IBM Rational Day

Jeudi 25 octobre 2012 - 8h30 à 17h00, Pullman Bercy

Témoignages. Débats. Rencontres...
Venez échanger et faire le point
sur les nouveautés Rational

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Lean Requirements Engineering

Gauthier Fanmuy
gauthier.fanmuy@adn.fr
+33 6 10 76 20 96
www.adn.fr

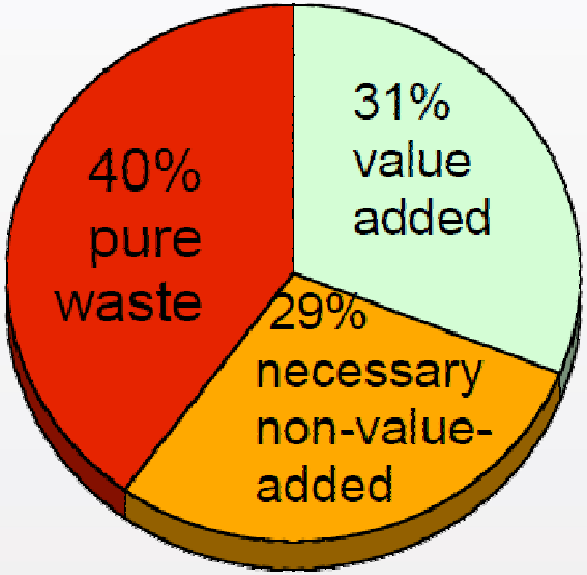
Juan Llorens
Juan.llorens@reusecompany.com
+34 91 680 90 22
www.reusecompany.com

IBM

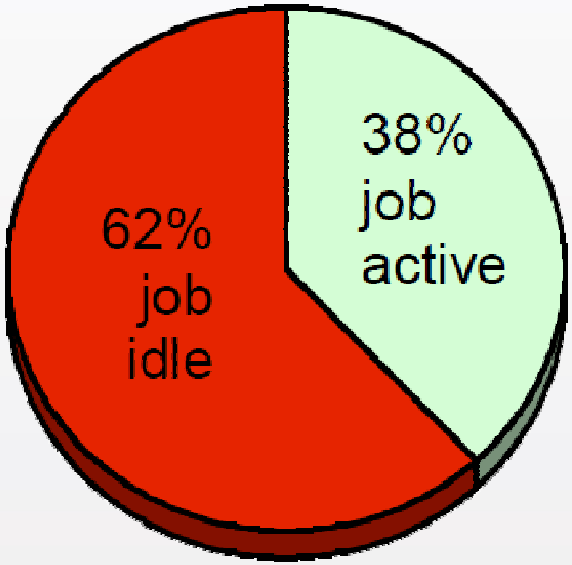
Agenda

- Lean Requirements Engineering
- Requirements Quality Suite
- Lean Journey in 2 steps
- Demonstration
- Conclusion

Engineering Processes Need Improvement



Value assessment of aerospace engineering activity (as % of charged hours)



Assessment of activity on aerospace engineering work packages (as % of actual hours)

(source: Product Development Value Stream Mapping (PDVSM) Manual, Hugh L. McManus, Lean Aerospace Initiative (LAI))

7 major wastes

In red: contribution of requirements related topics

Principles

- **Unnecessary function for the customer**
- **Too detailed document**
- Tasks achieved too early

- Redesign because of **wrong customer demand specifications**
- **Incomplete information**

- **Complex validation process**
- **Numerous interfaces**
- **'Stop & Go' activities**

- **Redundant tasks**
- Re-invented Solutions

- **Waiting for decisions**
- Overloaded resources
- Overflows

- **Untested solutions**
- **Not validated document**
- **Asynchronous tasks**

- **Unreliable processes**
- Difficult access to information

(source: Michel Baujard - Thales)

Traditional Requirements Engineering

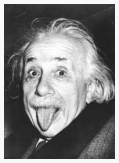
False friend of **PDCA** cycle
Produce **D**evelop **C**hange **A**cknowledge failure

- The “V” model

Added value
Non Added value - Necessary
Non Added value - Waste

Product Manager

System Engineers



Domain Experts

Architects

This just an image, not necessarily an exact image

Elicit Stakeholders Requirements → **Validate stakeholders Requirements** → **Define System & Subsystem Requirements** → **Establish Traceability** → **Verify system Requirements**

40% 29% 31% 40% 60% 60% 20% 20%

Fireman

Deliver Subsystem Requirements → **Develop Sub-systems** → **Integrate and verify the system** → **Validate the system**

