TRC

WEBINARS 2019

Boosting Reuse and Quality in the Engineering Process: Revamping Product Lines

Friday, 29 November 2019

Presenters' profile

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Introduction: Webinar rules

- Webinar rules:
  - 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
  - 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

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**. The 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.

ARROWHEAD TOOLS

NewControl

HORIZON 2020

ITEA 3

REVaMP²

Eltic-Plus Smart Connected World

CRYSTAL

AMASS Assurance and Certification of CPS

Innovative technologies applied to Knowledge Reuse

Elena Gallego

- **Consulting Director** at The REUSE Company.
- Elena has experience in Systems Engineering in the aerospace, defense, railway and automotive industries.
- Her topics of interest include **requirements** engineering, **knowledge** management, software engineering and domain architectures.
- She is also the author of some **research papers publications** in topics such as reuse of physical system models and improvement of the quality of requirements.
- Furthermore, Elena is participating as a **researcher** in different EU projects, **leading** the work package (WP2) for Industrial Use Cases in the **REVaMP2** (ITEA3 Call 2 2016) project, and has **contributions** in **AMASS** (H2020/ECSEL) and **CRYSTAL** (ART Call 2012: 332830).

Boosting Reuse and Quality in the engineering process: revamping Product Lines

Elena Gallego. Consulting Director at TRC.

Reuse of our legacy assets

We must ensure that the assets that we maintain in our Product Lines fulfil with the Quality priorities defined by the Organization.

- *It is precisely the idea of knowledge reuse what will help to overcome the challenges that organizations face to build better systems or deliver better services, in less time, with less money and more efficiency.*

9

The European automotive sector differed greatly in the level of variety they offered to customers, although variety had little relation to unitary sales.

	Bodies	Power trains	Total number of variations	European units sales in 2002
Mercedes E-Class	**30**	**15**	**3,347,807,348,000,000,000,000,000**	**157,584**
BMW 3-Series	**10**	**20**	**64,081,043,660,000,000**	**350,723**
Peugeot 206	**5**	**24**	**1,739**	**596,531**

Source: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.469.2061&rep=rep1&type=pdf

10

The challenges in Product Lines Engineering

- Customer-Oriented products development
- Sophisticated components interactions
- Old Product Lines vs. New Product Lines

Technology limits how we do Product Lines Engineering - PLE, as manufacturing complexity limits how we manage our Product Lines.

11

Knowledge Reuse Purpose

- A few goals of the Knowledge Based PLE are:
  - To ensure that the Product or Services development main documents are Complete, Consistent and Correct
  - To support the quality analysis of requirements, models, and even unstructured information
  - To reuse the Organizational or Domain information among several projects
  - To share knowledge between the different stakeholders in the process
  - To infer behavioral patterns from legacy assets

PLE: Product Line Engineering

12

Knowledge Based System: Infers and Uses a Knowledge Base to solve complex problems

Product Oriented

Services Oriented

13

Knowledge Organization

Product Oriented

- Product Breakdown Structures
- Architectures
- Thesaurus
- Patterns
- Controlled Vocabulary

Services Oriented

- Unstructured documentation
- Unknown inputs of information
- Thesaurus
- Controlled Vocabulary

