TRC

WEBINARS 2019

Increased customer satisfaction through improved requirements understanding

Tuesday, 05 March 2019

Presenters' profile

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Introduction: Webinar rules

- Webinar rules:
  - The Webinar will start in few minutes
  - You'll be muted all along the Webinar
  - There's a chatting box to ask your questions or send your comments when you want
  - Please address these comments and questions to the user "The REUSE Company" and not to the presenter directly

    CAKE19$Reqs$CAKE19
  - If you have any technical issue please use this chatting box, or mail us at: support@reusecompany.com
  - The Webinar will be recorded. A link to the recording will be sent to you in few days

Content

- Description of The Reuse Company
- What do we mean when we talk about **customer satisfaction**?
- What are the different components of **human understanding**?
- The concept of **requirement quality** and how are these three interlinked?
- Q&A

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The REUSE Company – TRC Worldwide

- Local partners: France, Germany, Italy, Spain and Japan
- Customers in different countries along United States, Europe and Asia

- TRC Headquarters is based on Madrid (Spain)
- United Kingdom TRC office
- Scandinavian TRC office (Sweden)

The REUSE Company (TRC)

Tools and solutions for knowledge Traceability, Reuse and Quality management

Specialized in the application of **Semantic Analysis Technologies** to a wide range of industries (Aerospace, Defense, Automotive, Railway, Energy…)

Focus: System/Software **Reuse, Traceability and Quality**. Integration of tools and technology from The REUSE Company facilitates the representation, analysis and exploitation of knowledge and enables a knowledge-centric systems engineering approach.

Mission: promoting system/software and knowledge reuse within any organization, by offering **processes**, **methods**, **tools** and **services**. Technology fully integrated within the organization production chain.

ITEA 3

Celtic-Plus
Smart Connected World

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION
HORIZON 2020

REVaMP²

AMASS
Assurance and Certification of CPS

CRYSTAL

Innovative technologies applied to Knowledge Reuse

Christer Fröling

- Christer worked in the Medical and Defence sectors at either industrial organisations or as business entrepreneur for over 20 years at various operational and management levels.
- Currently he is the CEO of REUSE Scandinavia in Sweden which specializes in requirements quality services and tools within the Scandinavian region.
- Christer is a driven change facilitator and has successfully adopted and implemented international process frameworks and standards within industry.
- He has in recent years specialised in organisational learning, change management, process improvements, LEAN and Systems Engineering (SE) and Requirements Engineering (RE). The requirements definition and formulation parts of RE connected to the concept of understanding has been if special interest.

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Customer Satisfaction

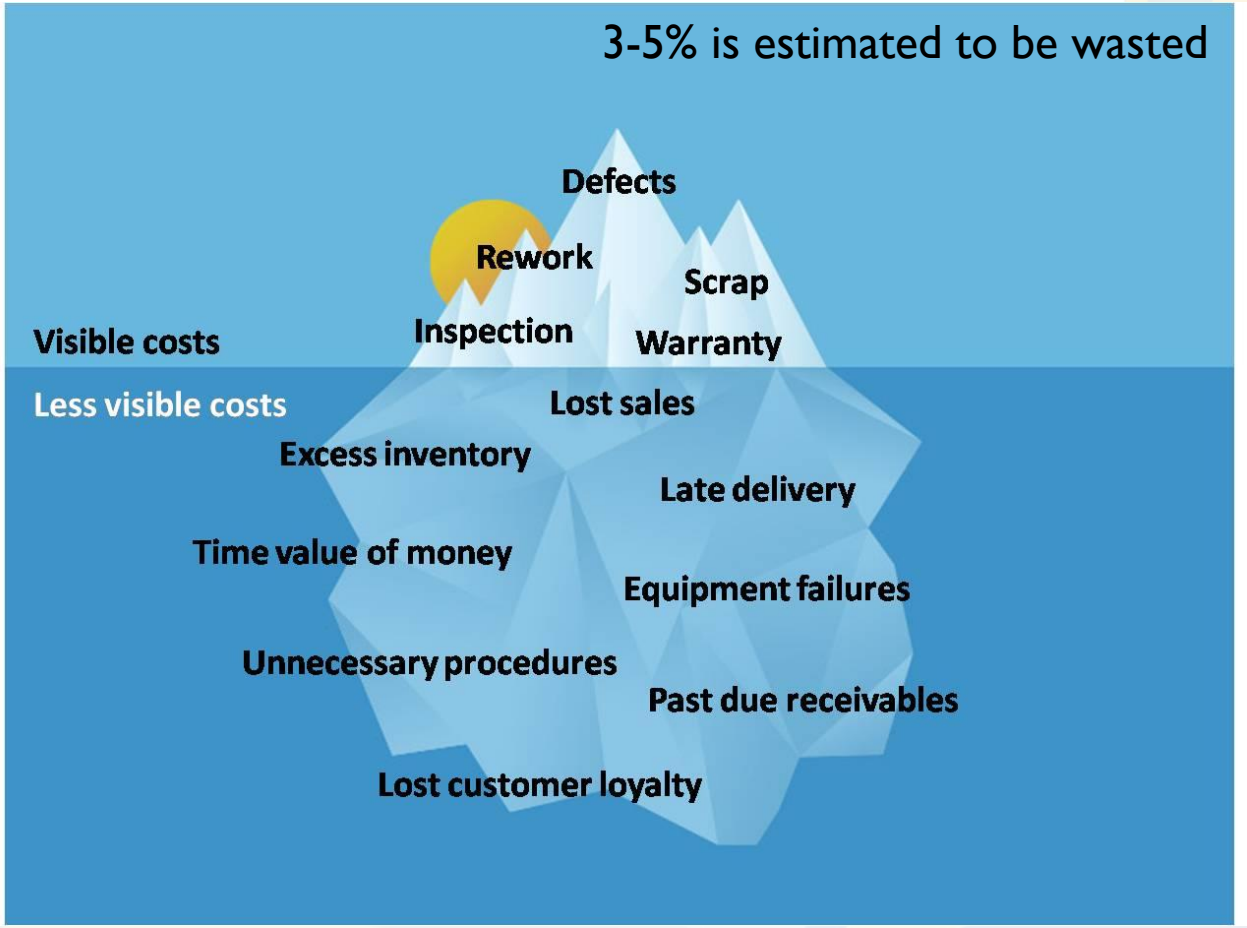
Customer satisfaction is a term frequently used in marketing.
It is a measure of how products and services supplied by a company meet or surpass customer expectation.

Source: Wikipedia

Quality is the totality of features and characteristics of a system or service that bears its ability to satisfy stated or implied needs.

Adapted from ISO 9000:2014

Result of poor quality=Waste



The art of (miss) communication – The root cause to poor quality?

Shared sematics?

Shared language?

Shared culture?

Incorrect, Inconsistent and Incomplete information

Result?

Shared History?

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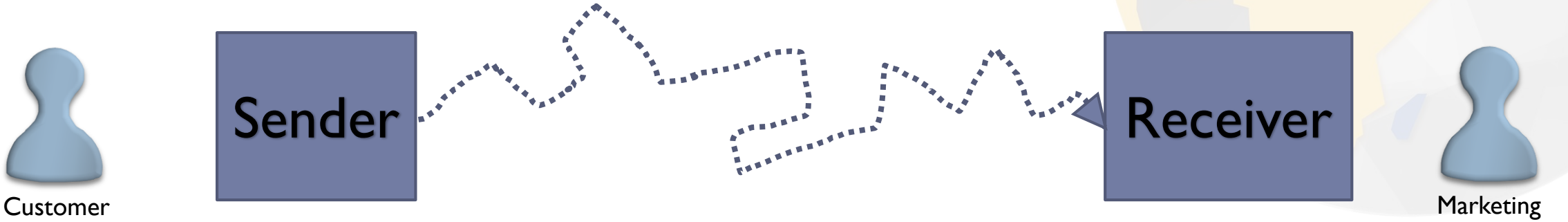
Requirements are used to capture and describe a need

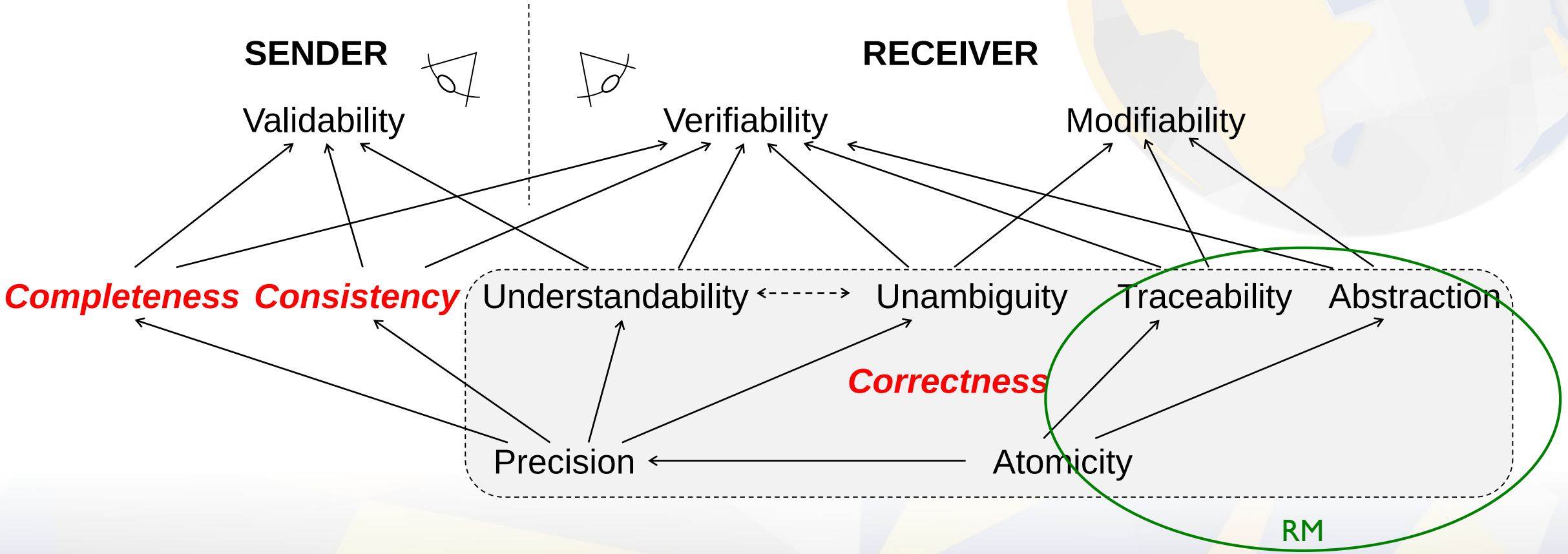


This is regardless off development practice:

Water fall
Iterative
Test driven
Agile
Scrum
…..