Developers

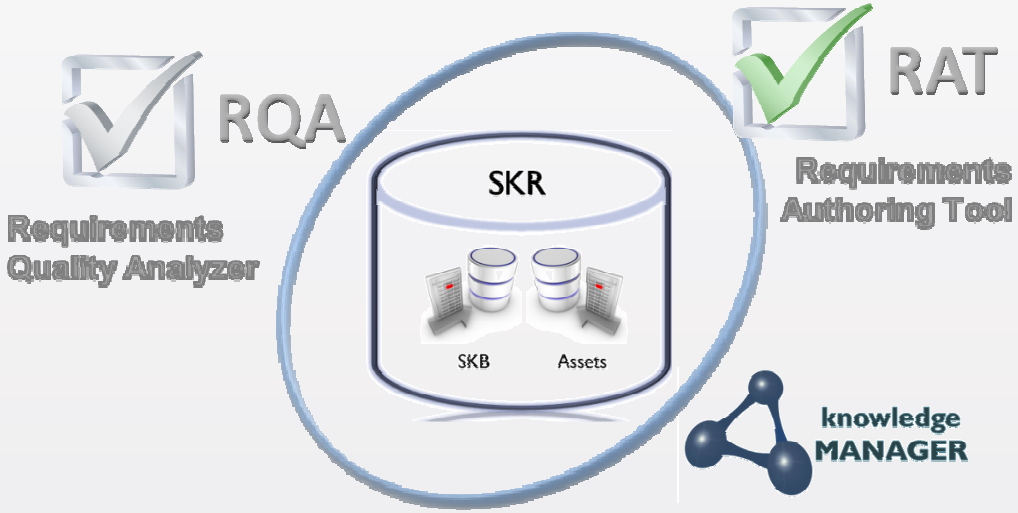
50% 10% 40%

Testers

The Requirements Quality Suite (RQS)

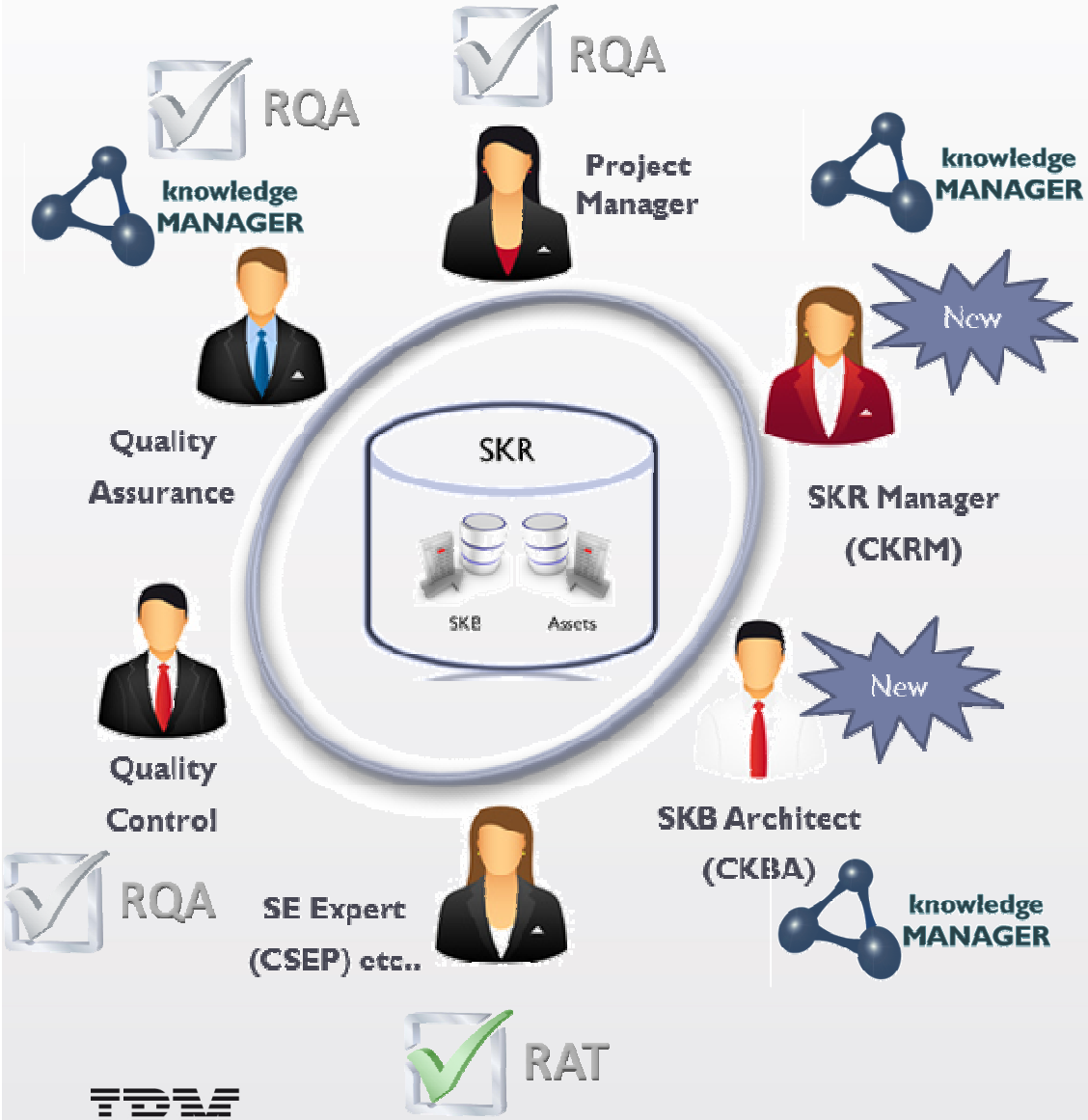
Requirements Quality Analyzer (RQA):
To setup, check and manage the **quality** of a requirements specification (DOORS or Excel).