14

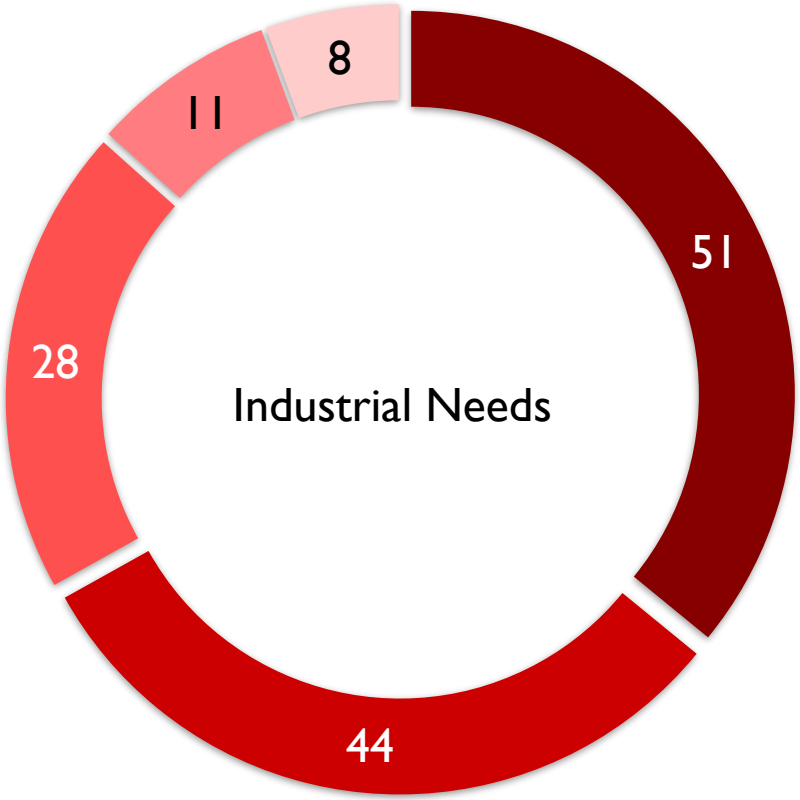
ITEA 3

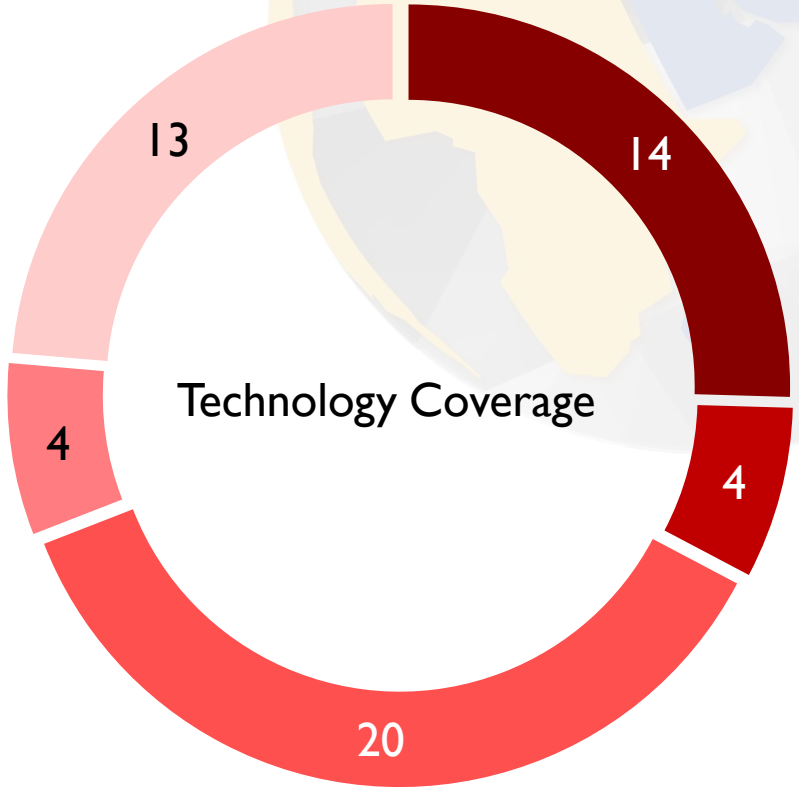
Project Profile

REVaMP²

A Software-Intensive Systems and Services (SIS) platform for round-trip engineering

The need from Industry





Extraction Modelling Integration Co-Evolution Verification

Number of requirements covering the different characteristics

16

The REUSE Company (TRC)