Development team X

The meaning of understanding each other



You will not get what you asked for…

You will get what the receiver **THINK** you asked for

Brain Test no #1

- You might not realize it, but your brain is a code-cracking machine…

For emaxlpe, it deson't mttaer in waht order the ltteers in a wrod aepapr, the olny iprmoatnt tihng is taht the frist and lsat ltteer are in the rghit pcale.

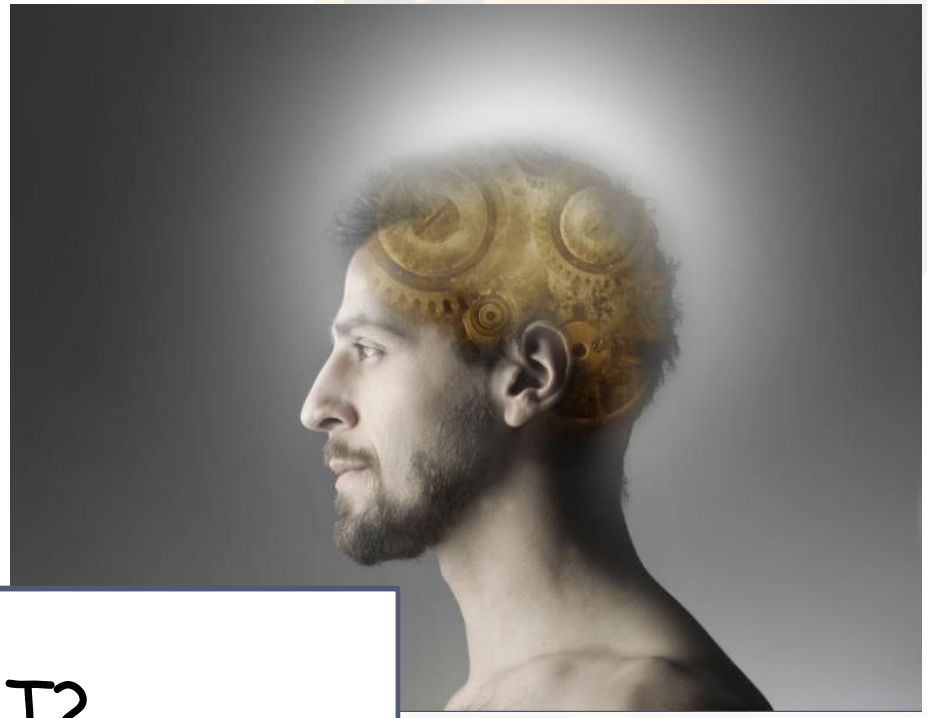
The rset can be a toatl mses and you can still raed it wouthit hgue pobelrm

Brain Test no #2

- You might not realize it, but you react, think and behave based on information, history and knowledge..

When you are at the store get 2 litres of milk. If they have cheap eggs, take 4.

If not, skip it.



RESULT?

Why focusing on information quality?

- Because communication among **humans** is not always that easy and we fool ourselves and others

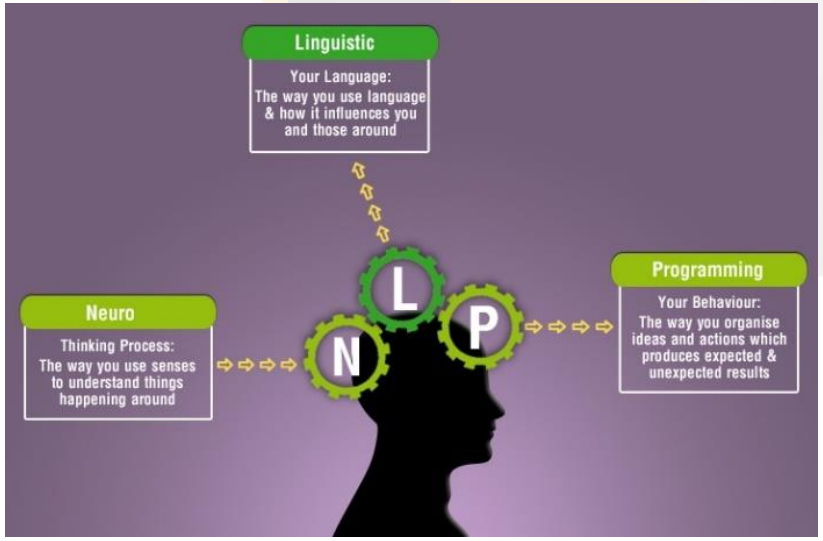
[Deletion]

[Conclusions]

[Generalization]

[Distortion]

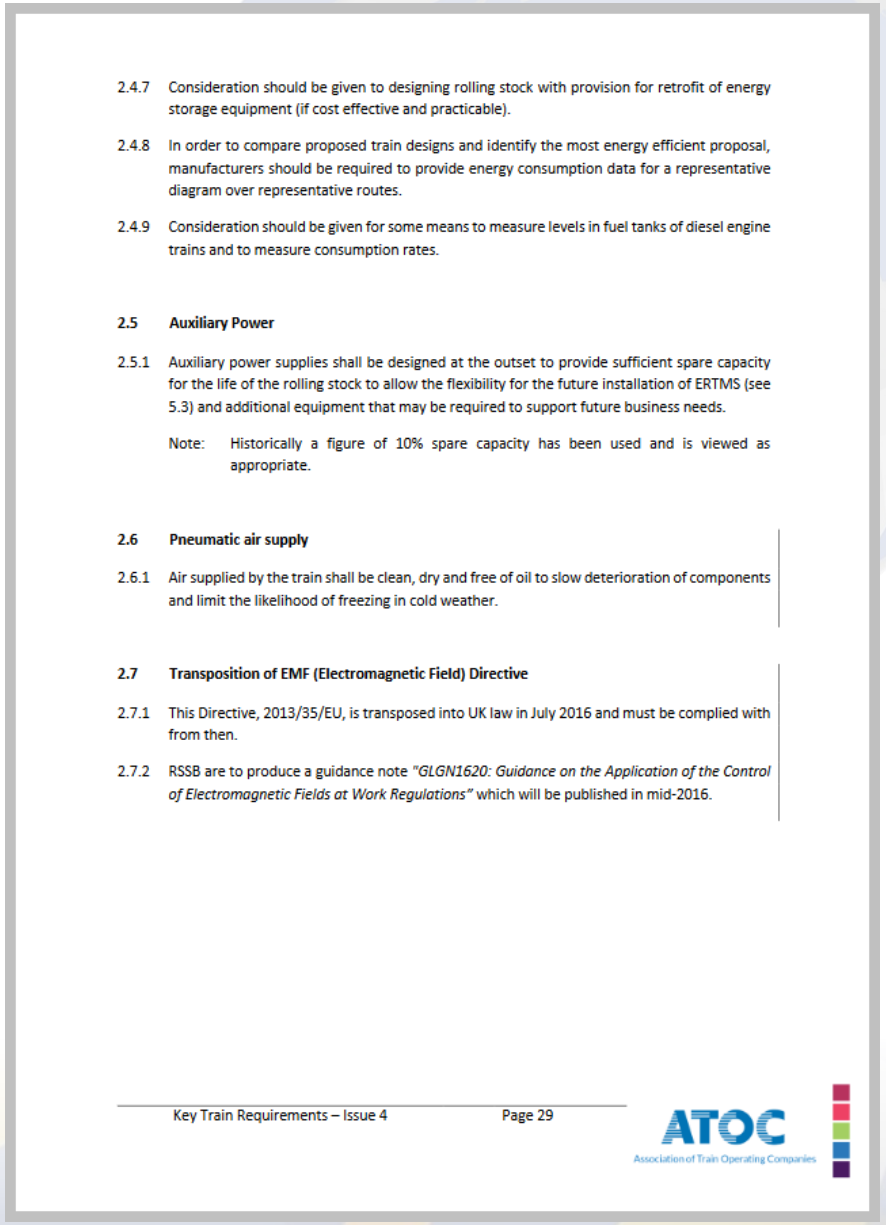
[Language/Culture]



Source: https://en.wikipedia.org/wiki/Neuro-linguistic_programming

Verify quality of the requirements

- Practice in facilitating reviews to avoid common mistakes like:
  - Doing the requirements walk-through **too early** in the design process
  - Reviewers are **not prepared** (reviewing on the meeting)
  - **Not involving the right people** (stakeholders).
  - No one says a word (being **silent is NOT acceptance**)
  - **One strong party** sets the complete scene
  - **Feedback is centered around typos**, not meaningful content (missing completeness and consistency)
  - It develops into a **design meeting**



2.4.7 Consideration should be given to designing rolling stock with provision for retrofit of energy storage equipment (if cost effective and practicable).

2.4.8 In order to compare proposed train designs and identify the most energy efficient proposal, manufacturers should be required to provide energy consumption data for a representative diagram over representative routes.

2.4.9 Consideration should be given for some means to measure levels in fuel tanks of diesel engine trains and to measure consumption rates.

2.5 Auxiliary Power

2.5.1 Auxiliary power supplies shall be designed at the outset to provide sufficient spare capacity for the life of the rolling stock to allow the flexibility for the future installation of ERTMS (see 5.3) and additional equipment that may be required to support future business needs.

Note: Historically a figure of 10% spare capacity has been used and is viewed as appropriate.

2.6 Pneumatic air supply

2.6.1 Air supplied by the train shall be clean, dry and free of oil to slow deterioration of components and limit the likelihood of freezing in cold weather.

2.7 Transposition of EMF (Electromagnetic Field) Directive

2.7.1 This Directive, 2013/35/EU, is transposed into UK law in July 2016 and must be complied with from then.

2.7.2 RSSB are to produce a guidance note *"GLGN1620: Guidance on the Application of the Control of Electromagnetic Fields at Work Regulations"* which will be published in mid-2016.

