Q-Rapids: Data-driven Engineering of Quality Requirements in Agile Projects

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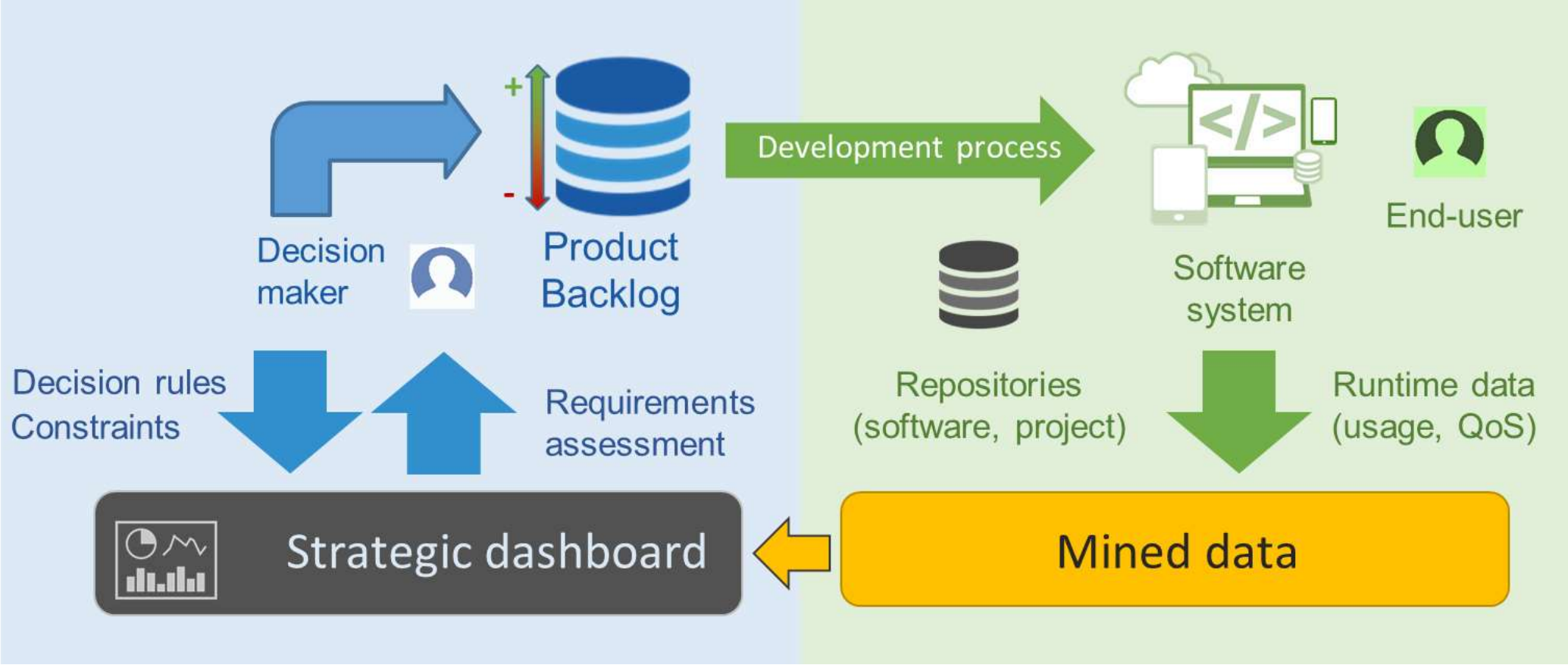
A Data-driven Project

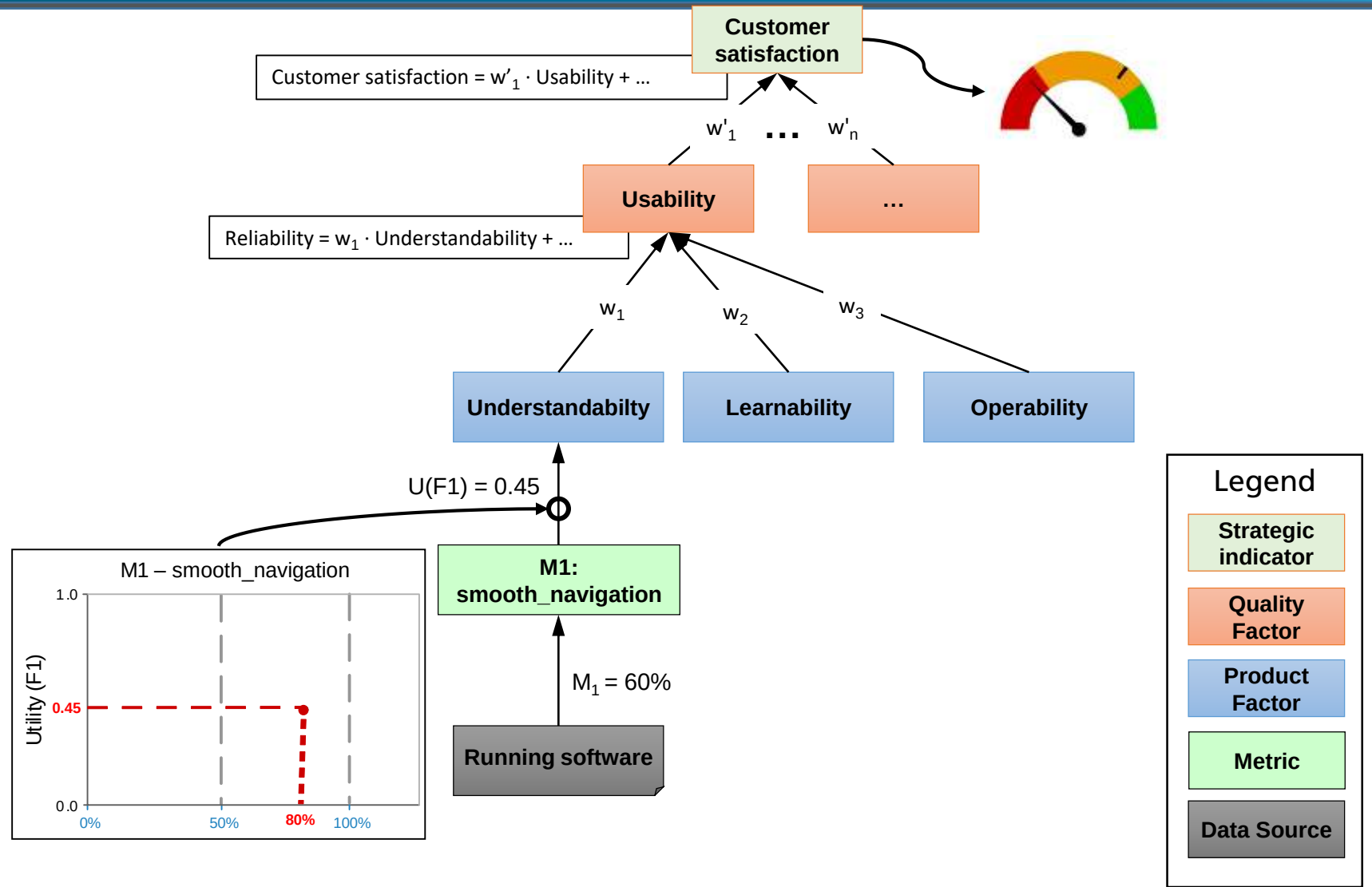
- Use of available data as a way to implement quality requirements analysis
- Q-Rapids project: an H2020 Research and Innovation Action aiming at supporting quality requirements management through data analysis

