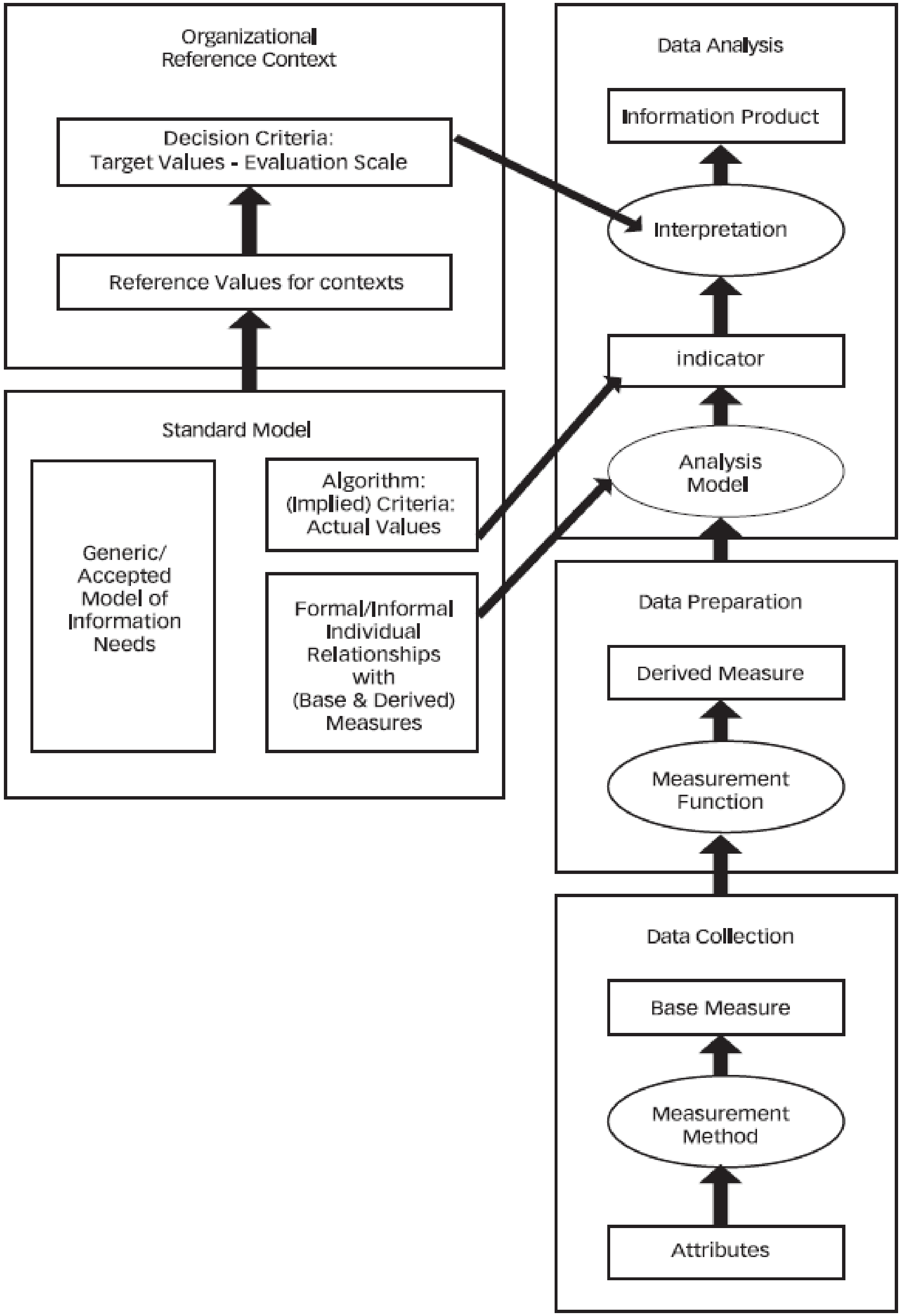
KPI QUALITY MODEL

KPI Quality model

- Goal
  - Evaluate the quality of KPIs – to fine tune the measurement method for the KPI quality
- Activities
  - Assessing top level KPIs at Volvo Cars and Ericsson
  - Improvement of KPI quality
- Next steps
  - Develop guidelines on how to create high-quality, actionable KPIs – sprint #12