Key Train Requirements – Issue 4 Page 29

ATOC
Association of Train Operating Companies

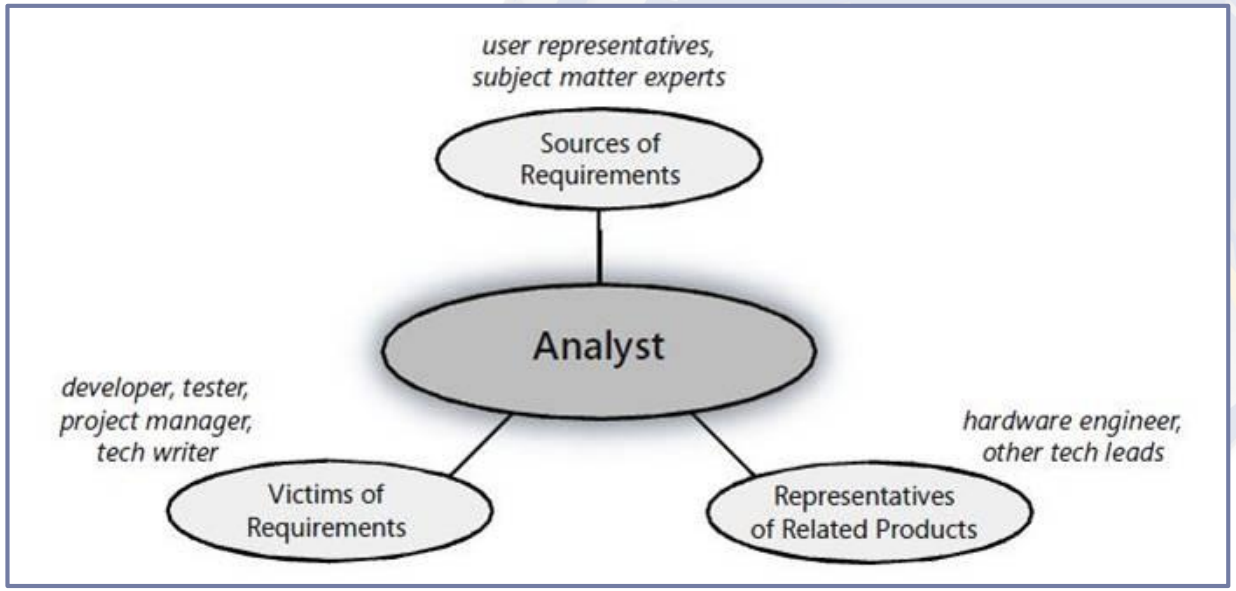
Requirements Review Meeting!?

- Would you refer to be able to confirm the quality of your Customer's Requirements
  - to your standards or
  - to their standards or
  - or to a standard agreed, controlled and enforceable by both of you?
- Would you refer to be able to confirm the quality of your Supplier's Requirements
  - or to a standard agreed, controlled and enforceable by both of you?
- What work products / information items would you like to objectively assess the correctness, completeness and consistency of?

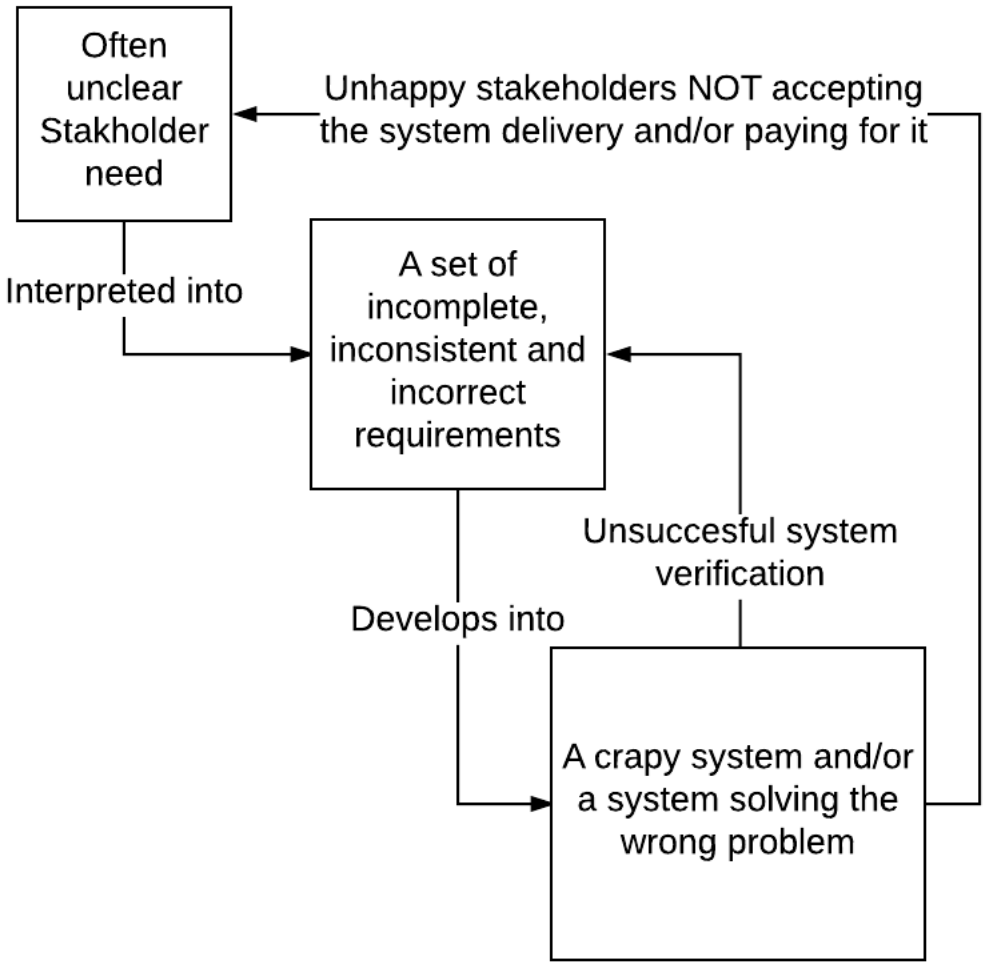
The quality of a peer-review?

- The process is "unjust, unaccountable ... often insulting, usually ignorant, occasionally foolish, and frequently wrong." We are correcting minors and missing majors..
  - *Richard Horton*

- Fixing typographical and grammatical errors is useful because any changes that enhance effective communication are valuable. However, this should be done **before** sending out the document out for broad review. Otherwise, reviewers can trip on these superficial errors and fail to spot the big defects that lie underneath – *Carl Wiegers*



The death spiral



Source: https://requirementdoctor.blog/2017/12/08/the-over-reliance-on-requirements-management-tools-as-the-engineering-messiah/

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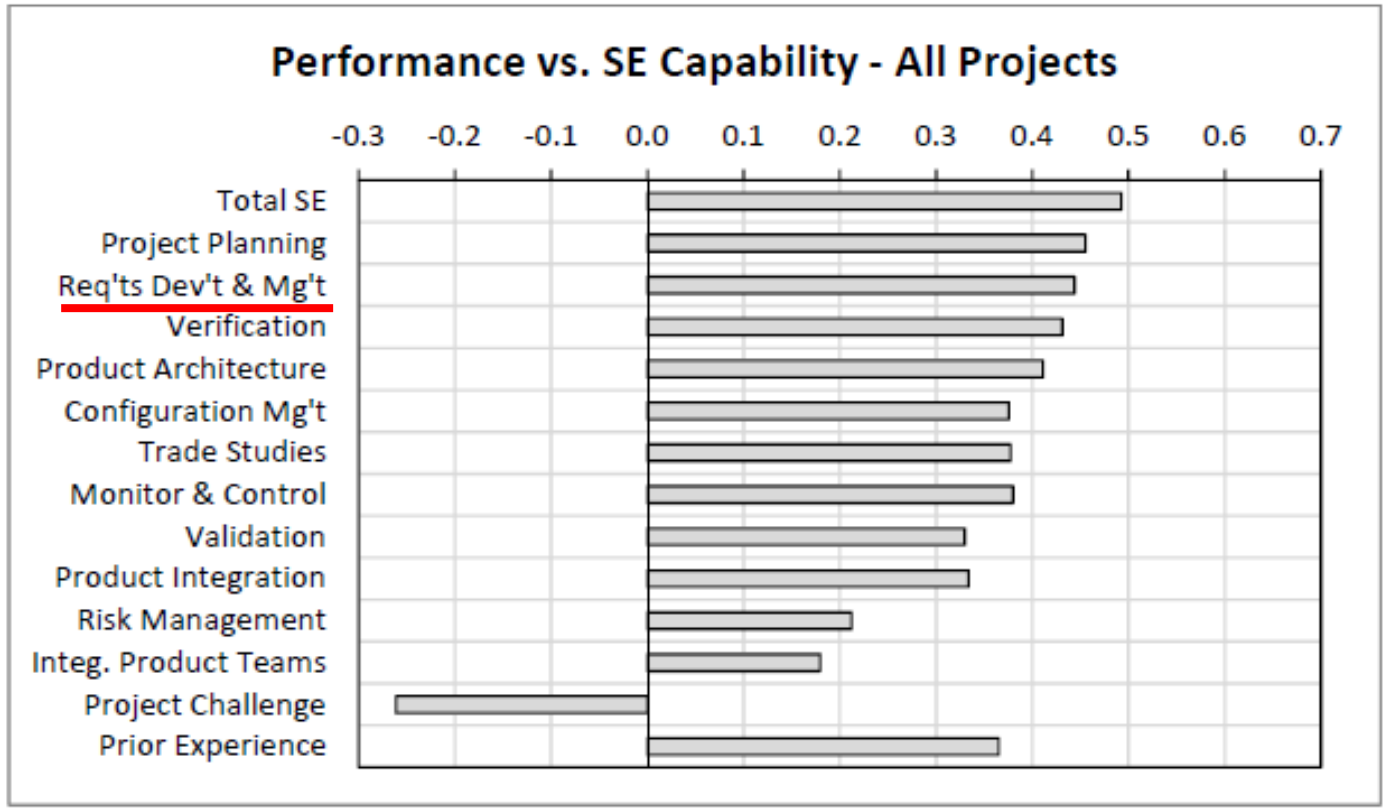
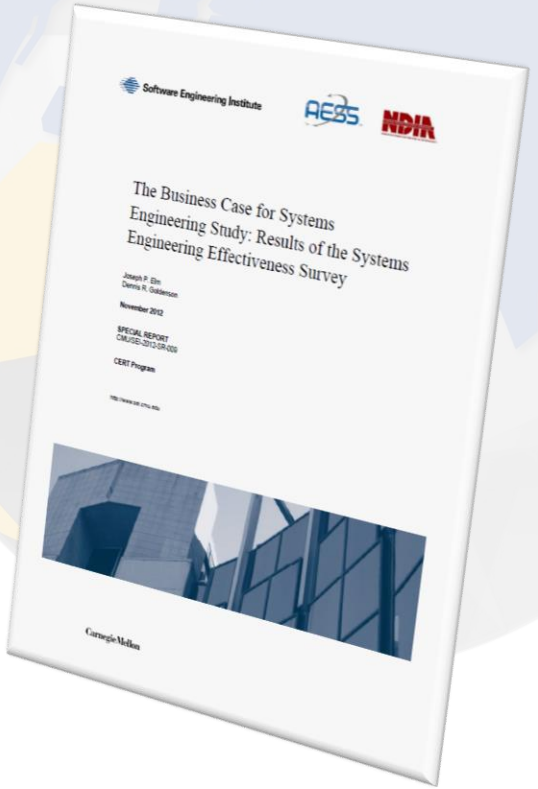
Why projects SUCCEED?