Project number: 732253	Project acronym: Q-Rapids
General information	
Title	Quality-Aware Rapid Software Development
Start date	1-Nov-2016
Duration	36 months
Call	H2020, Topic *Advanced Software Engineering*
Keywords	Quality Requirements; Software Development
Budget	approx. 5 Million Euros
Partners	UPC, UOULU, FRAUNHOFER IESE, BITTIUM, SOFTEAM, ITTI, NOKIA

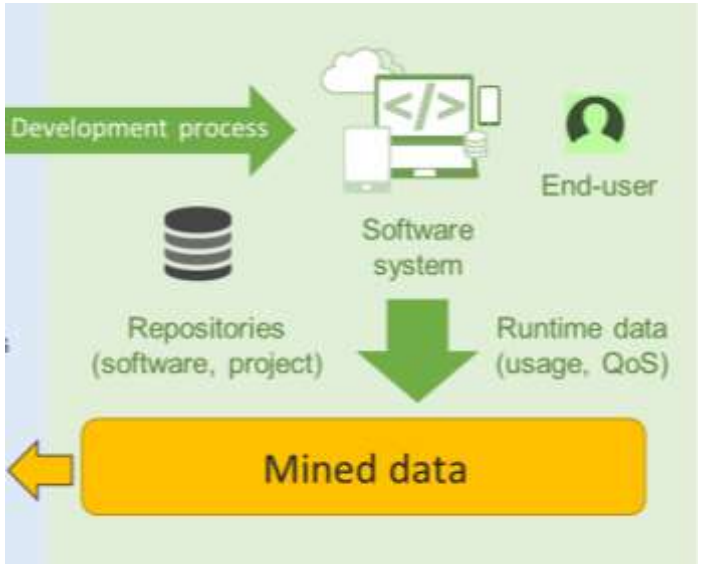
The Q-Rapids approach (simplified)