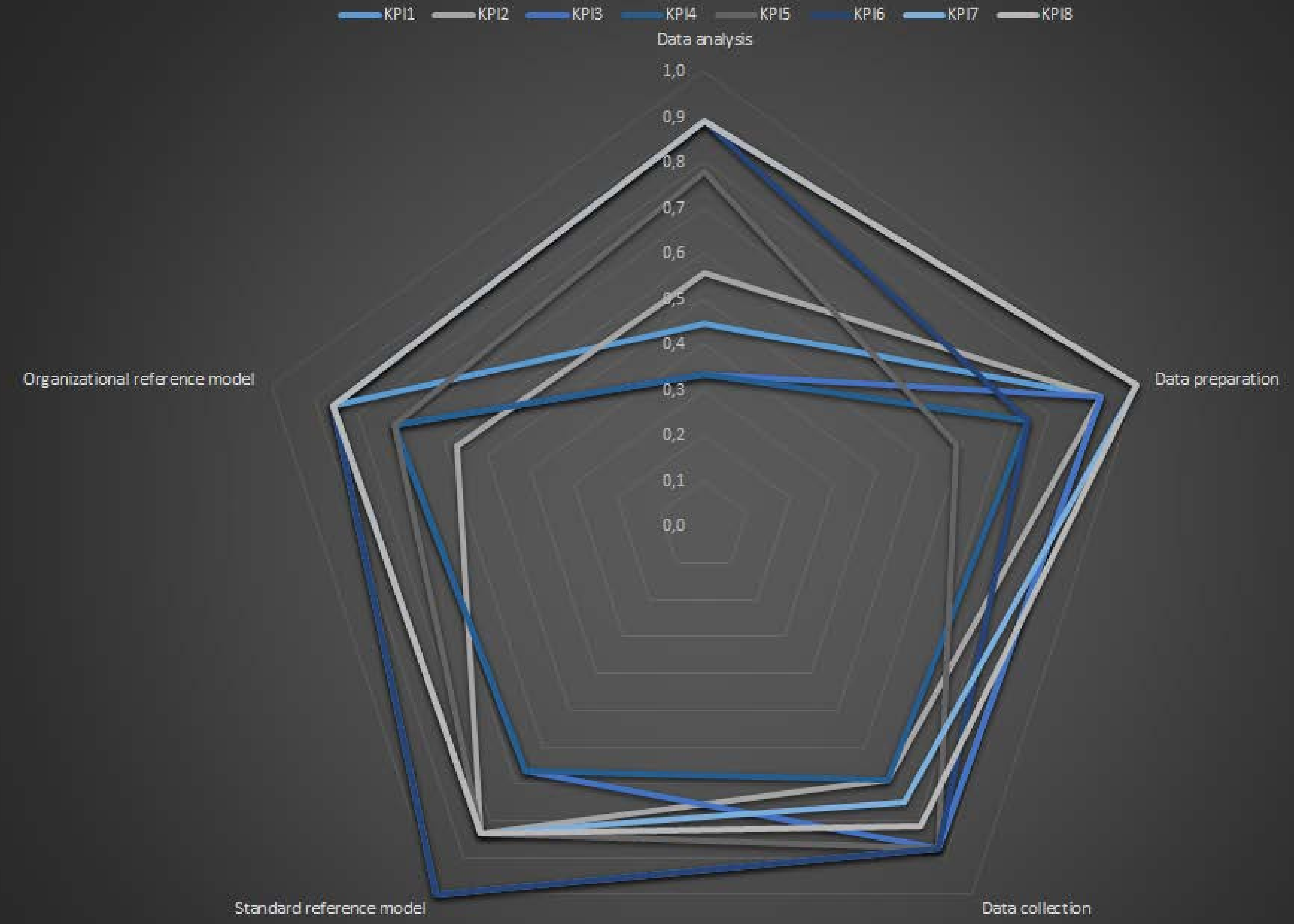
Expanding ISO/IEC 15939 with a model* to provide interpretation of indicators

The model of ISO 15939 is focused on the measures and their relationships, but does not take into account the organizational aspects of the measures e.g. whether a measure or an indicator is appropriate for the organization or how it should be interpreted in the organizational context.



Organizational Reference Context
Decision Criteria: Target Values - Evaluation Scale
Reference Values for contexts
Standard Model
Generic/ Accepted Model of Information Needs
Algorithm: (Implied) Criteria: Actual Values
Formal/Informal Individual Relationships with (Base & Derived) Measures
Data Analysis
Information Product
Interpretation
indicator
Analysis Model
Data Preparation
Derived Measure
Measurement Function
Data Collection
Base Measure
Measurement Method
Attributes

* Refined analysis model of ISO/IEC 15939 with metrological standard reference model and organizational reference context. Figure 4.4, adopted from Alain Abran, Software metrics and software metrology. John Wiley & Sons, 2010


KPI1
KPI2
KPI3
KPI4
KPI5
KPI6
KPI7
KPI8
Data analysis
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
Data preparation
Data collection
Standard reference model
Organizational reference model

GÖTEBORGS UNIVERSITET

METRICS DAY

Metrics day

- Calendar event
  - http://www.software-center.se/news-events/e/?eventId=6285649228
- Website
  - http://www.software-center.se/research-themes/technology-themes/development-metrics/metrics-day-2016
- Format
  - Keynote presentations in the morning
    - For inspiration and discussion
  - Tutorials and workshops in the afternoon
    - For learning and dissemination

SPEED MEASUREMENT

Speed measurement (short status)

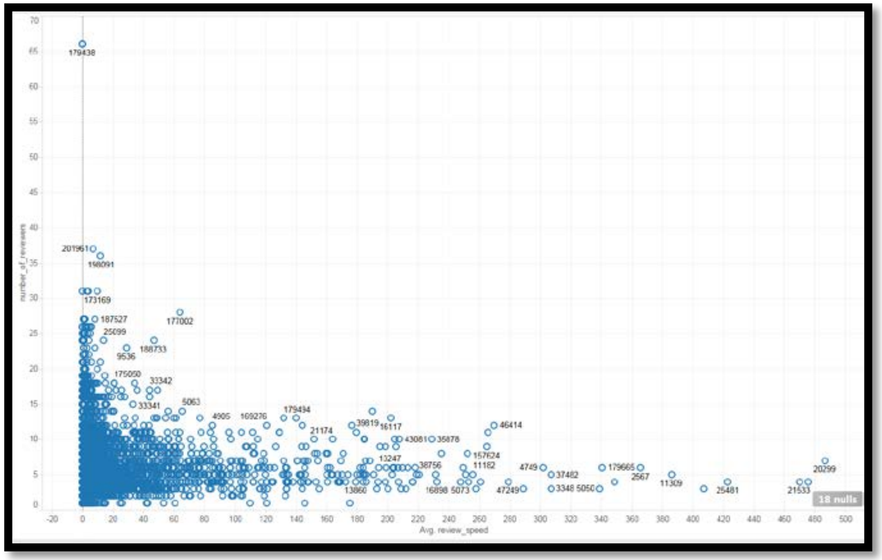
- Goal (for sprint 11)
  - Develop an automated measurement system for measuring speed and controling ”other factors”