Source: The Business Case for Systems Engineering Study: Results of the Systems Engineering Effectiveness Survey, 2012

Requirements Development & Management

RM Tool

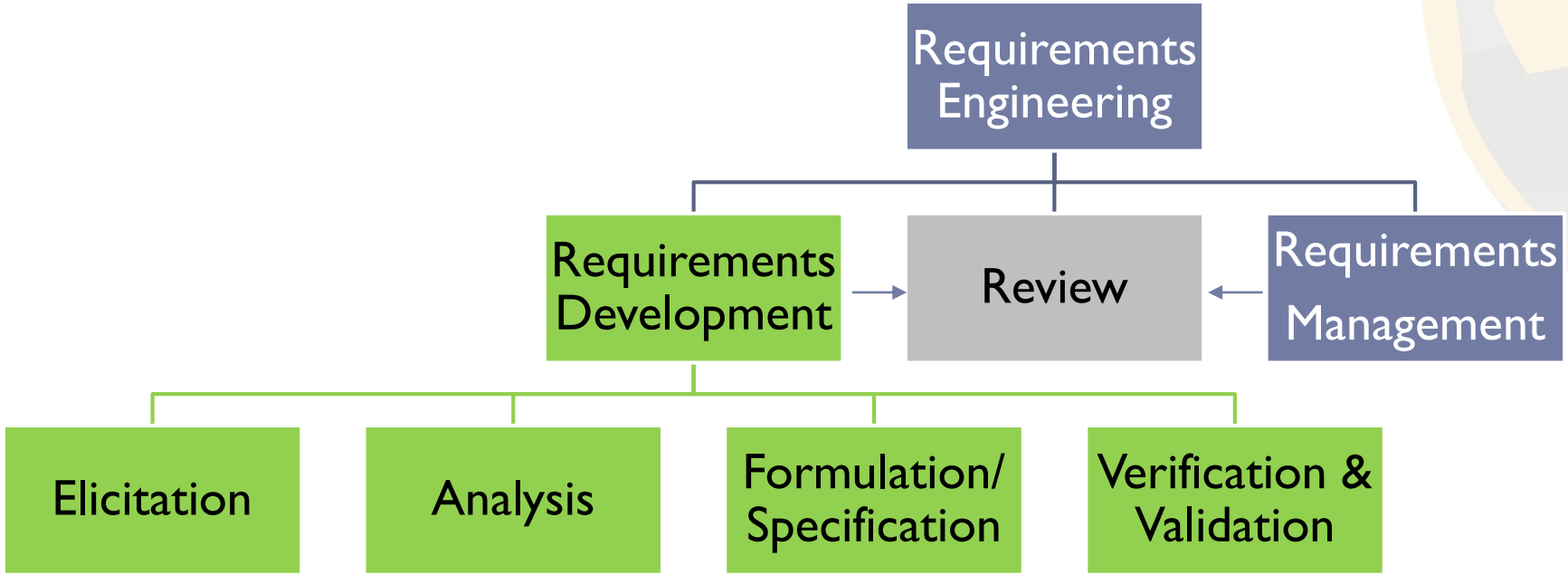
Requirements Management (RM) - Governance

- Create structure for requirements & verification data
- Create **Traceability**
- Change Management
- Requirements validation
- Review of Requirements
- Rules for Requirements creation
- Create understanding and engagement
- Identify inconsistency and contradictions
- Identify, formulate and decide on requirements

RD Tool

Requirements Development (RD) - Development

High quality Requirement Engineering



Evolution of the Verification and Validation with focus on requirements quality

System Validation
Did we build the right product?

Requirements Validation
Have we understood the problem?

Stakeholders

Requirements

Design

System

System Verification
Did we build the product right?

Requirements Verification
Are the requirements "SMART"?
(Correct, Consistent, Complete)

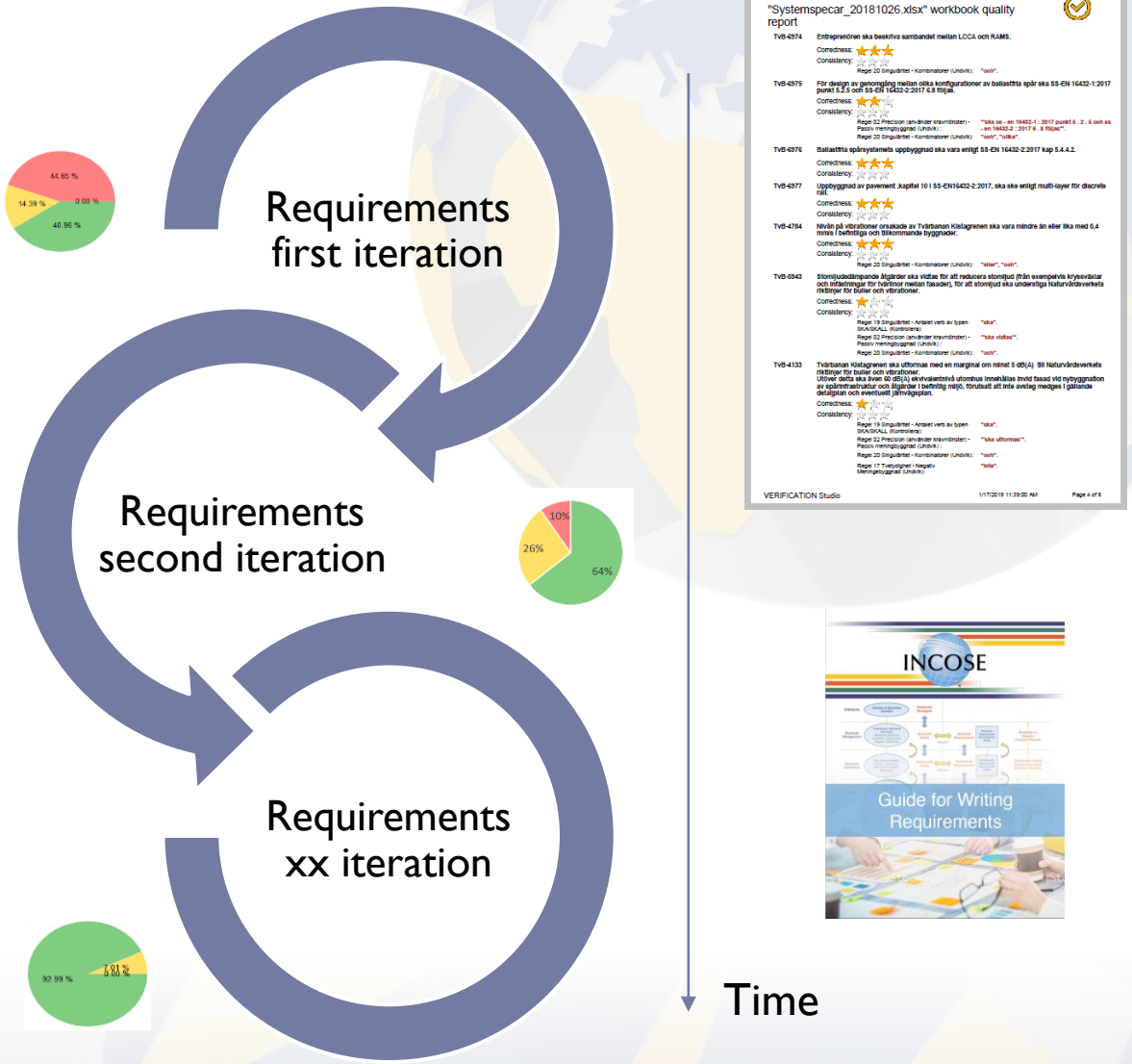
Requirements Quality Metrics

Iterative requirements process

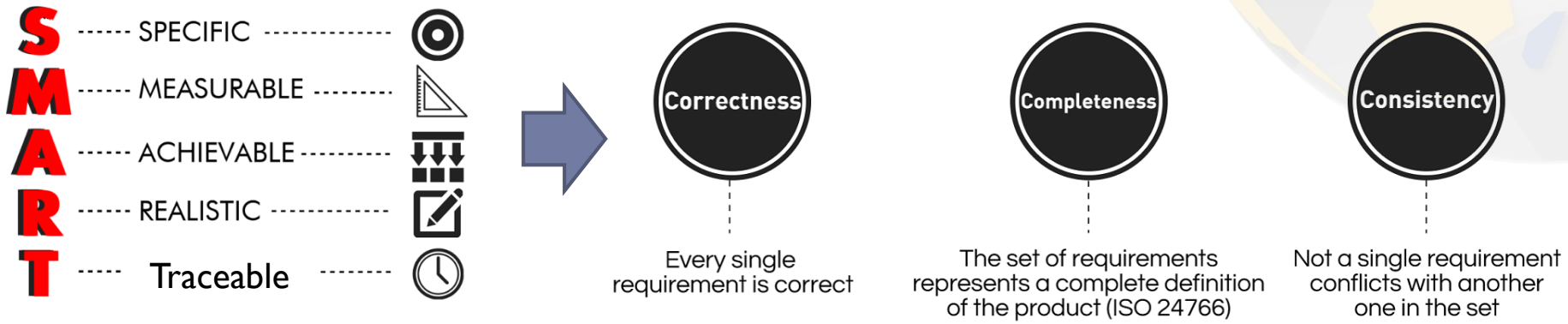
- Increased quality over time when project and system matures