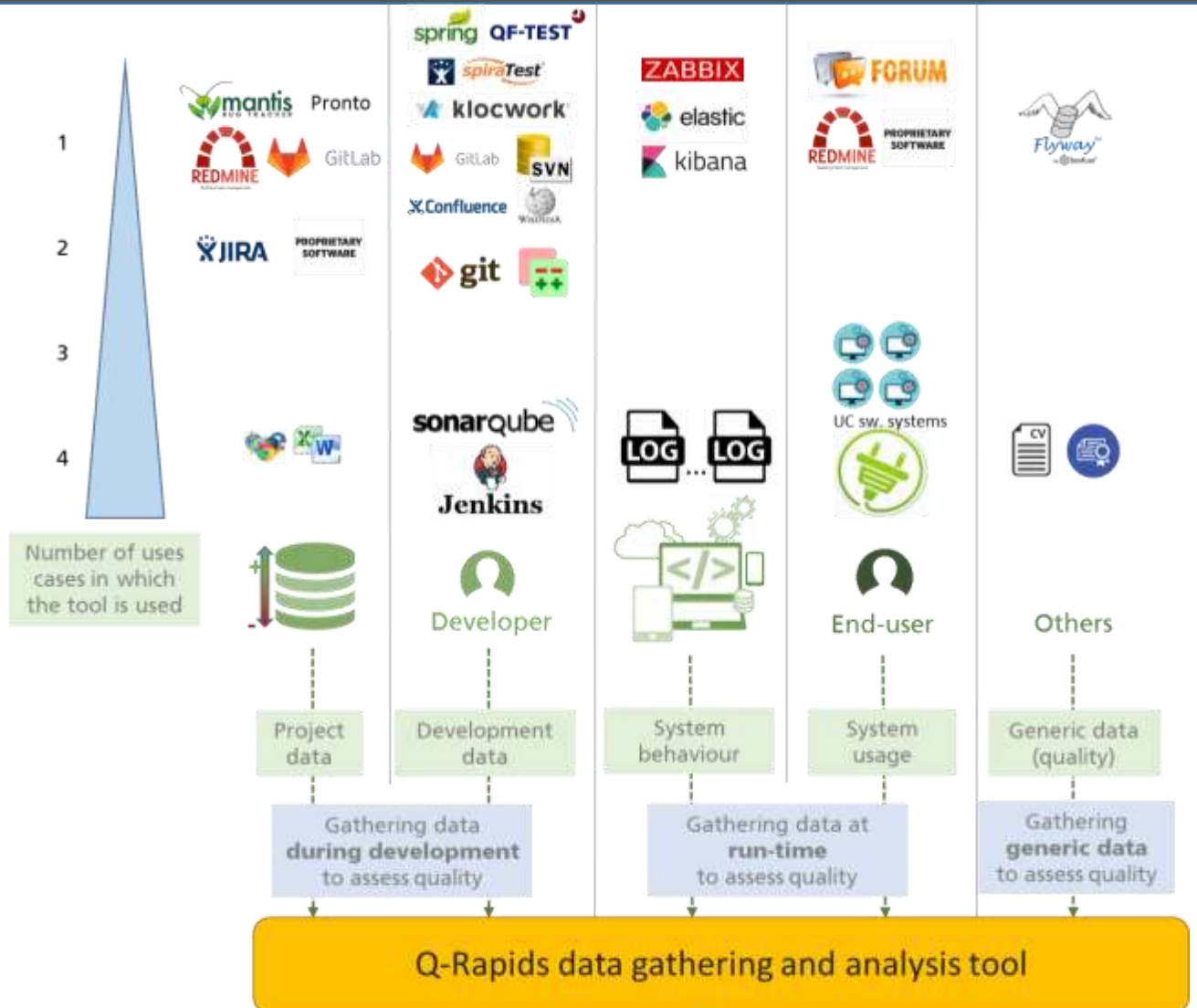


An Exemplar Scenario



Combination of Different Real Data Sources

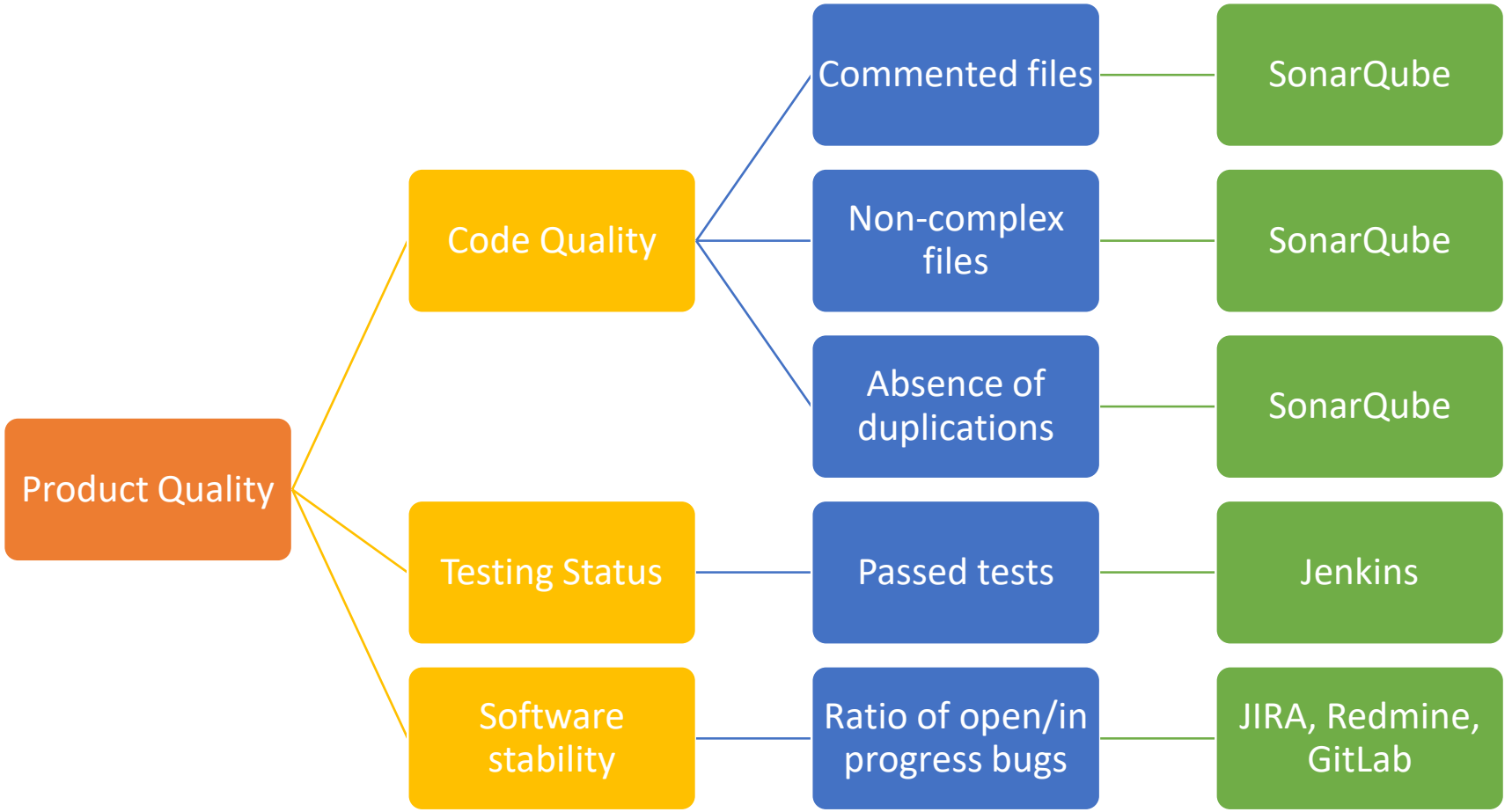




Relevant Quality Factors at Industry

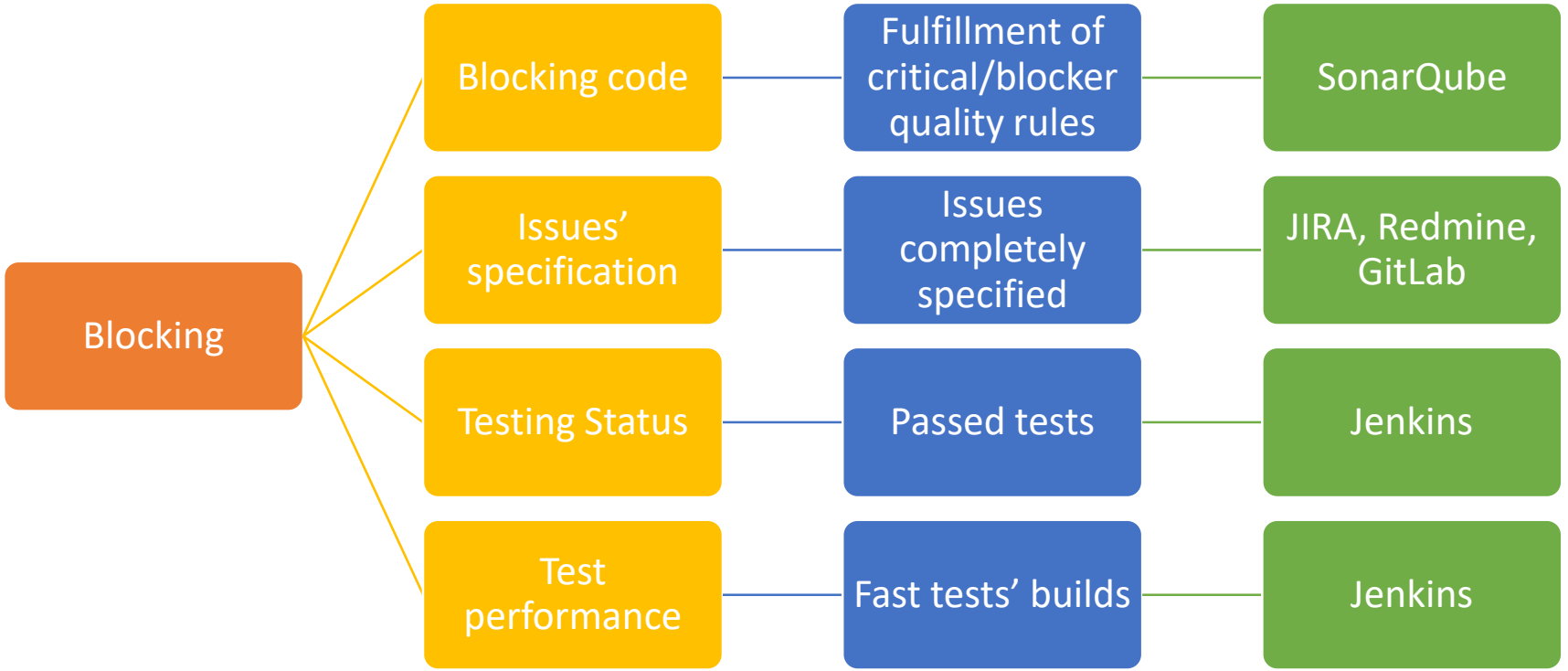
> Which quality factors should be measured to support rapid software development?
>
> Q-Rapids Sw. Quality Workshops in the Industry Partners Premises