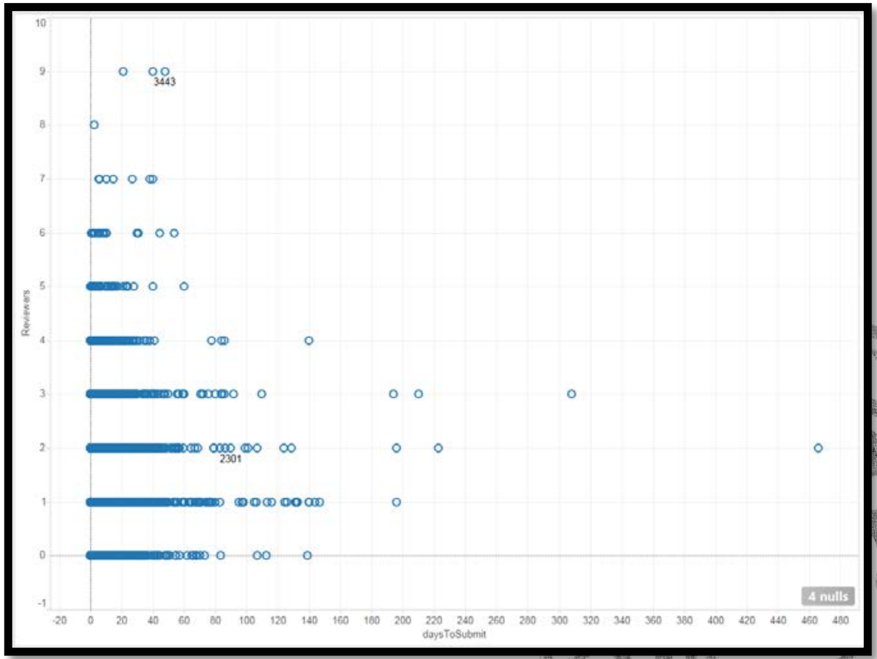
- Research challenges solved
  - Does the review speed depend on
    - Size of the reviewed code?
    - Location of the reviewed code?
    - Number of reviewers?
    - Number of comments in a review?
  - How does the review speed compare between different companies?

Speed measurement Results

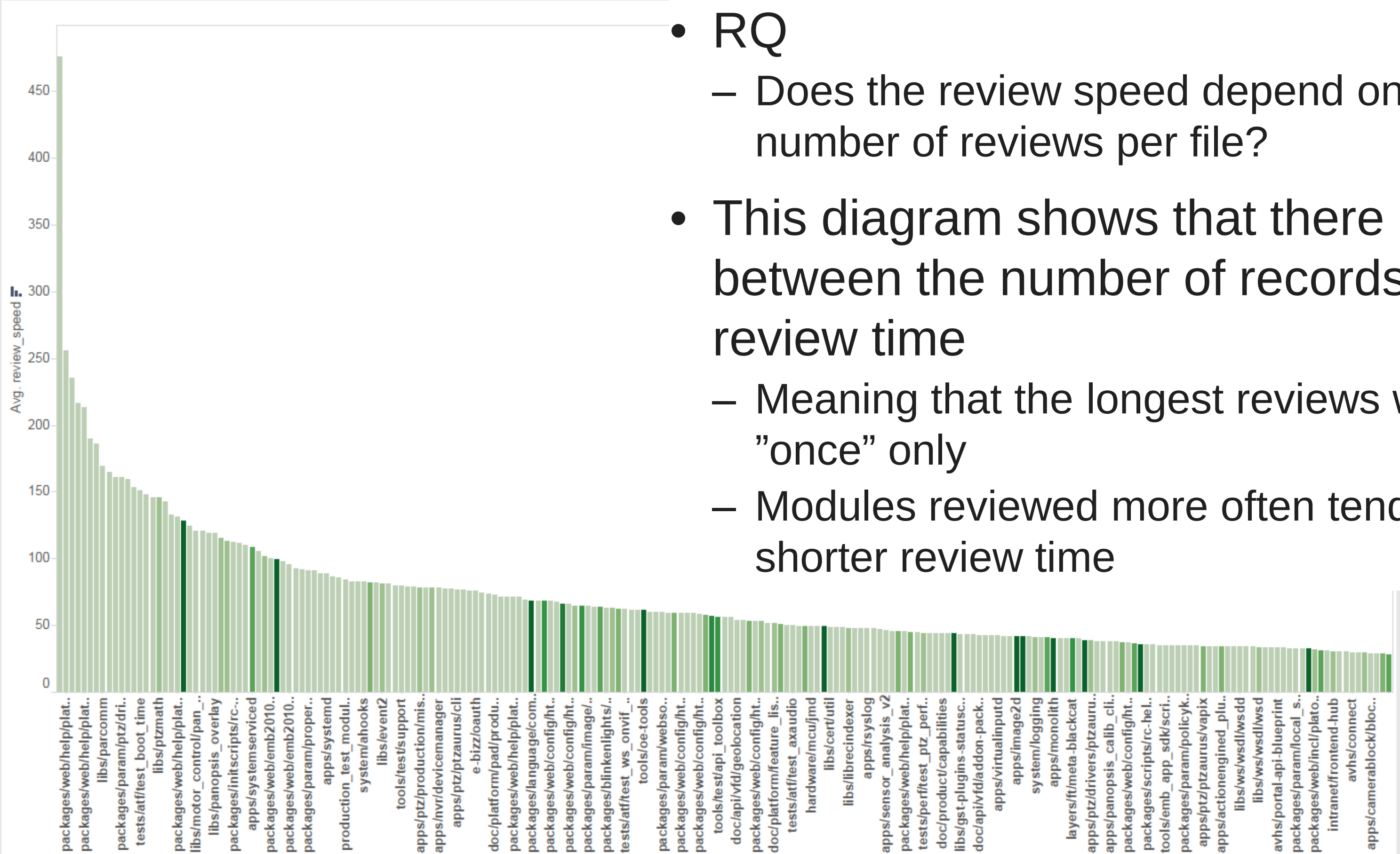
- RQ
  - Does the review speed depend on the number of reviewers?