- Start of with basic Sematic quality:
  - Basic Correctness
  - Some Completeness
  - No Consistency

- End of with high Semantics and Syntax quality:
  - Mature Correctness
  - Defined Completeness
  - Defined Consistency

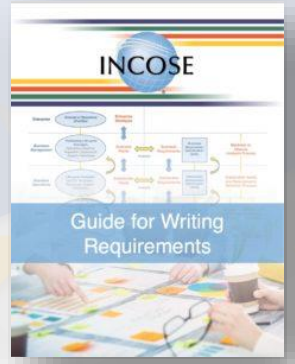


Requirements Quality vs. Information Quality



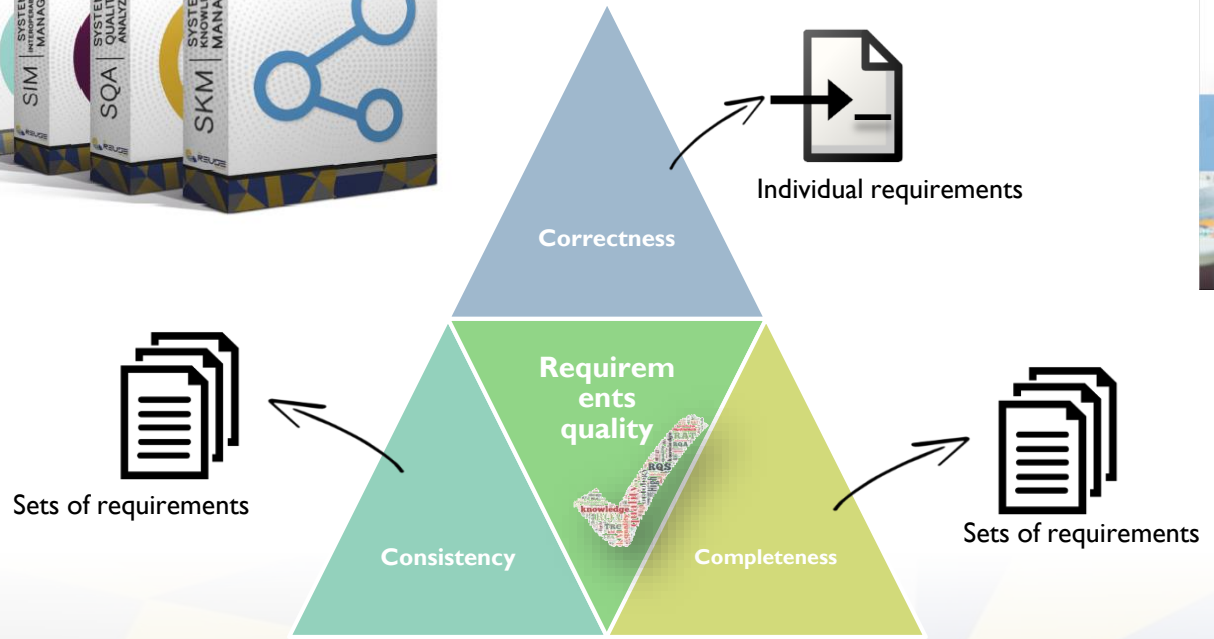
Quality characteristics – Standards/guides

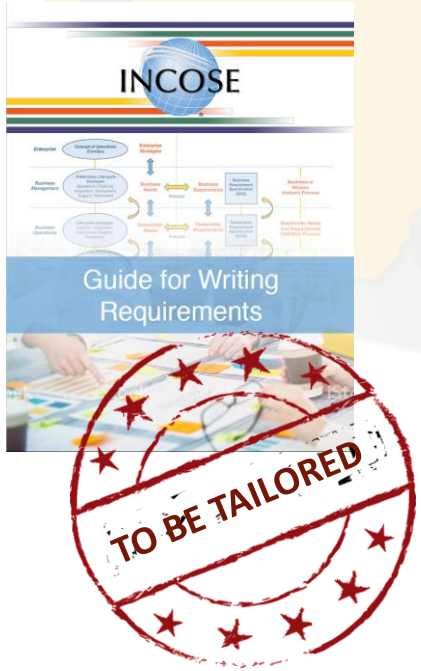
Characteristic	IEEE 830	IEEE 29148	IEEE 1233	ISO 24766	ESA PSS	NASA ARM	INCOSE Guide	Wiegers
Correct	☑			☑		☑	☑	☑
Unambiguous/Clear	☑	☑	☑	☑	☑	☑	☑	☑
Complete	☑	☑	☑	☑	☑	☑	☑	☑
Consistent	☑	☑	☑	☑	☑	☑	☑	☑
Ranked/Prioritized	☑			☑		☑		☑
Verifiable	☑	☑	☑	☑	☑	☑	☑	☑
Modifiable/Configurable	☑		☑		☑	☑		☑
Traceable	☑	☑	☑	☑		☑	☑	☑
Necessary		☑		☑			☑	☑
Appropriate							☑	
Singular/Atomic		☑		☑			☑	
Feasible/Affordable		☑		☑	☑		☑	☑
Conforming							☑	
Accurate					☑			
Abstract/implementation free		☑	☑					
Bounded/Scoped		☑	☑	☑				
Granular/Abstraction			☑	☑				
Conciseness				☑				
Stability				☑				
Modularity				☑				



Requirements quality metrics

- The CCC* approach





*CCC – Correctness, Consistency and Completeness

Requirements Quality characteristics

- **Correct:**
  - The requirement accurately copes with the corresponding needs
  - There are no conflicts with any possible higher level requirements
  - If it includes facts, these facts must be true

Requirements Quality characteristics

- **Complete** (for individual requirements):
  - The requirement includes **all** the needed information so that the reader can fully understand it.
    - Reader: customer, tester, designer, developer…

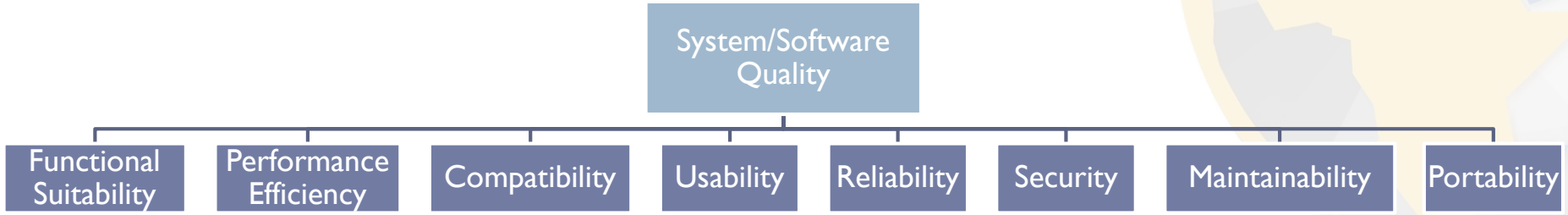
Requirements Quality characteristics

- **Complete** (for sets of requirements)
  - Describes **all** the desired capabilities and the proper responses to all possible situations
  - All meta data or attributes need to be present
  - Missing links (traces)
  - All different viewpoints must be considered:
    - System Characteristics
    - Architectural: interfaces, system composition
    - Safety: hazards and failure conditions
    - Operational environment
    - Regulatory

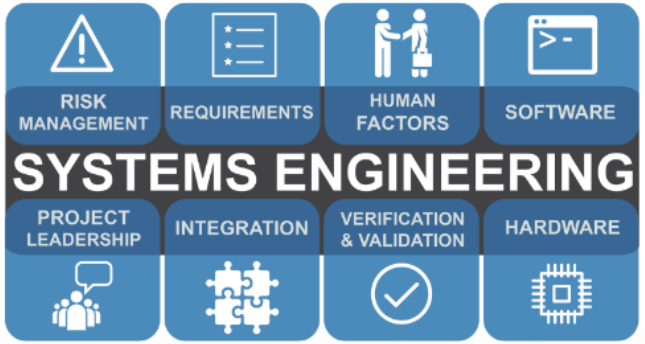
Requirements Quality characteristics

- **Consistent:**
  - Consistent vocabulary, writing style…
  - Contradicting requirements: at the same level or between linked requirements in higher levels
  - Redundancy: the same need expressed twice (duplicated requirements)
  - Inconsistent measurement units (…inch/mm)

Quality of the Requirements= Quality of the System?