Excerpt of the Quality Model (1/2)



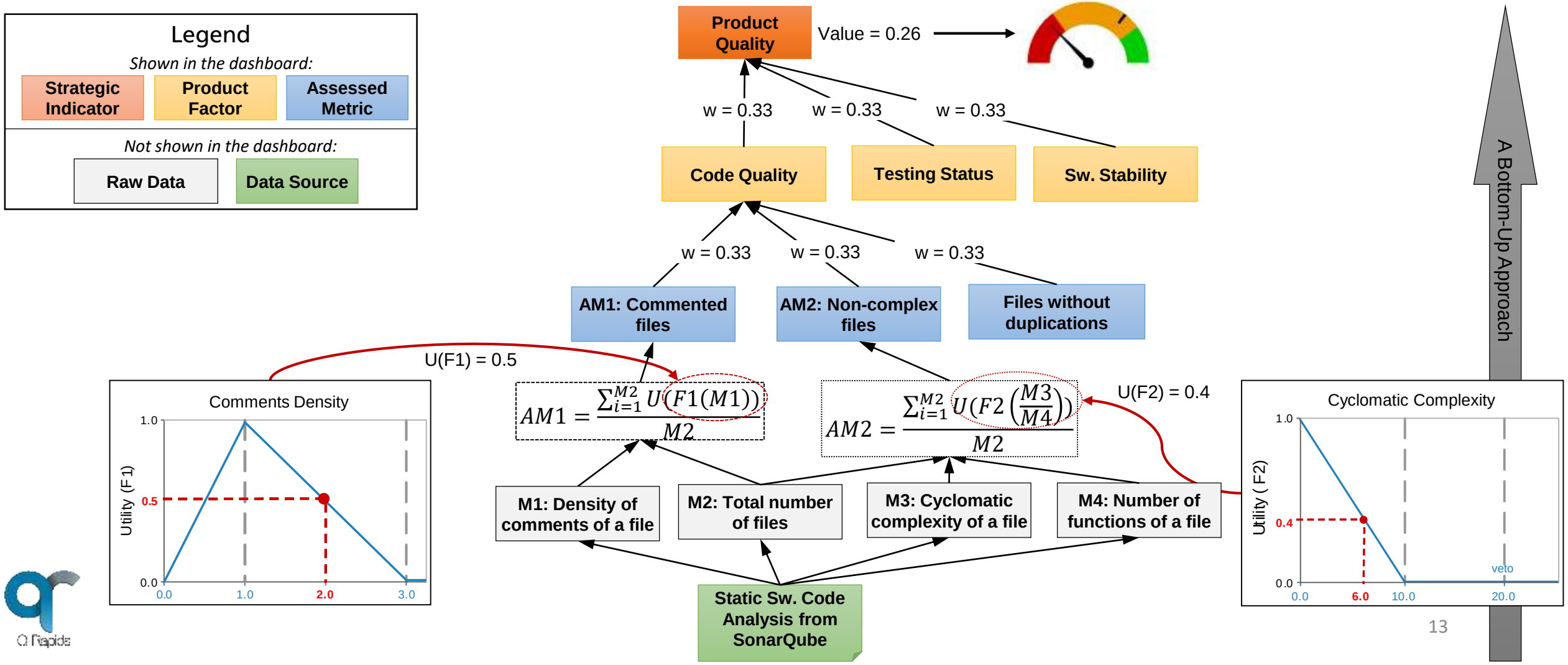
Strategic Indicator — Product Factor — Assessed Metric — Data Source

Excerpt of the Quality Model (2/2)



Strategic Indicator — Product Factor — Assessed Metric — Data Source

Quality Model Assessment: How does it Work?



A Data-driven Project

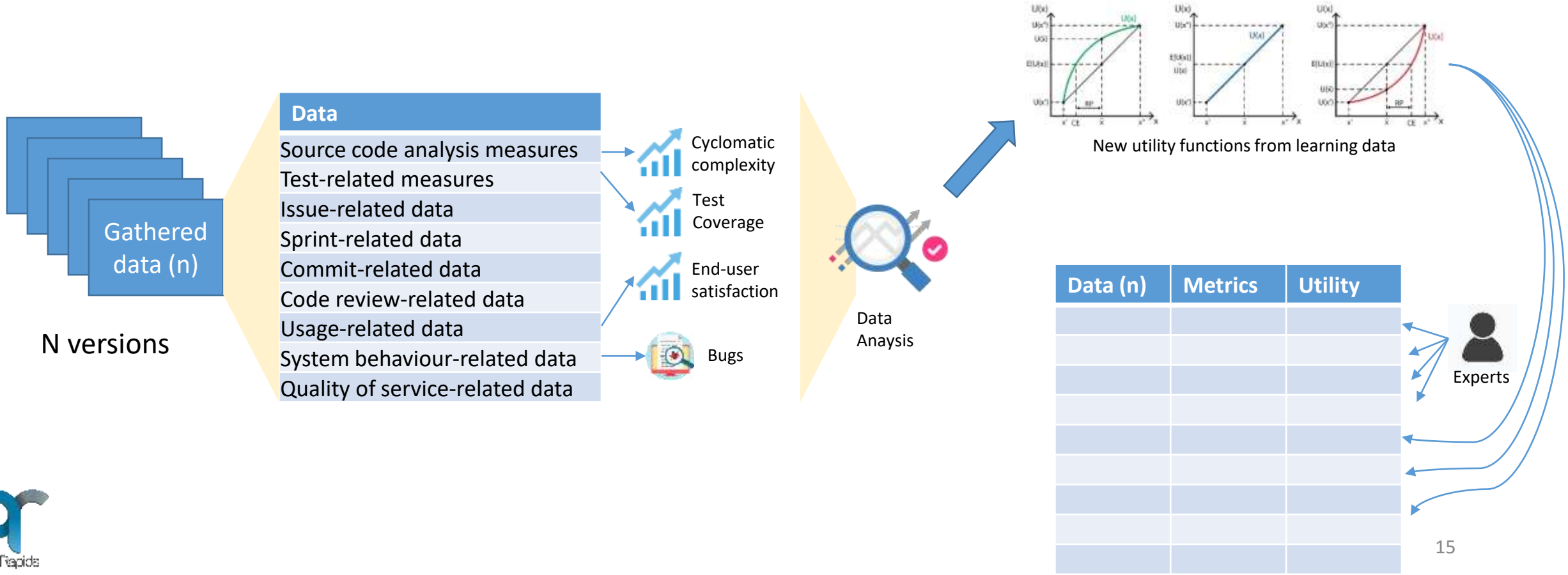
- During the sw. quality workshops in the companies, we identified:
  - Relevant strategic indicators and product factors
  - Availability of raw data from real data sources to compute assessed metrics