- Analysis of dependency between
  - Review speed and
  - Number of reviewers





Review length per module with number of records



- RQ
  - Does the review speed depend on the number of reviews per file?
- This diagram shows that there is no link between the number of records and the review time
  - Meaning that the longest reviews were done ”once” only
  - Modules reviewed more often tend to have shorter review time

Preliminary conclusions

- The review speed does not depend on
  - number of reviewers
  - number of comments

- The review speed seem to depend on
  - file which is reviewed

- What we need to check in the next step
  - Is there a correlation between the size of the module and the review speed

- What we could also quickly do
  - Does the review time depend on the reviewer?
  - Is there a relation between who reviews which module?

THANK YOU!

Project #21, Sprint 3

Data-Driven Decisions about Software Development Environments

(previously: “Enabling a Quantitative Comparisons of Heterogeneous Software Development”)

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Jesper Derehag,
Ericsson

Changing Development Environments

Software Development

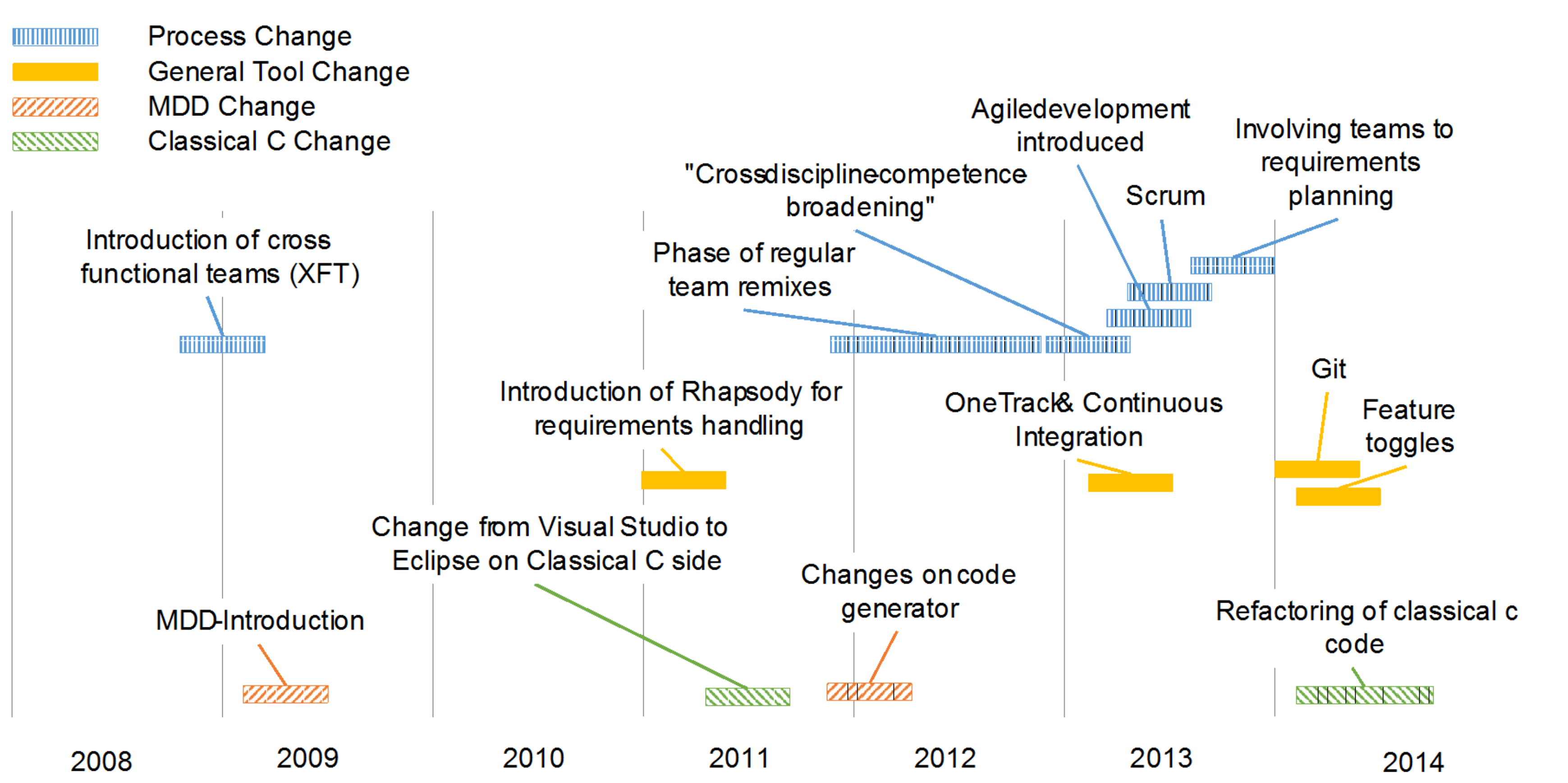
Tools

Languages / Artifacts

Processes / Teams

Changing Development Environments
Case 1: Ericsson

- 14 changes in 7 years

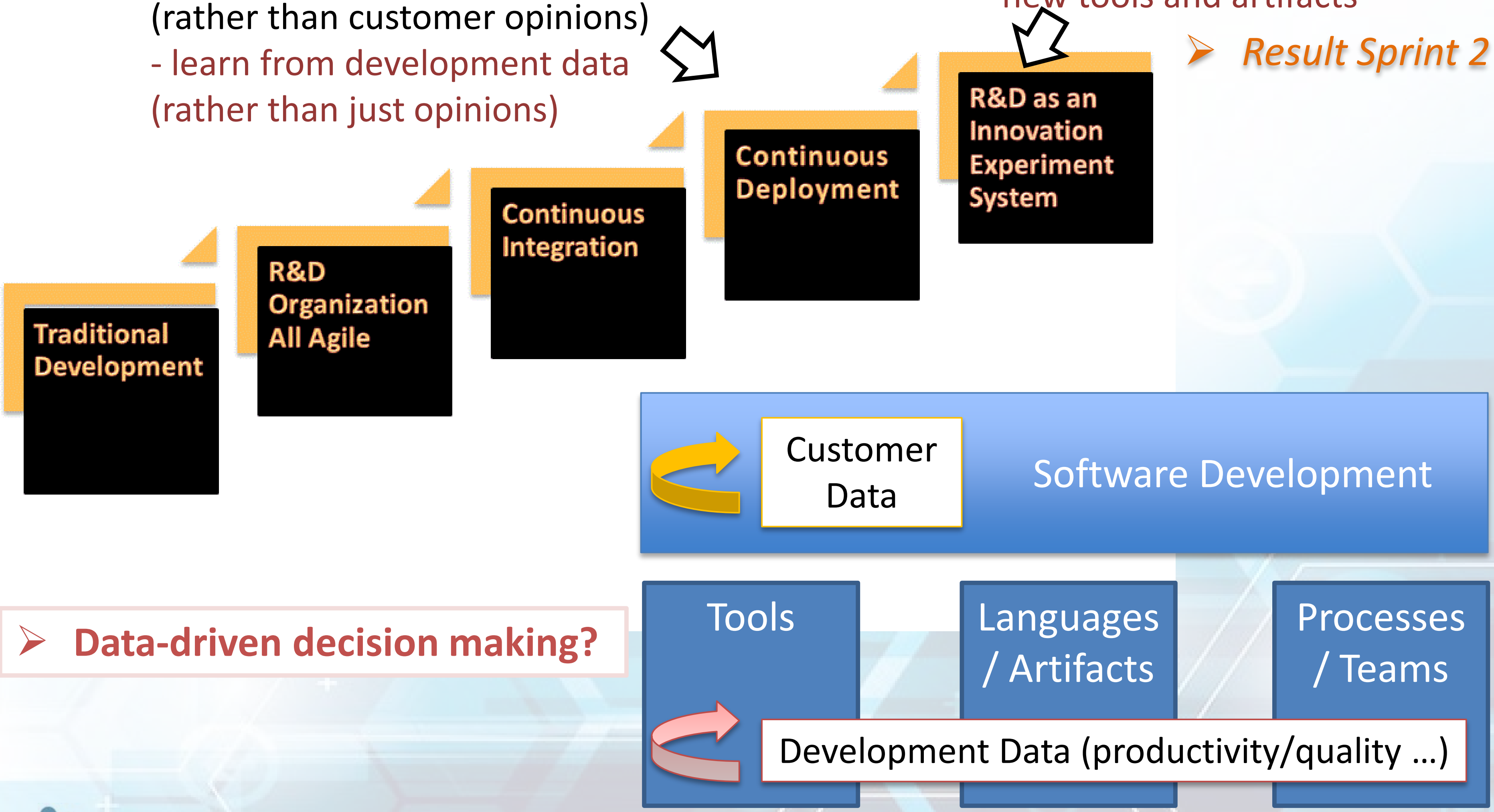


Software Center

Stairway to Heaven

Continuous deployment:
- learn from customer usage data (rather than customer opinions)
- learn from development data (rather than just opinions)

R&D as an 'experiment system':
- deployment as a starting point for further tuning
- data as basis for tuned use of new tools and artifacts



➢ *Result Sprint 2*

➢ **Data-driven decision making?**

Challenge: data-driven decision making

3 Reasons:

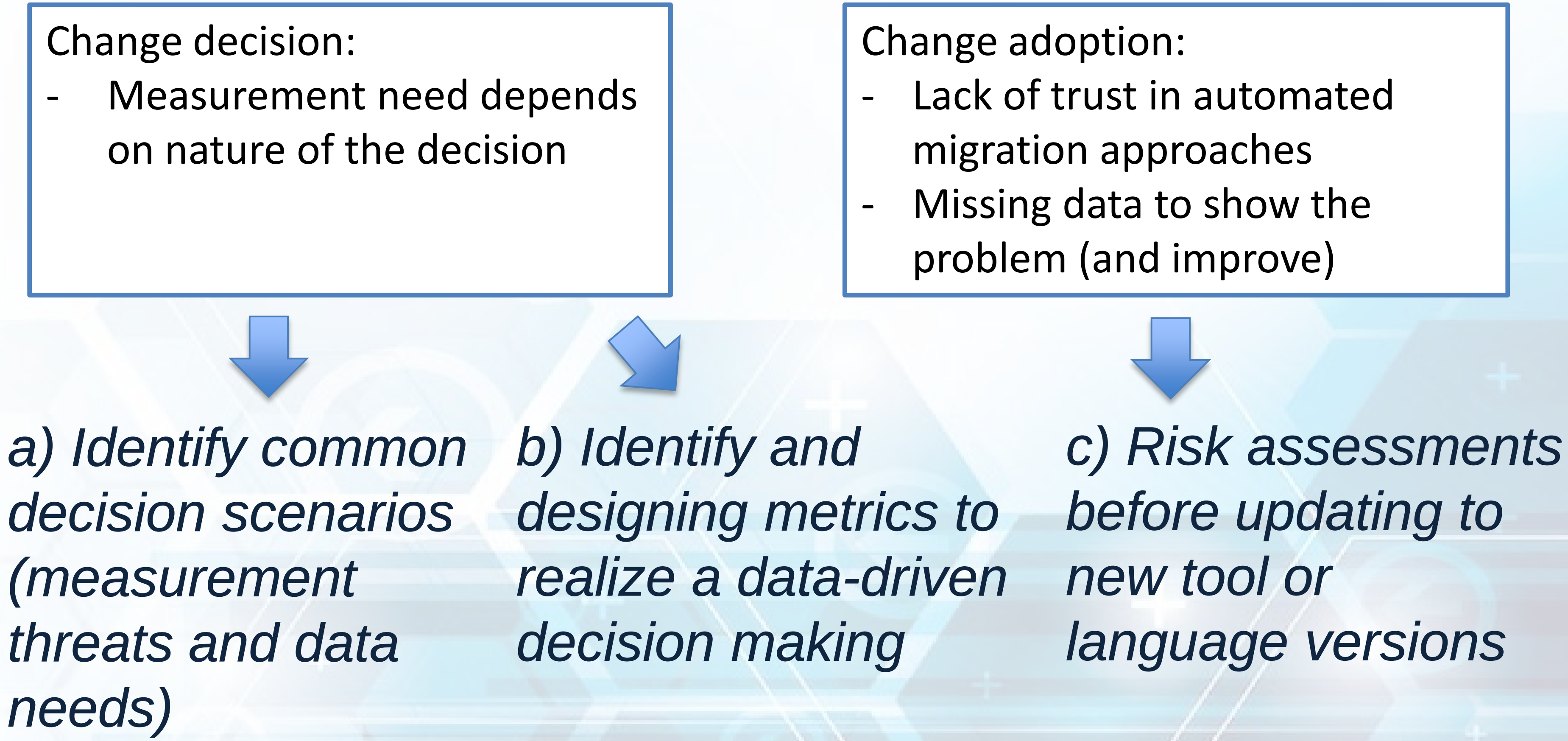
1) Comparison traditional vs. pilot projects: heterogeneity of languages, code generators, …