Requirement Authoring Tool (RAT):
To **assist** authors while they are creating or editing requirements in DOORS.



knowledgeMANAGER:
To manage the knowledge around a requirements specification: the **ontology** (domain concepts and semantics), the **structure of the requirements** (“boilerplates”), the **communication** between authors and domain architects.

The Requirements Quality Actors



SE Expert:
-Author Requirements

Quality Assurance:
-Adjust metrics and quality functions.
-How can metrics and quality functions be adjusted to carry on with the improvement process?

Quality Control:
-Execute assessments for individual requirements and global specifications.
-Is quality evolving as expected?

Project Manager / Quality Manager:
-Does my project requirements have the right quality?
-Do our teams need additional training?

SKB Architect:
-Evolve the requirements knowledge model.

SKR Manager:
-Leader of the Knowledge Repository

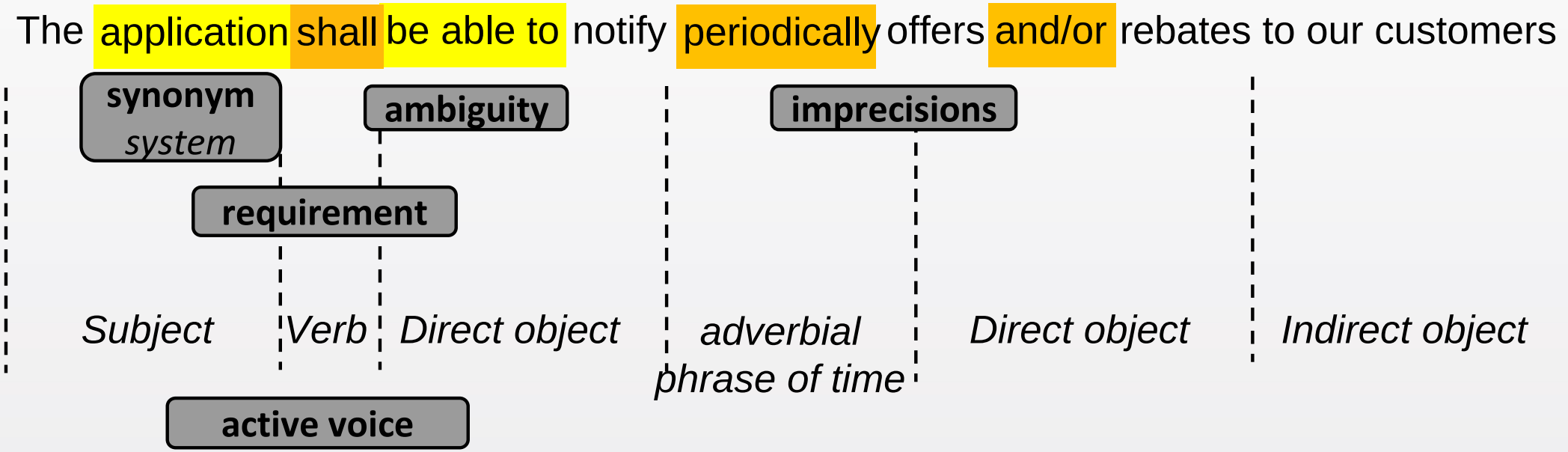
Requirements Quality Analyzer: Individual metrics

Define, measure, improve and manage the quality of requirements

The assessment is modeled by evaluating metrics.