  - Metrics interpretation from experts to define utility functions in assessed metrics
  - Weights of the different elements for the aggregation

- But…
  - It is not always feasible to gather this knowledge from experts for each assessed metrics and aggregation
  - Use of artificial intelligence and data analysis to learn from the data gathered and initial quality models

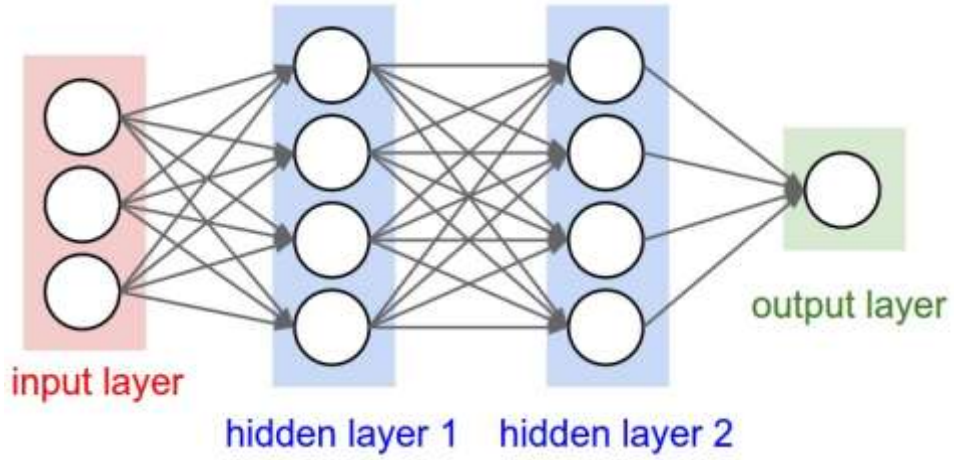
Metrics Interpretation: Utility (Good/Bad?)

- Building a knowledge base from both expert knowledge and data analysis

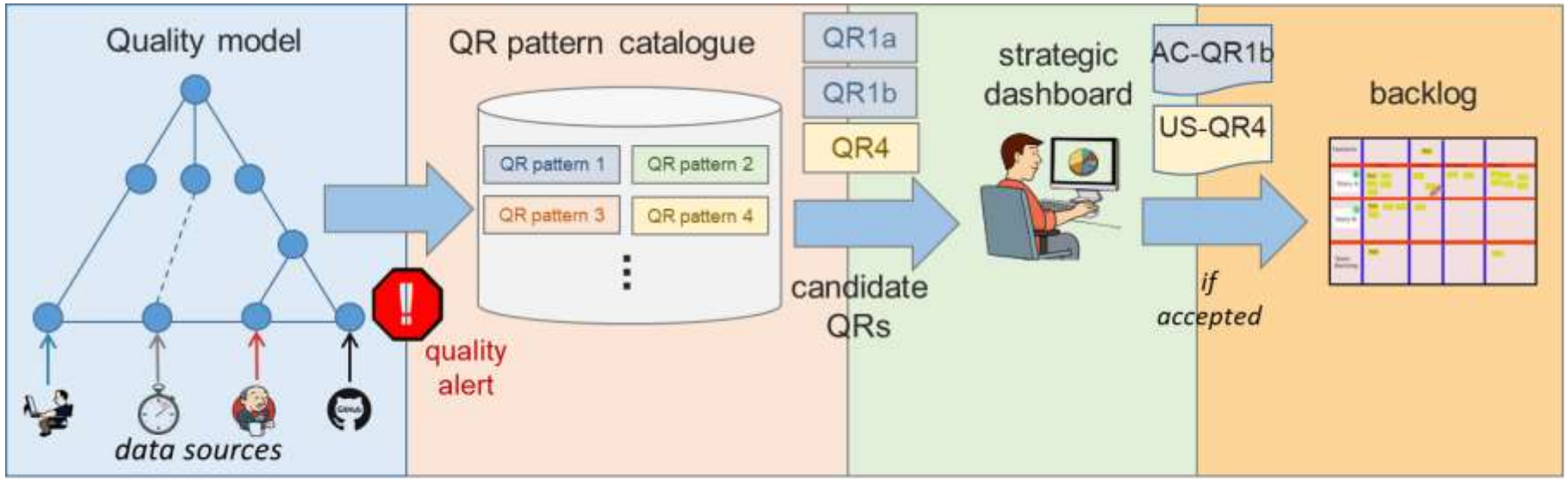


Neural networks to assess quality factors

- Building neural networks for specific quality factors based on raw data (basic metrics, derived metrics,…). For each version during rapid development process, we have:
  - Quality Model Assessment
  - Raw Data and its Data Analysis
- Identifying new weights and relevant product factors and assessed metrics from the internal layers of the neural networks