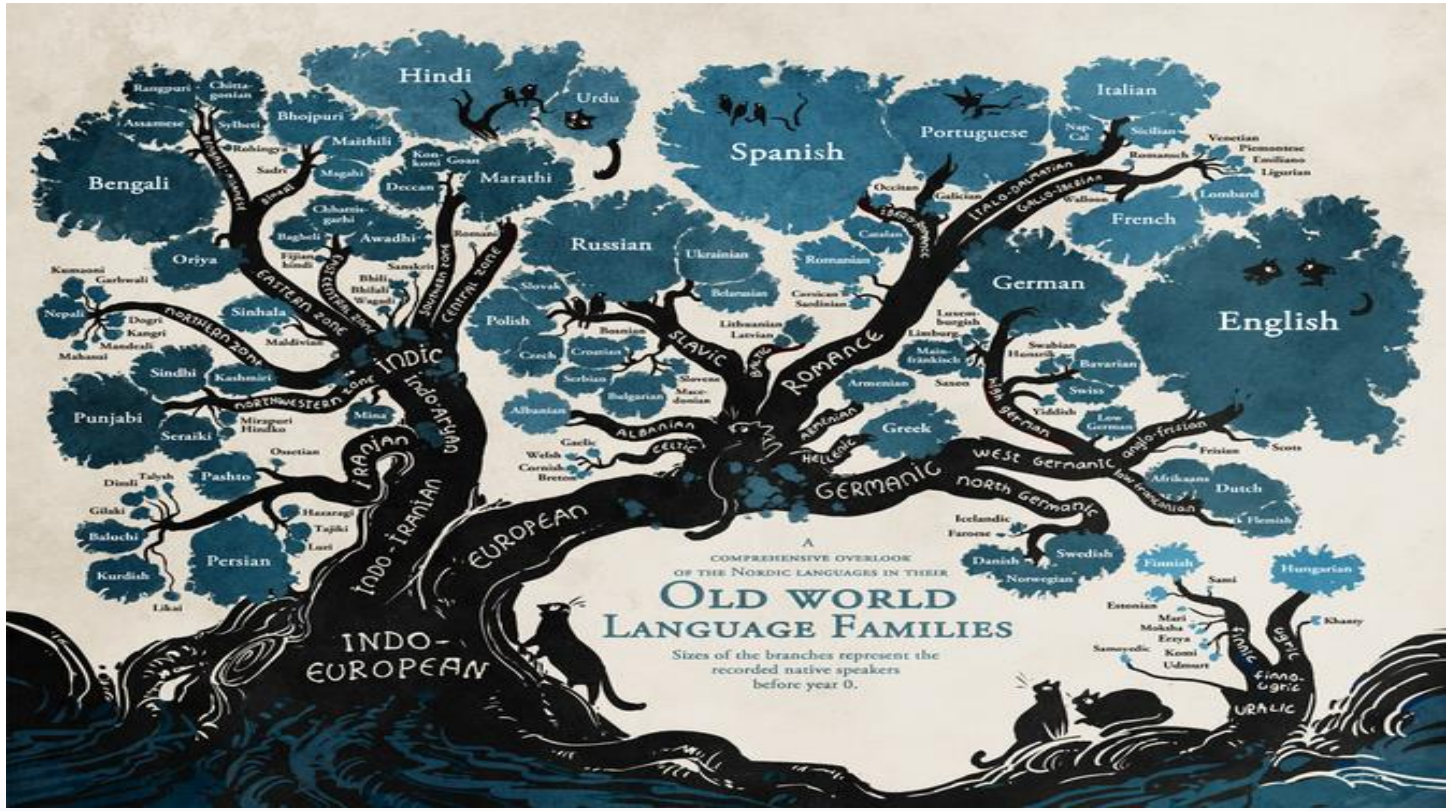


Source: ISO 25010:2011



INCOSE

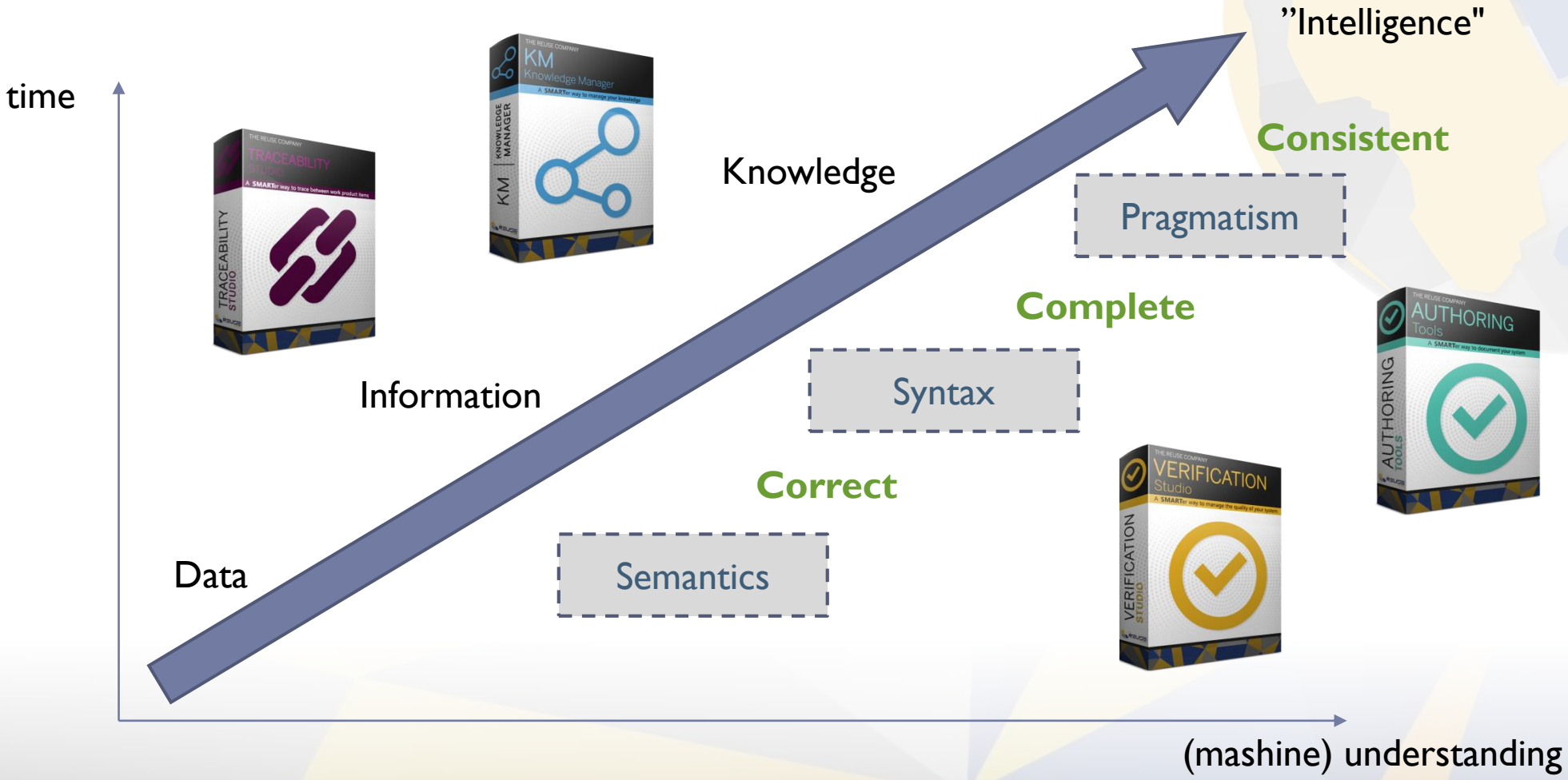
Knowledge Centric Engineering – Part of Artificial Intelligence (AI)



Goals of Artificial Intelligence

- Reasoning
- Automated Learning & Scheduling
- Machine Learning
- Natural Language Processing
- Computer Vision
- Robotics
- General Intelligence

Natural language processing – The key to knowledge



Knowledge Organization: The System Knowledge Base (SKB)

01 Vocabulary

Controlled Organizational and Project Vocabulary for a common understanding among stakeholders

02 Conceptual Models

Recreate and capture the system architectures represented in views and models. Stablish relationships among system and system elements

03 Patterns

Represent requirements similarities and enable formal representation, automatic recognition and aid authors

04 Formalization

Representation of assets semantic through SRL – System Representation Language

05 Reasoning

A combination of rules, tasks and groups to infer information from valuable assets

Knowledge Organization: The System Knowledge Base (SKB)

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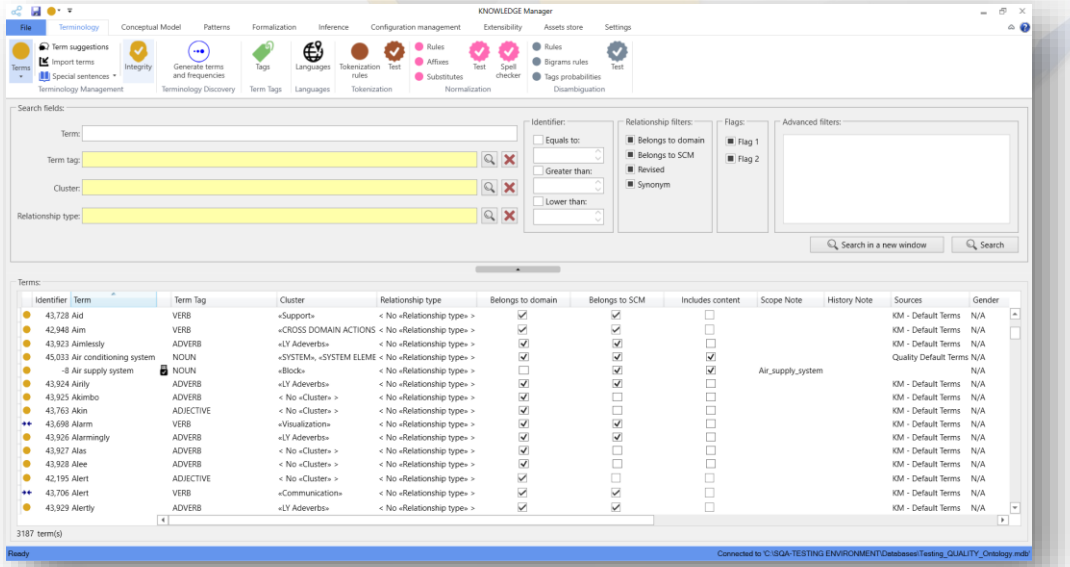
Vocabulary