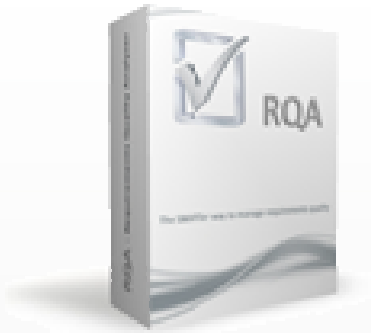
- Size
- Readability
- Conditional vs. imperative sentences
- Active vs. passive voice
- Optional sentences
- Ambiguous sentences
- Subjective sentences
- Implicit sentences
- Abuse of connectors
- Negations
- Speculative sentences
- Use of false friends
- Design terms
- Flow terms
- Number of domain nouns and verbs
- Acronyms
- Hierarchical levels
- Volatility
- Number of dependences
- Match a Boilerplate

Individual Requirements metrics: Lexical and syntactical analysis



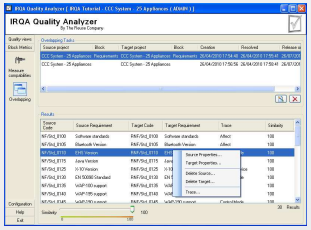
Detection of : ambiguous sentences, complex sentence structures, multiple requirements, imprecise requirements…

Requirements Quality Analyzer: Global Metrics

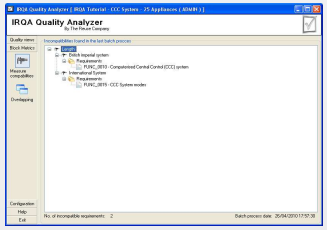


- Unlike individual requirements metrics, **global metrics** involve a whole set of requirements
- These metrics are defined to take a global understanding of some common mistakes

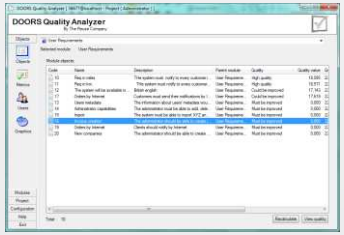
Consistency (semantic)



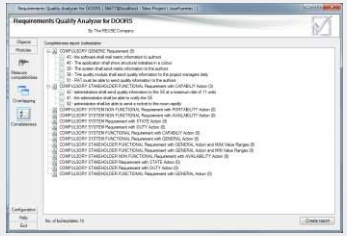
Consistency (inconsistent units)



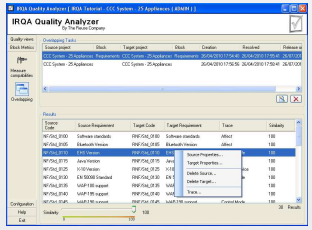
Correctness (individual metrics)