2) Amount of usable data limited by mass of changes

3) Missing ability to assess actual risk of migration

Identified Needs

➢ *Result Sprint 2*



Change decision:

- Measurement need depends on nature of the decision

Change adoption:

- Lack of trust in automated migration approaches
- Missing data to show the problem (and improve)

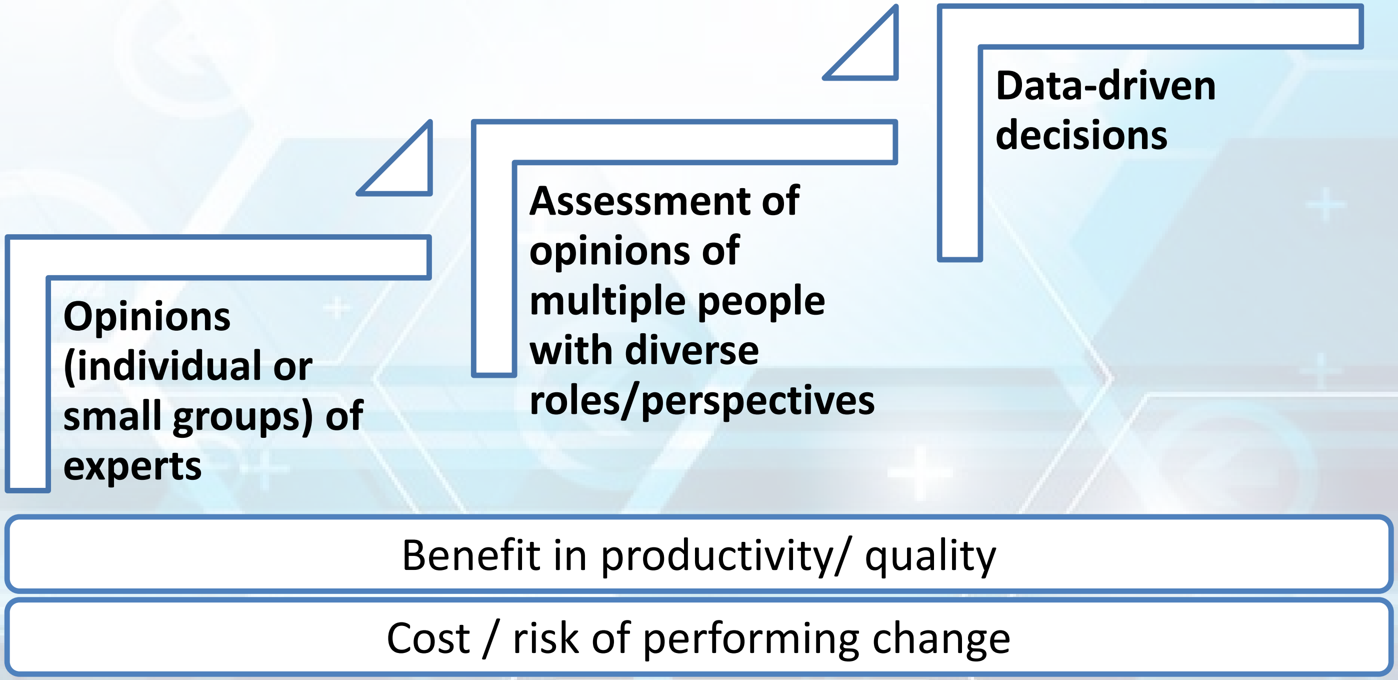
a) Identify common decision scenarios (measurement threats and data needs)

b) Identify and designing metrics to realize a data-driven decision making

c) Risk assessments before updating to new tool or language versions

Summary

- Where are we and why?
- How can we help with metrics to enable data-driven decisions