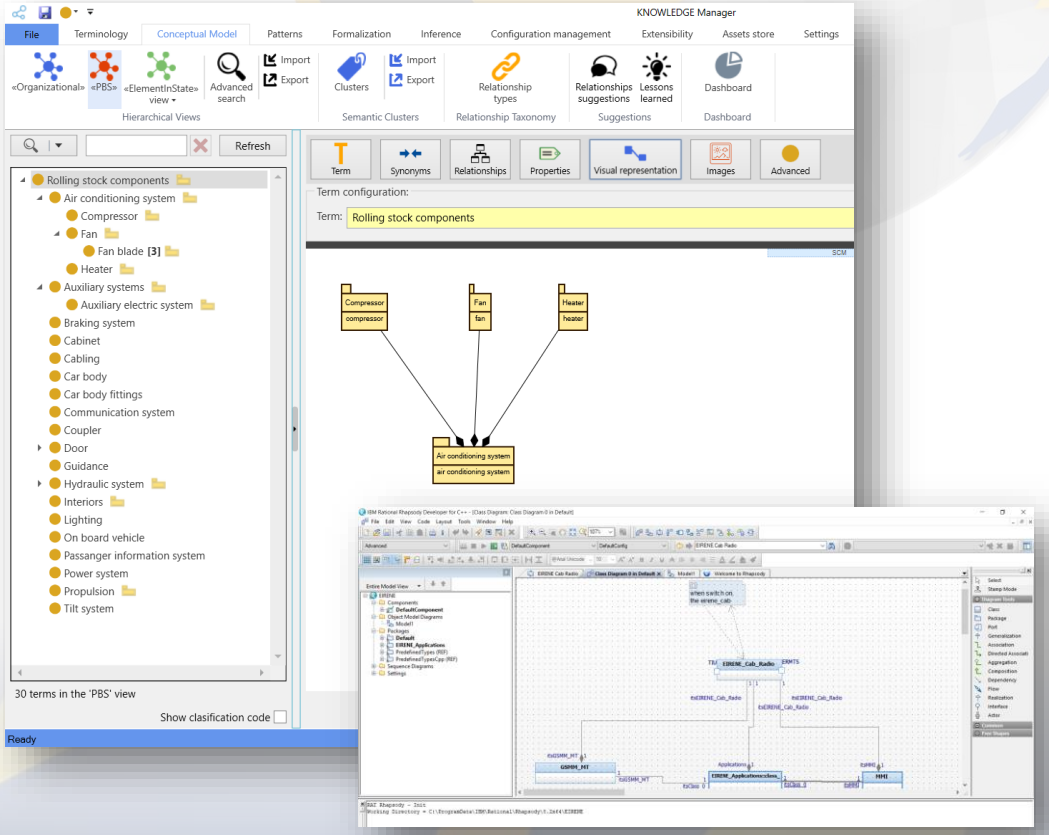
Controlled Organizational and Project Vocabulary for a common understanding among stakeholders



02

Conceptual Models

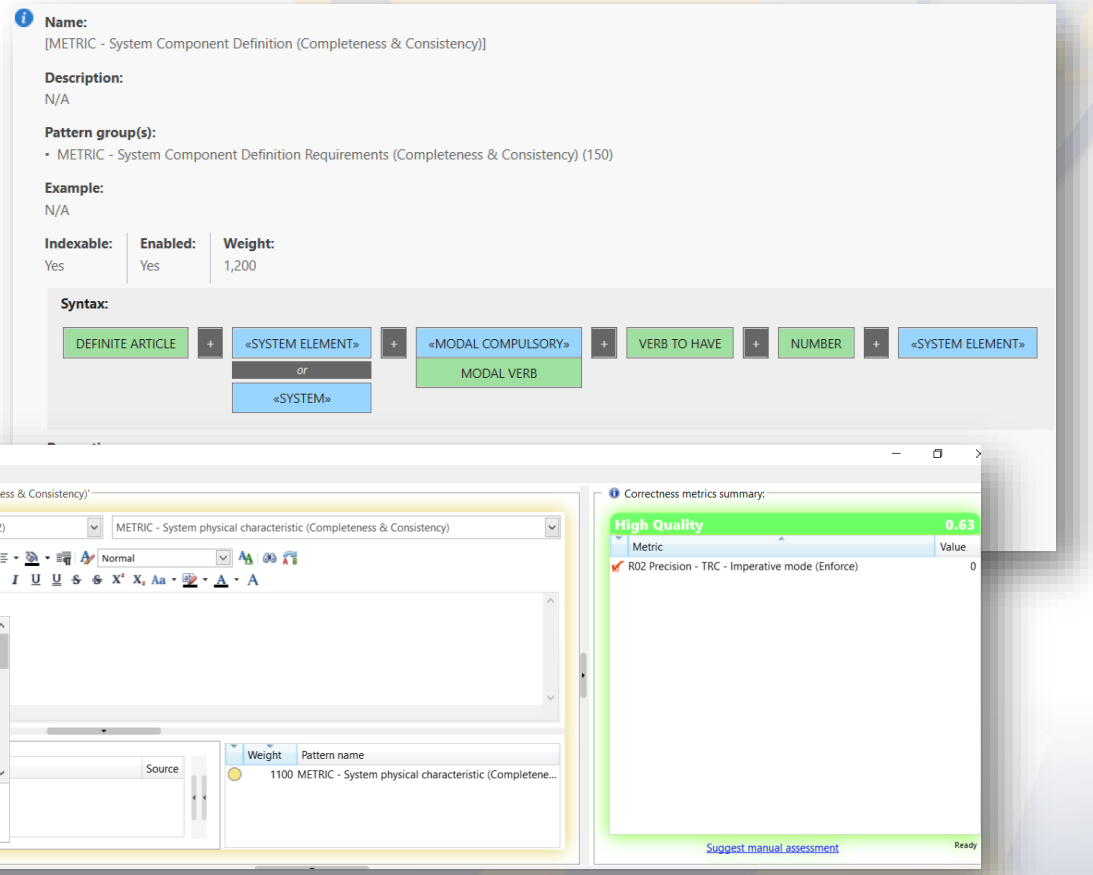
Recreate and capture the system architectures represented in views and models. Stablish relationships among system and system elements



03

Patterns

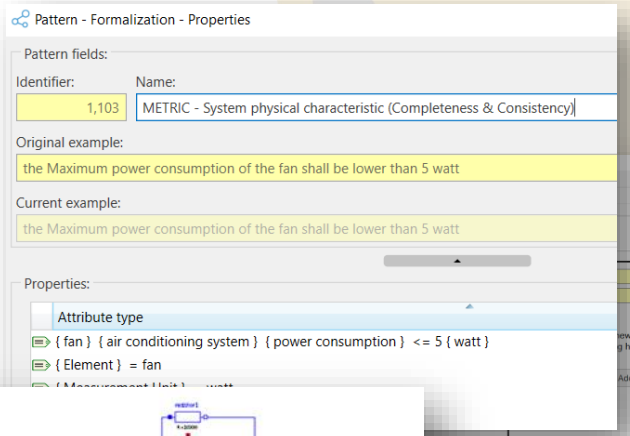
Represent requirements similarities and enable formal representation, automatic recognition and aid authors