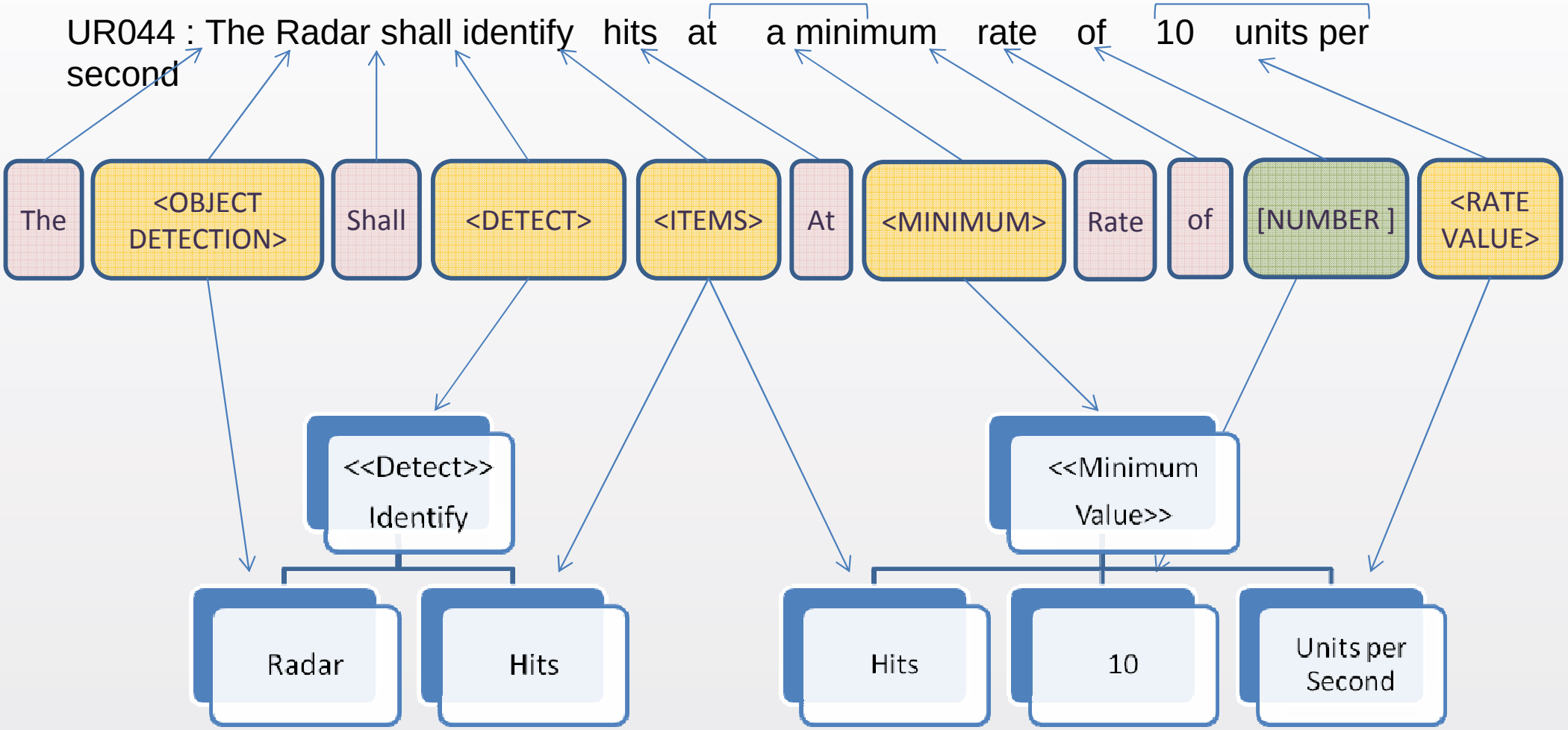
Completeness (missing req.)



Completeness (missing links)