Opinions (individual or small groups) of experts

Assessment of opinions of multiple people with diverse roles/perspectives

Data-driven decisions

Benefit in productivity/ quality

Cost / risk of performing change

Software Center workshop

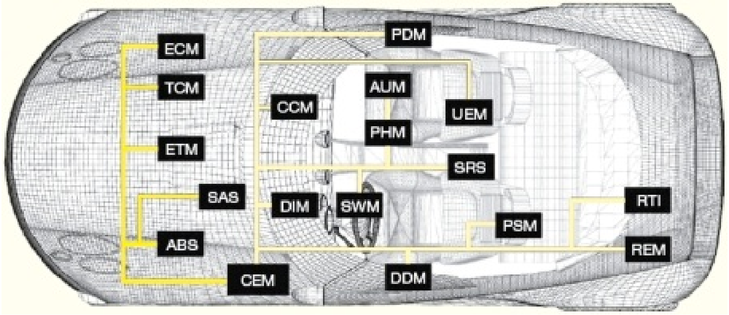
Project: QuaSAR@car

Darko Durisic

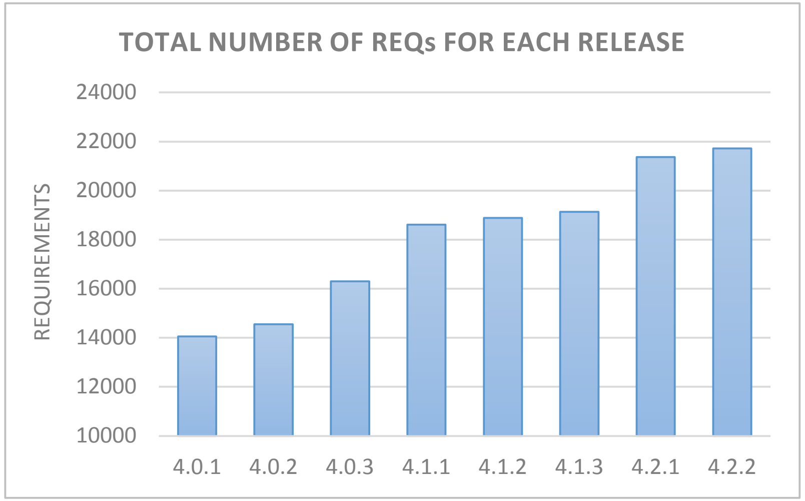
Project description

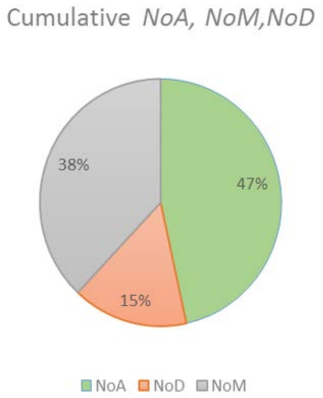
- **Goal:** Efficiently manage the evolution of large software systems based on the evolution of domain-specific meta-models (AUTOSAR meta-model).

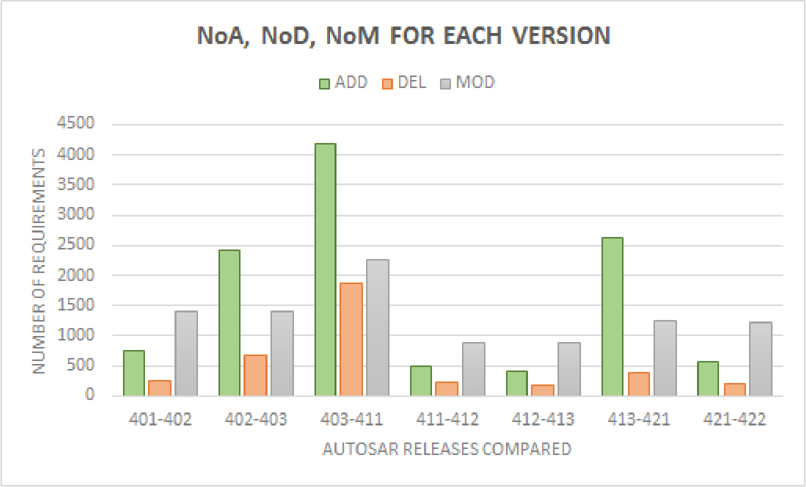
- We plan to achieve this by developing methods and tools for automated
  - analysis of the domain-specific meta-model changes for different roles,
  - estimation of cost and time to adopt the changes and new features and
  - prediction of the impact of the changes to the existing requirements.