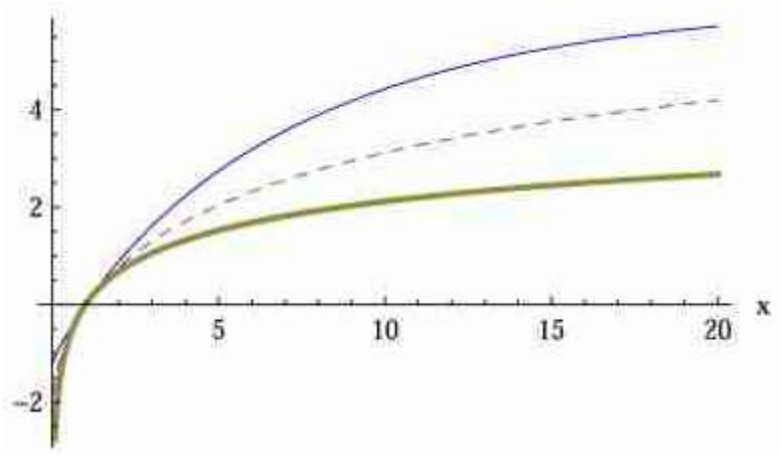


Generation of Quality Requirements

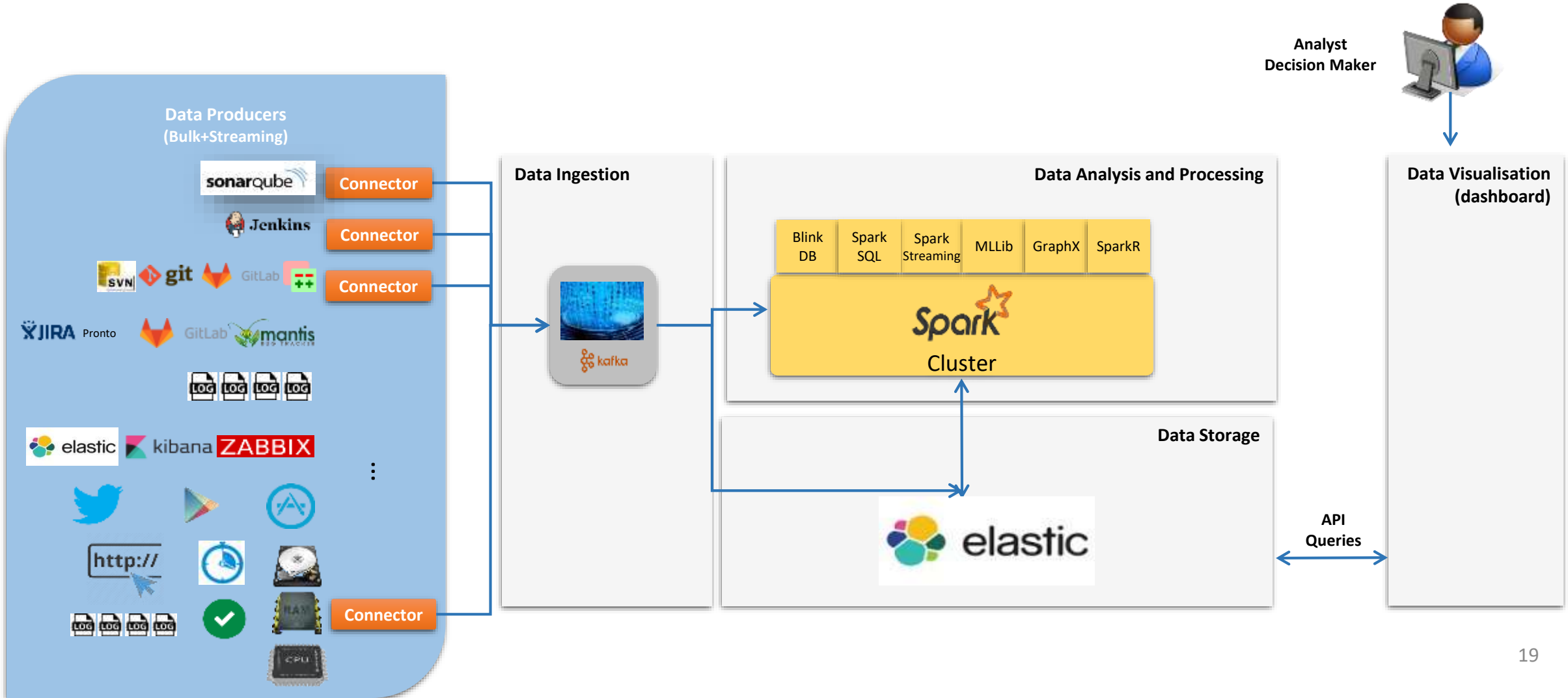


Assessment of QRs Application: Prediction

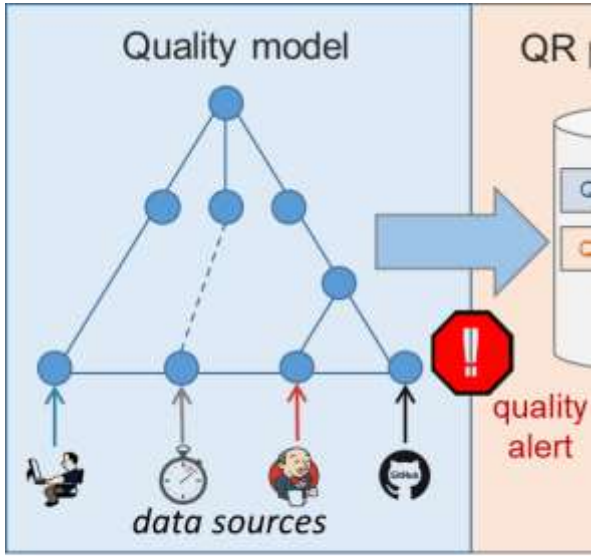
- Aggregation of factors into a single strategic indicator
- Drill-down capabilities
- Evaluation of decisions (impact, value, effort, risk, ...)
- Prediction rules to detect upcoming violations
- What-if analysis
- Mitigation strategies