Requirements global metrics: Semantic Analysis

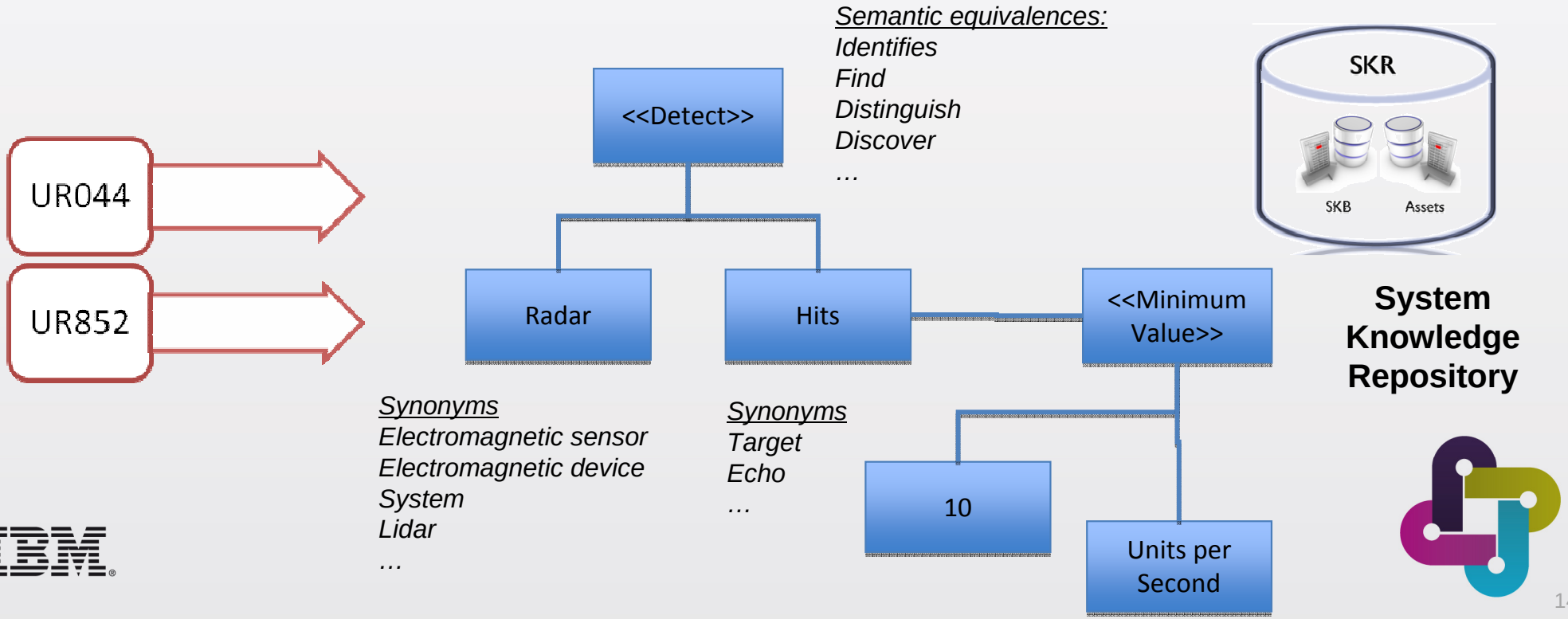


Requirements are modeled in **graphs**

Requirements global metrics: Semantic Analysis

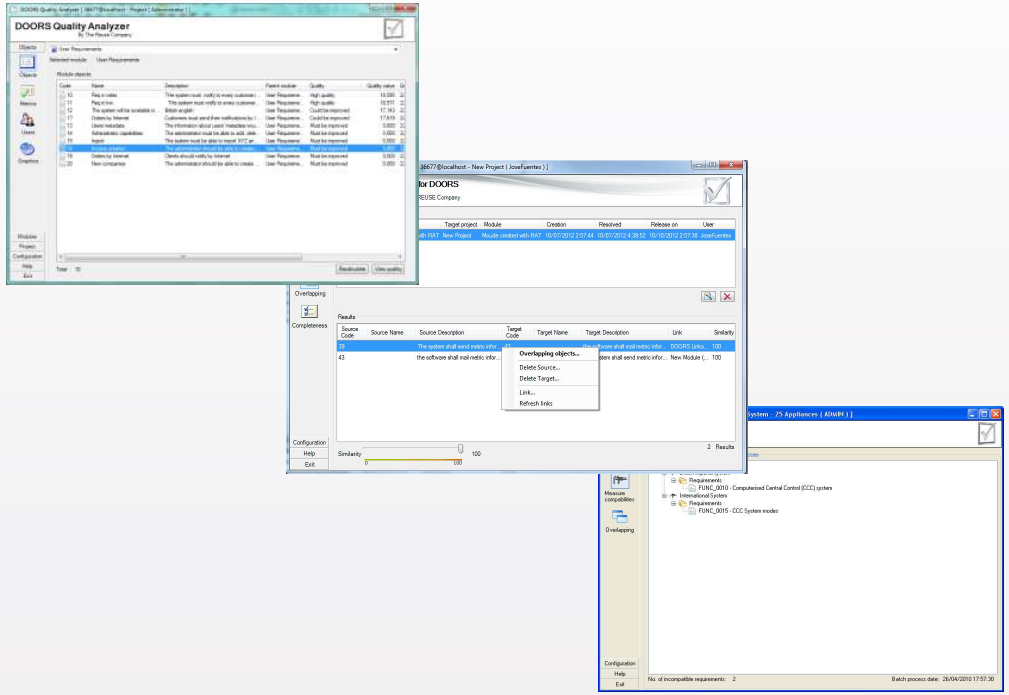
UR044 : The Radar shall identify hits at a minimum rate of 10 units per second

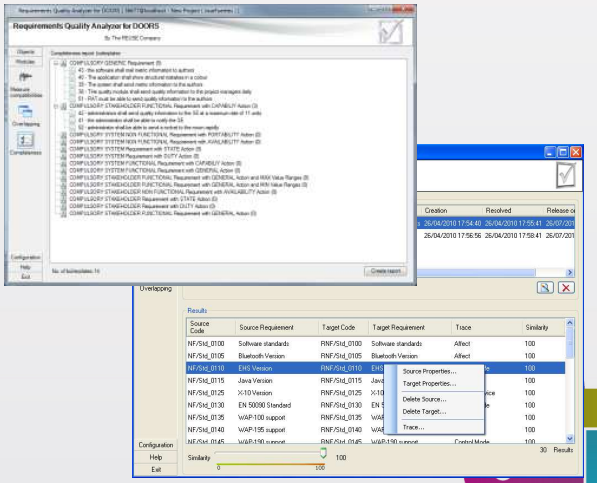
UR852: Targets shall be detected by the Electromagnetic sensor at a frequency not lower than 10 units per second