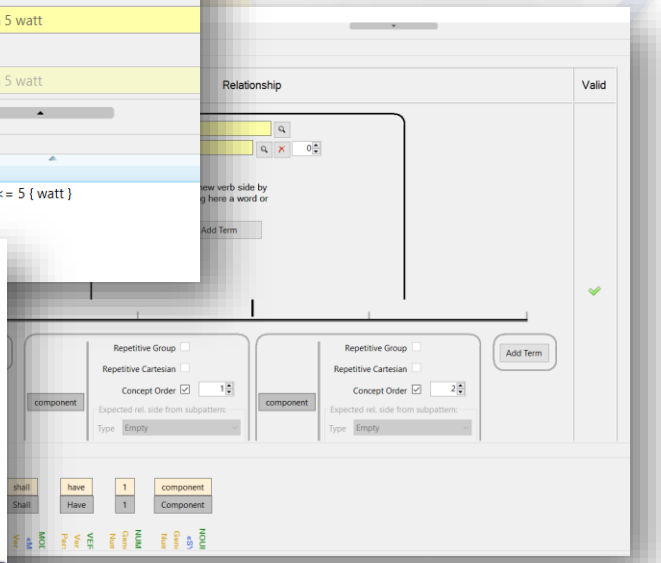


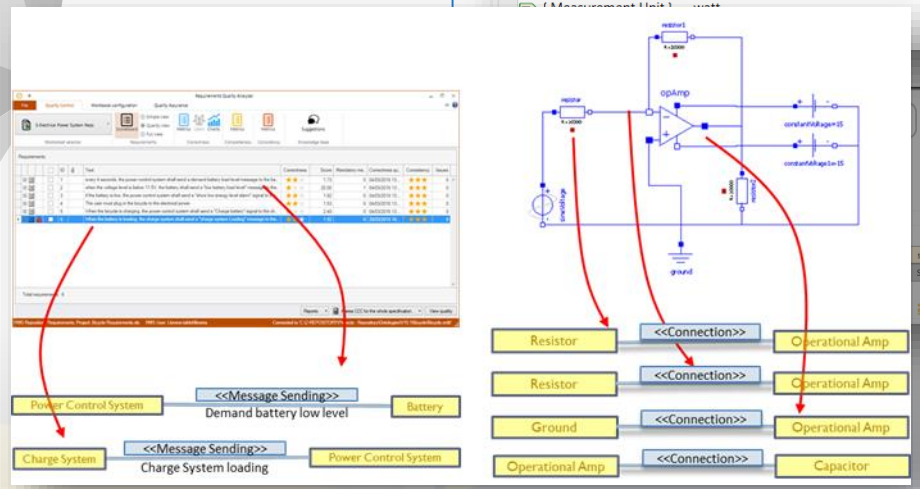
04

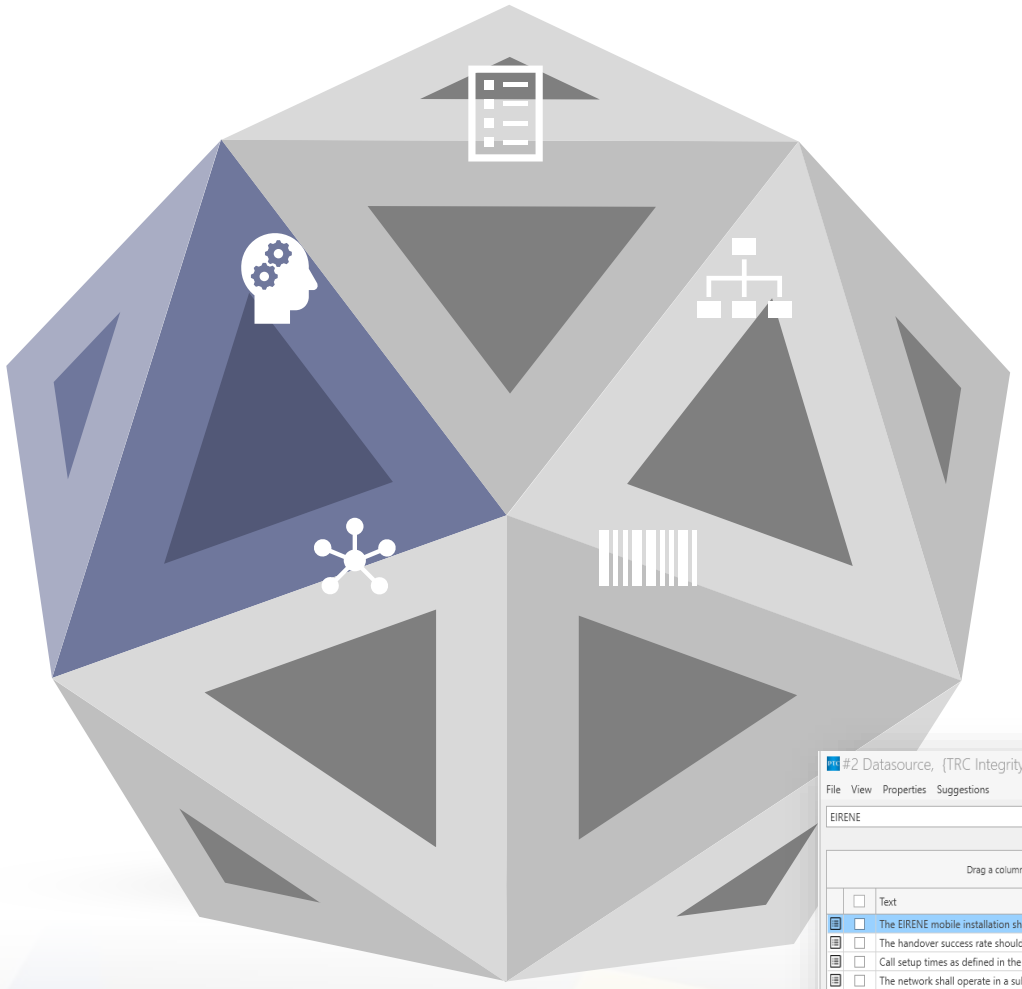
Formalization

Representation of assets semantic through SRL – System Representation Language





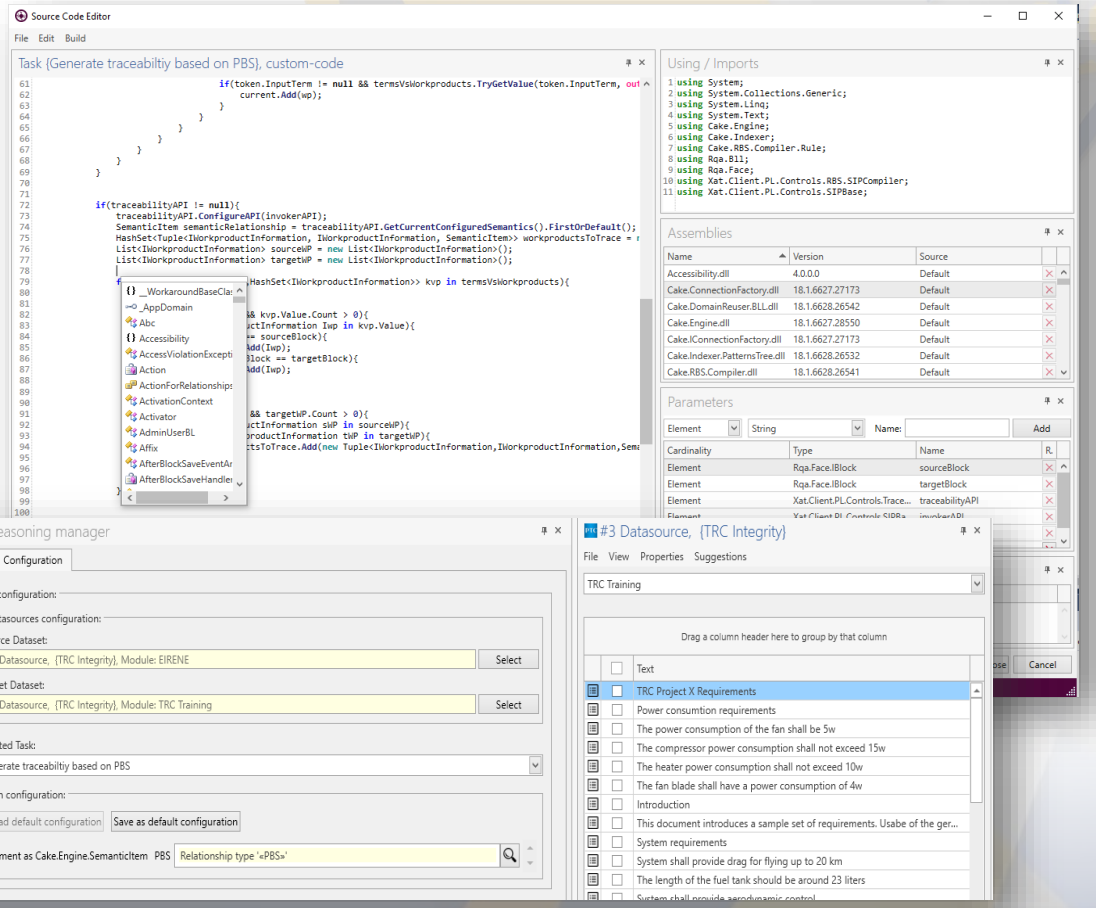




05

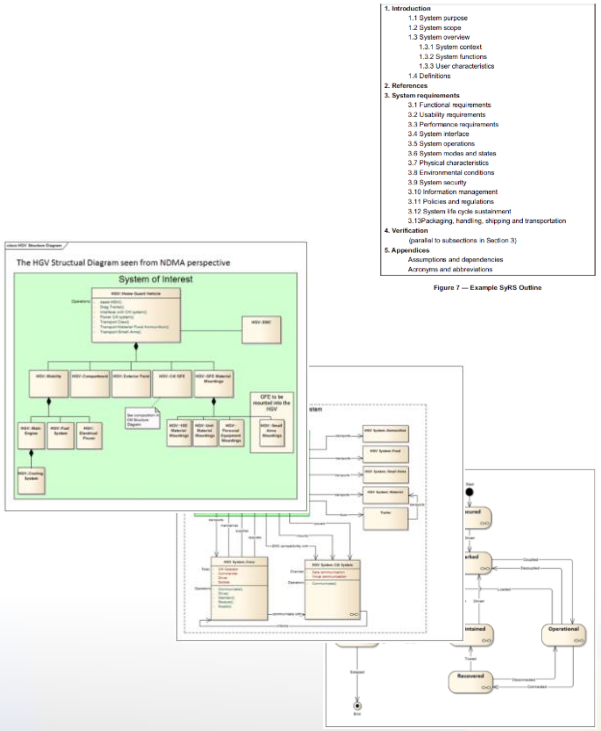
Reasoning

A combination of rules, tasks and groups to infer information from valuable assets

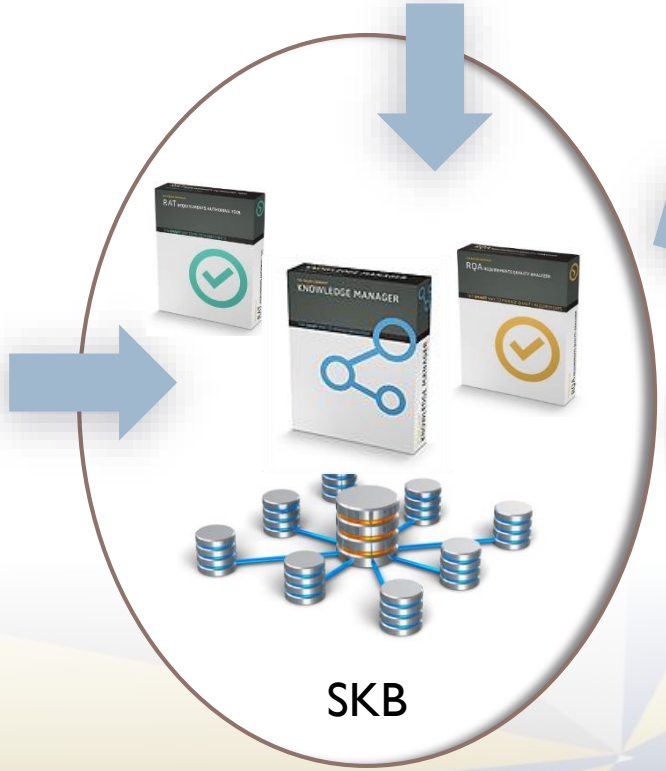


Knowledge Centric Engineering – The future of SE

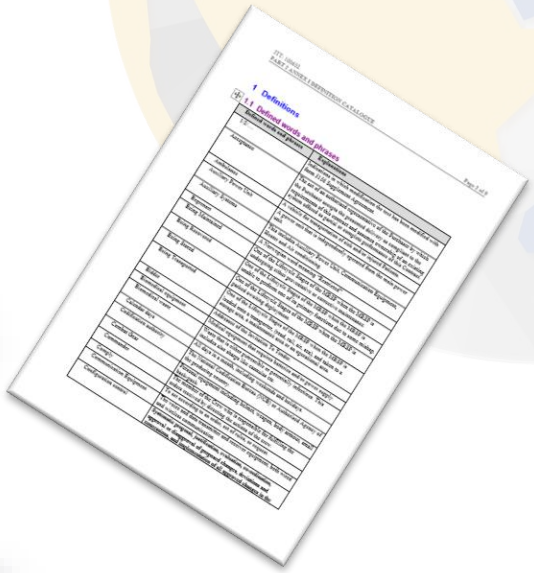
STRUCTURES
xBS, Models, Documents, etc..



QA
RULES



ACRONYMS & DEFINITIONS



REQUIREMENT PATTERNS

Requirements Quality circle

Systems satisfy

Stakeholders need

Requirements state

Design fulfill

Tests confirm

Time to choose path – Its NO reason to look back!

Next webinar and other events

- **Topic:**
  - **Automatic Traceability Discovery for Systems Engineering**
  - Traceability is a core activity within the System Development Lifecycle, although a tedious and time consuming task. With TRACEABILITY Studio you will discover how traceability issues can be reduced by controlling the quality of the traces. Furthermore, help users to do traceability tasks by suggesting automatic traces based on the organization and system knowledge.
- **Dates:**
  - 2nd and 4th of April
- **Other Events:**

Content

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- What do we mean when we talk about customer satisfaction?
- What are the different components of human understanding?
- The concept of requirement quality and how are these three interlinked?
- Q&A


Q&A

Kontaktinformation

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