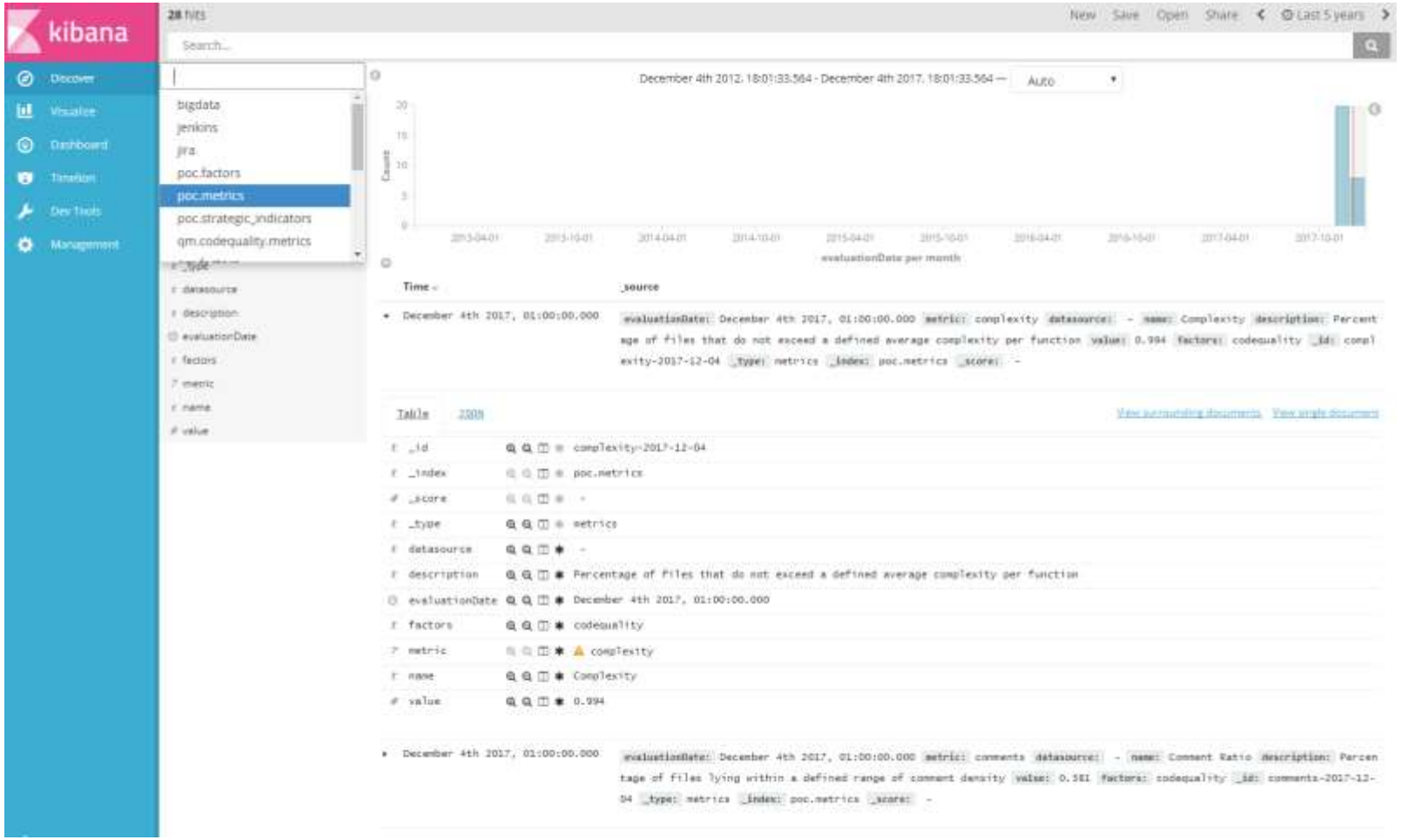
The Q-Rapids Architecture



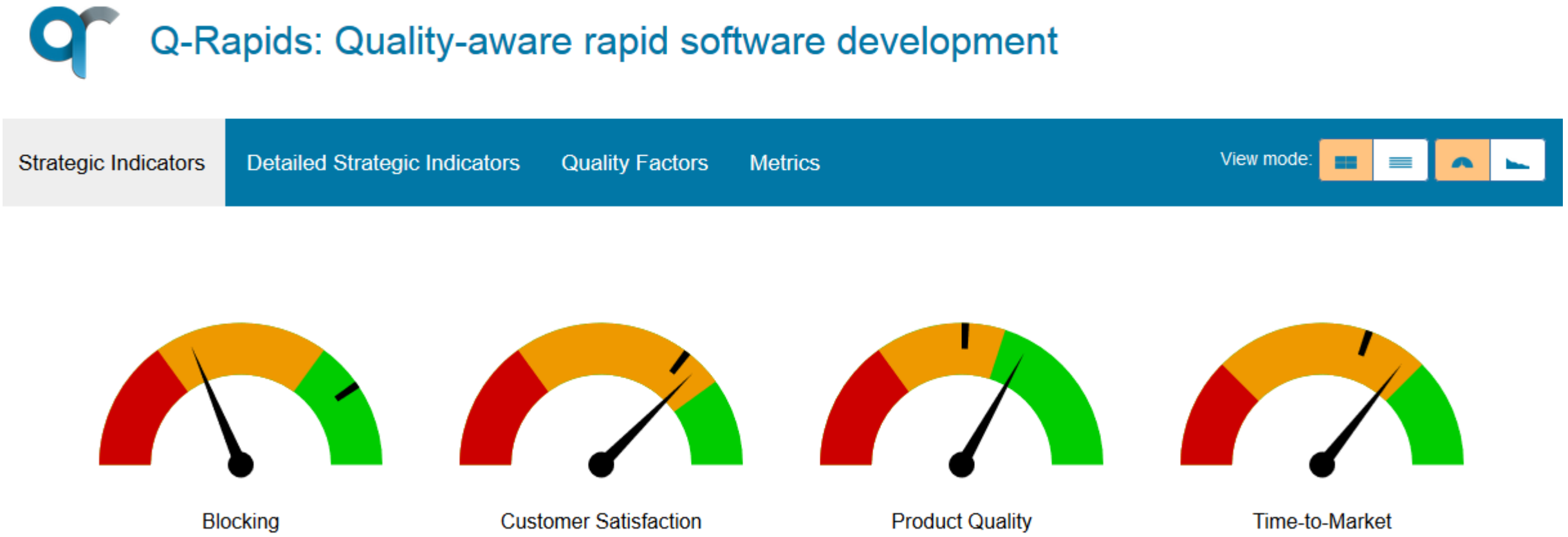
Quality Model Assessment Implementation



Raising of quality alerts



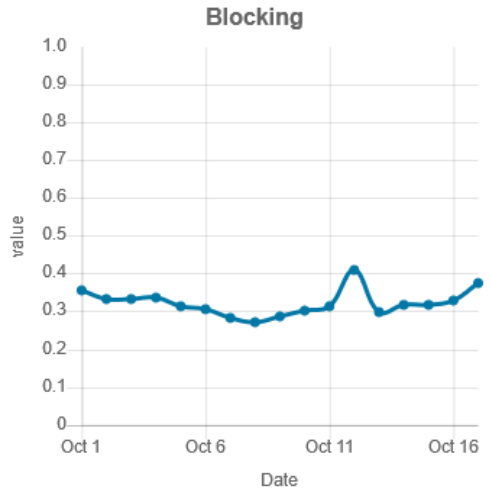
The Strategic Dashboard: current views



The Strategic Dashboard: current views

Q-Rapids: Quality-aware rapid software development

Strategic Indicators | Detailed Strategic Indicators | Quality Factors | Metrics | View mode:



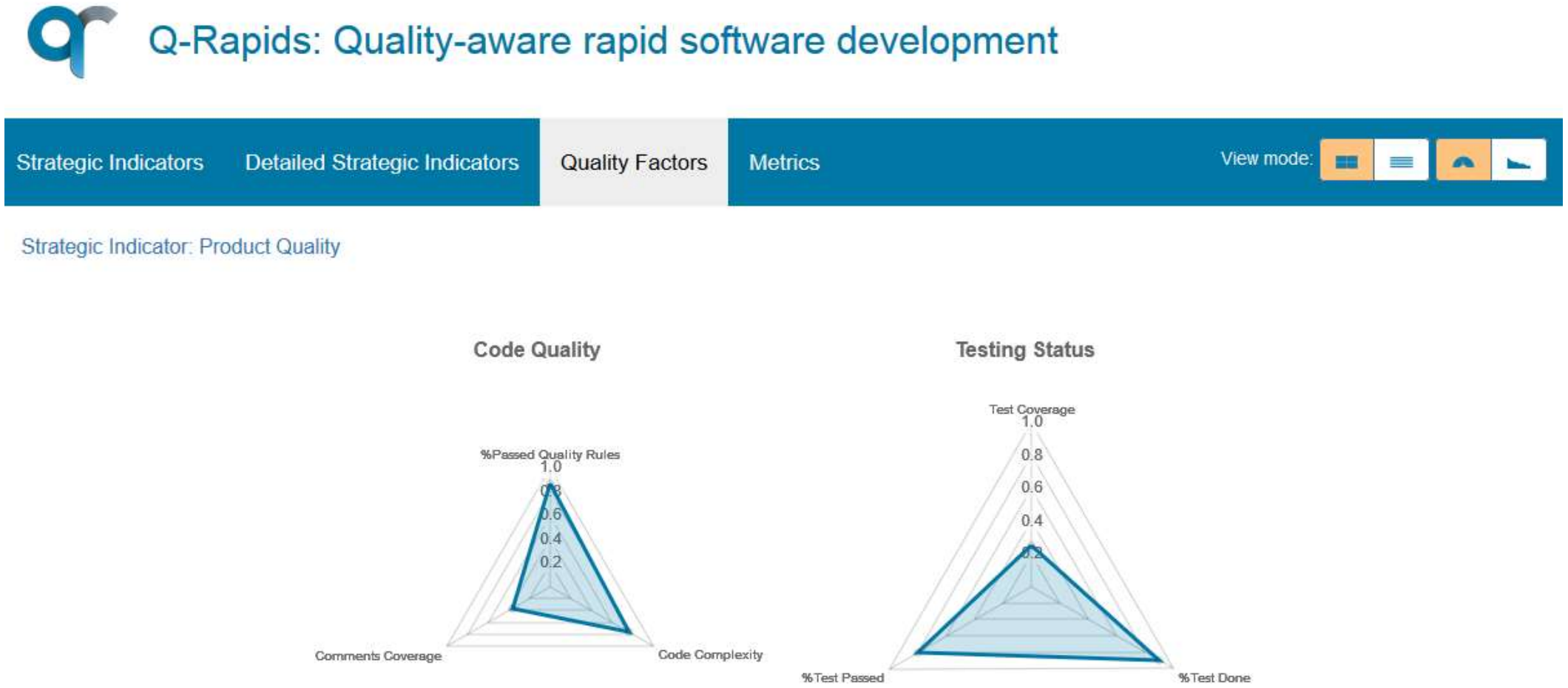
The Strategic Dashboard: current views

Q-Rapids: Quality-aware rapid software development

Strategic Indicators | Detailed Strategic Indicators | Quality Factors | Metrics | View mode:

Strategic Indicator: Product Quality

The Strategic Dashboard: current views

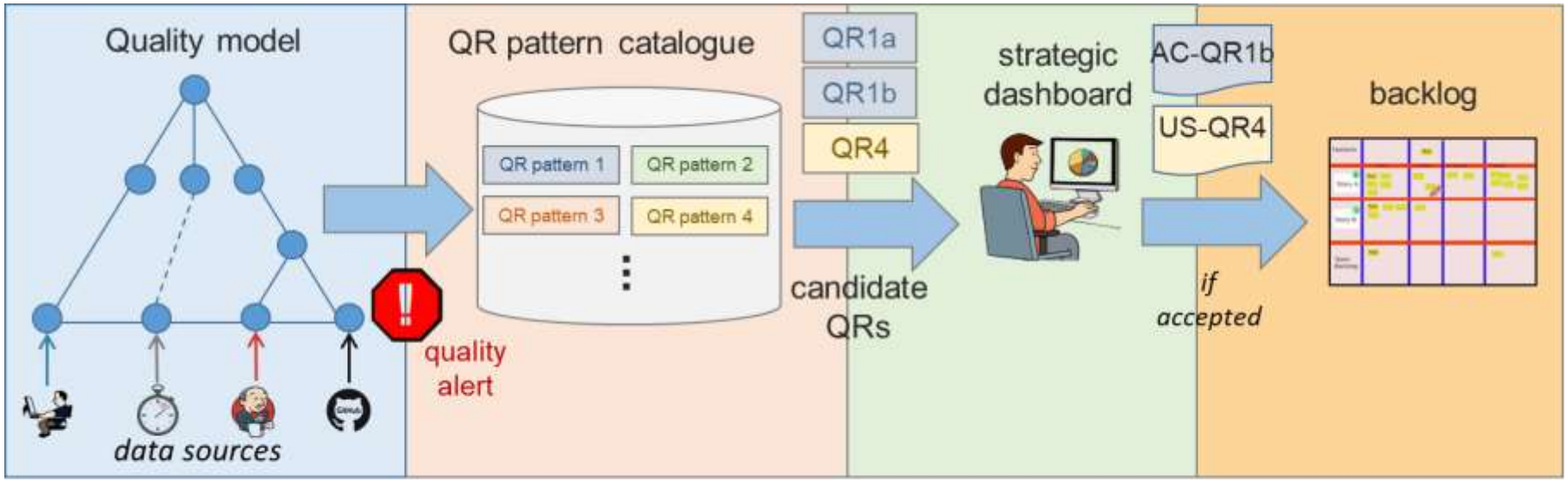


The Rapid Software Development Process

- Implementing a continuous end-to-end flow of features in organizations
- Optimal management of features by real-time identification and understanding of quality requirements
  - Information provided by the dashboard at different organizational levels (business owners, product owners, developers, testers, ...)
  - Catalogue of possible actions: include/drop items in backlogs; re-prioritization; stop the line (until solving the blocking situation)
  - Fit to agile method of the organization, e.g.:
    - Kanban: input to Kanban board
    - Scrum: use of the dashboard in prioritization
  - In any case, gain of transparency

Summary

- Generation of quality requirements and their integration in an agile development process based on learning algorithms and data analysis



Thanks for your attention!

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