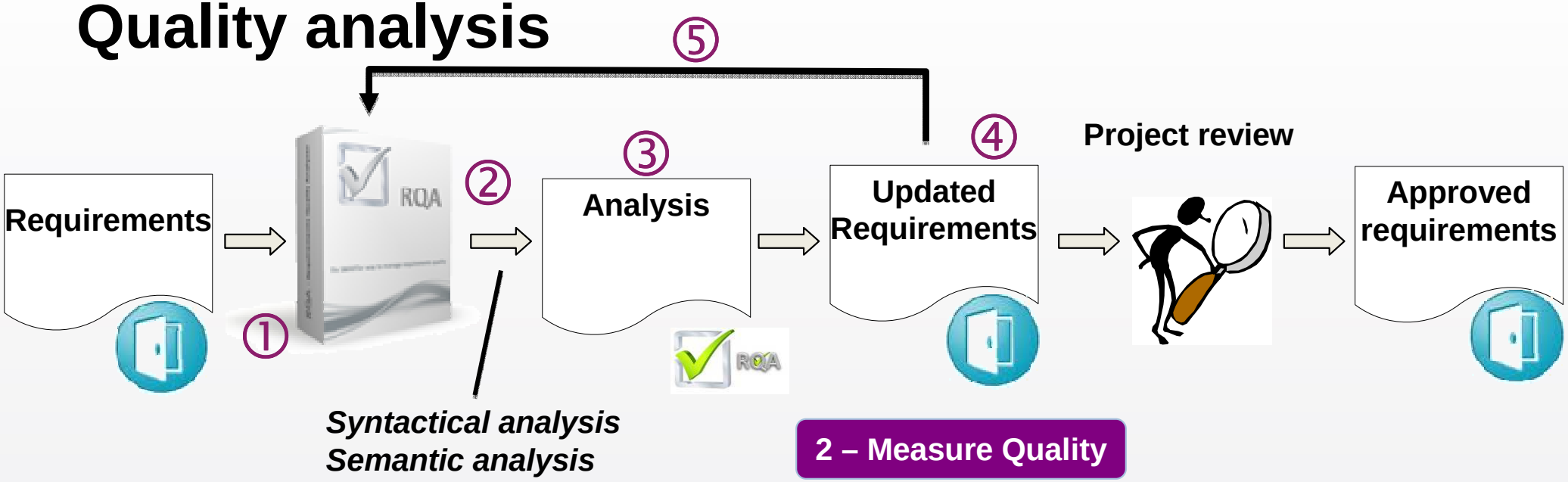
Coverage of CCC metrics

- Correctness
  - Individual Requirements
- Consistency:
  - Semantics: % concepts in the SKB
  - Units: use of different system units
- Completeness
  - Missing requirements: % requirements boilerplates matching
  - Missing Links