Evolution of the AUTOSAR Requirements

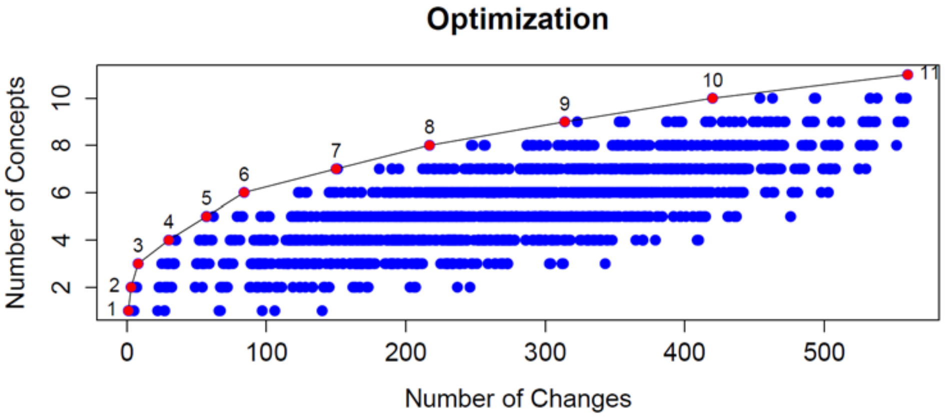


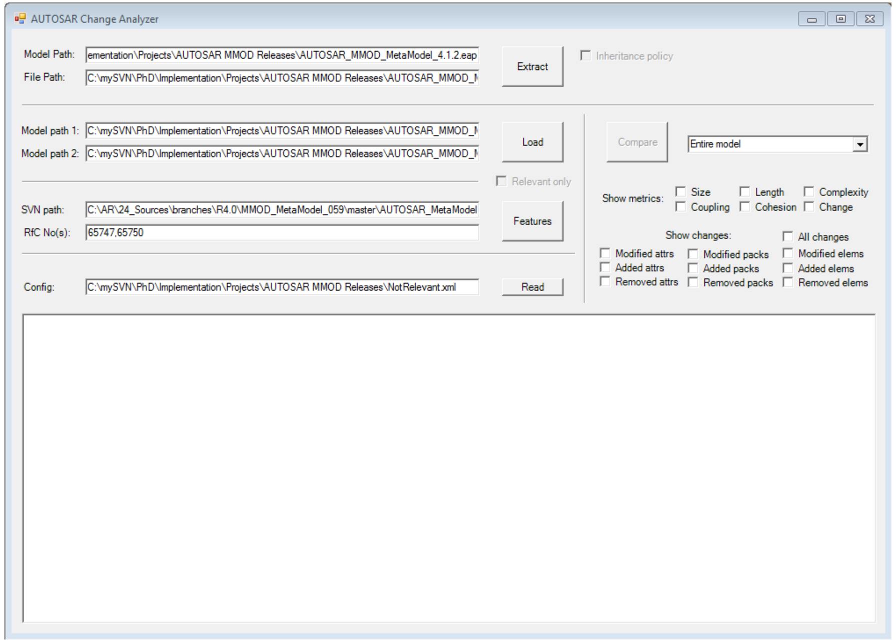




- AUTOSAR still grows, i.e., it is based on the standardization of new features.
- Evolution mostly driven by additions and modification of requirements.
- Major changes in the major (first digit change) releases.

Current sprint (2)





AUTOSAR Change Analyzer

Model Path: ementation\Projects\AUTOSAR MMOD Releases\AUTOSAR_MMOD_MetaModel_4.1.2.eap

File Path: C:\mySVN\PhD\Implementation\Projects\AUTOSAR MMOD Releases\AUTOSAR_MMOD_I

☐ Inheritance policy

Model path 1: C:\mySVN\PhD\Implementation\Projects\AUTOSAR MMOD Releases\AUTOSAR_MMOD_I

Model path 2: C:\mySVN\PhD\Implementation\Projects\AUTOSAR MMOD Releases\AUTOSAR_MMOD_I

Entire model

☐ Relevant only

Show metrics: ☐ Size ☐ Length ☐ Complexity ☐ Coupling ☐ Cohesion ☐ Change

SVN path: C:\AR\24_Sources\branches\R4.0\MMOD_MetaModel_059\master\AUTOSAR_MetaModel

RfC No(s): 65747,65750

Show changes: ☐ All changes

☐ Modified attrs ☐ Modified packs ☐ Modified elems

☐ Added attrs ☐ Added packs ☐ Added elems

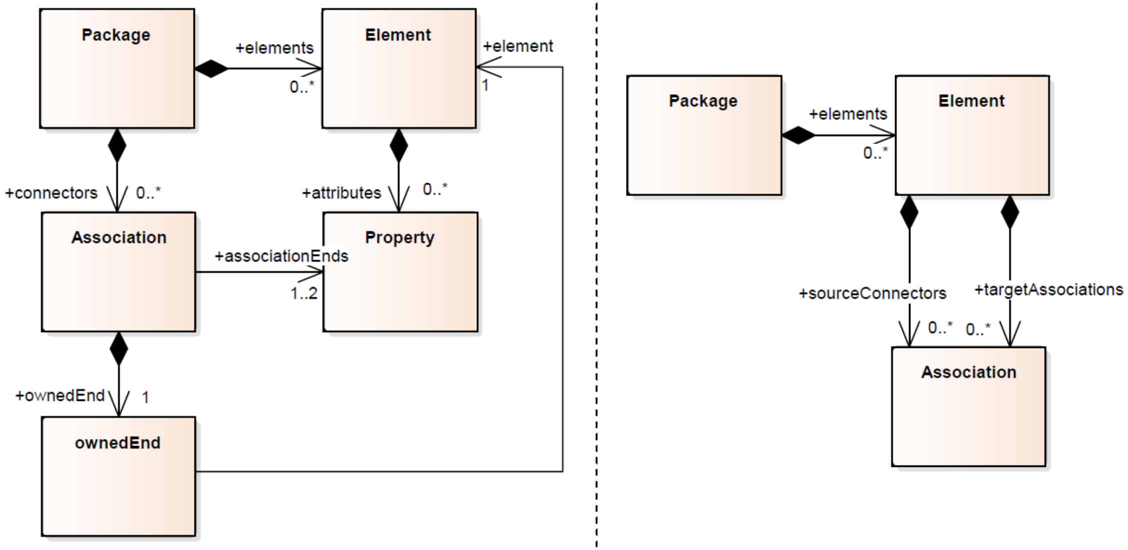
☐ Removed attrs ☐ Removed packs ☐ Removed elems

Config: C:\mySVN\PhD\Implementation\Projects\AUTOSAR MMOD Releases\NotRelevant.xml

Applicability of our data-model to other meta-models

- **Modelica:** Subset of our data-model is applicable, i.e., Modelica Elements, Attributes and Connectors use no Stereotypes, TaggedValues and UUIDs.

- **UML:** Subset of our data-model is applicable, with different definition of connectors (Association) that are owned by Packages rather than Elements.



Transformation required in case of UML

Next Steps

- Co-evolution of several artefacts in the development process
    - Domain specific meta-model and tool-specific meta-models
    - Domain-specific meta-models and industrial models and requirements