First step of the Lean journey: Requirements Quality analysis



1 – Define Requirements Quality Rules

3 – Analyze Requirements

4 – Improve Requirements

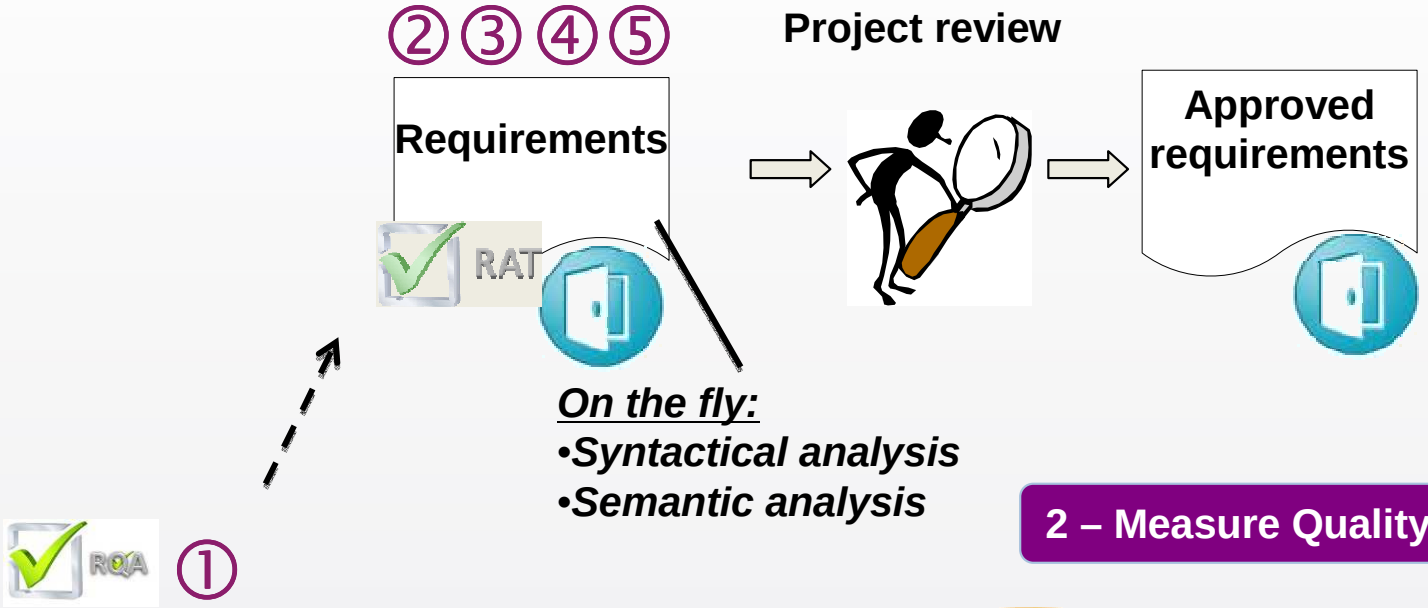
6 - Standardize

5 – Control Quality

Second step of the Lean journey: Assistance in requirements authoring

- Huge HR efforts to review requirements before they are accepted by the developing organization
  - Bad Quality => Waste in time and expenses
- The use of a dedicated tool to check the quality of Requirements reduces the workload effort for reviewing.
- A well written set of requirements directly during authoring activities would reduce even more drastically the cost Requirements Engineering.

Second step of the Lean journey: Assistance in requirements authoring



2 – Measure Quality

1 – Define Requirements Quality Rules

3 – Analyze Requirements

4 – Improve Requirements

6 - Standardize

5 – Control Quality

RQA and RAT demonstrations

Customers Testimonies

- Space project specification :
  - Major manufacturer: around 335 requirements
- Avionics project specifications
  - Major manufacturer: around 10000 Requirements , 100 requirements modules
  - Major supplier: 3 projects, around 4000 requirements
- Analysis results
  - Useful tool, enable to show the weaknesses
  - Pertinence correct
  - Showed that some defects can go through review process
  - Sentences used are not accurate as it should be
  - Helpful on the first sets for requirements creation
  - Adjustment of the rules.
  - Easy to use

Conclusion

- Ready for rational; Readiness for OSLC (CRYSTAL project)
- Typical use cases of RQA and RAT
  - Assistance in requirements authoring
  - Verification of the quality of Customer requirements in a **bid process**
  - Verification and improvement of the quality of system/software requirements **before a business or project review**
  - Verification and improvement of the quality of system/software requirements **before launching a bid process to suppliers**
  - Verification or assistance in establishing requirements traceability*
- Benefits
  - Lean requirements engineering: **good requirements at the first time**.
  - **Self training**: awareness and help in better requirements writing
  - Highlights the **most critical requirements** to correct before a review. In a review, the actors focus on the business rather than the problems of form
  - **Reuse of business knowledge**

Joint Agreement

EADS and Airbus promote agreement between IBM and The Reuse Company / AxDaNe (ADN) for integration of requirements quality control technology in DOORS

Toulouse, 29th of August 2012

EADS Innovation Works (on behalf of EADS) and Airbus, have promoted on 29th Aug 2012 a three parts agreement between IBM, The Reuse Company / AxDaNe (ADN), and EADS itself, with the intention to fully integrate the Requirements Quality Suite, from The Reuse Company inside IBM-Rational DOORS requirements management system. The Reuse Company intends to apply to the IBM Partnerworld Ready For Rational program to allow The Reuse Company to demonstrate and validate the integration between the Reuse Company Requirements Quality Suite and IBM **Rational** DOORS.

The intention of the agreement is to conform a confident architecture for the application of both tools together within the AIRBUS, ASTRIUM and the rest of the organizations forming EADS. A deeper integration of The Reuse Company's technologies within the JAZZ platform will be debated during 2013.

As one the first consequences of this is the decision taken by Airbus to deploy from End 2012 the solution RQA integated with DOORS for the A320 Neo Programme.

The Reuse Company is a SME with headquarters in Madrid, Spain, aimed to promote Systems and knowledge REUSE within all organizations, by offering processes, methods, tools and services that makes it possible.
www.reusecompany.com

AxDaNe (ADN) is a consulting company specialized in Systems & Requirements Engineering, partner of TRC as reseller of the Requirements Quality Suite. ADN is located in France (Paris – headquarters, Lyon), Belgium (Bruxelles) and Singapore.
www.adneurope.com