The Product Line Knowledge Base is formed by all types of Knowledge

Business or Mission Analysis

Stakeholder needs and requirements

System requirements

Architecture

Design

System Analysis

Implementation

Validation

Transition

Verification

Integration

Operation

Maintenance

Disposal

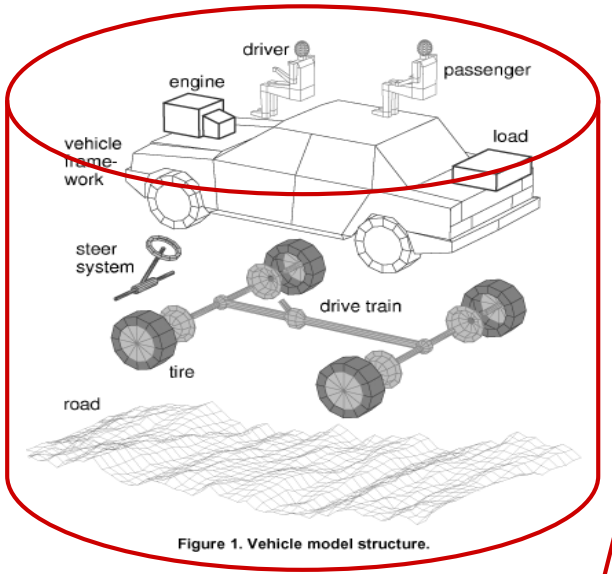


Figure 1. Vehicle model structure.

Knowledge Base

18

Product Line Knowledge Base Objectives

- Extraction of requirements from the product-line assets
  - Automatic allocation of assets from the solution space to requirements document
- Identification of the variant features in the requirements
  - Patterns and Thesaurus to cover commonality and variability
- Coverage of the specific system features
  - Knowledge interfaces with Product Lifecycle Management software tools

19

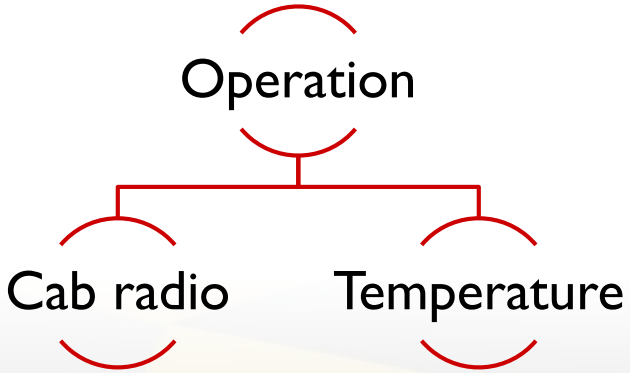
- *The goal of this process is to automatically generate the right set of patterns to formalize the features of the products and the different semantics and values from the natural language into SRL and later use the formalization of the different products to generate the variability model based on the captured features.*

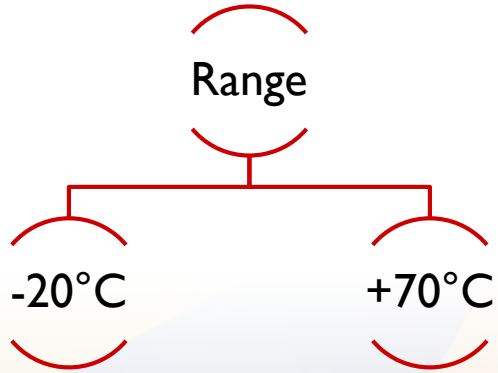
20

A simple example of a pattern matching, and relationships generation

When switched on, the Cab radio shall operate within a temperature range of -20°C to +70°C

When [TRIGGER] and [PRECONDITION], the [ACTOR] shall [ACTION] [OBJECT]





21

KM -Knowledge Management

Capture, creation, **representation**, and **exchange of knowledge** across targeted groups of **stakeholders**

Traceability

Support the **integration** among assets through semantic **interoperability** to ensure the **traces** between similar elements

RAT - Requirements

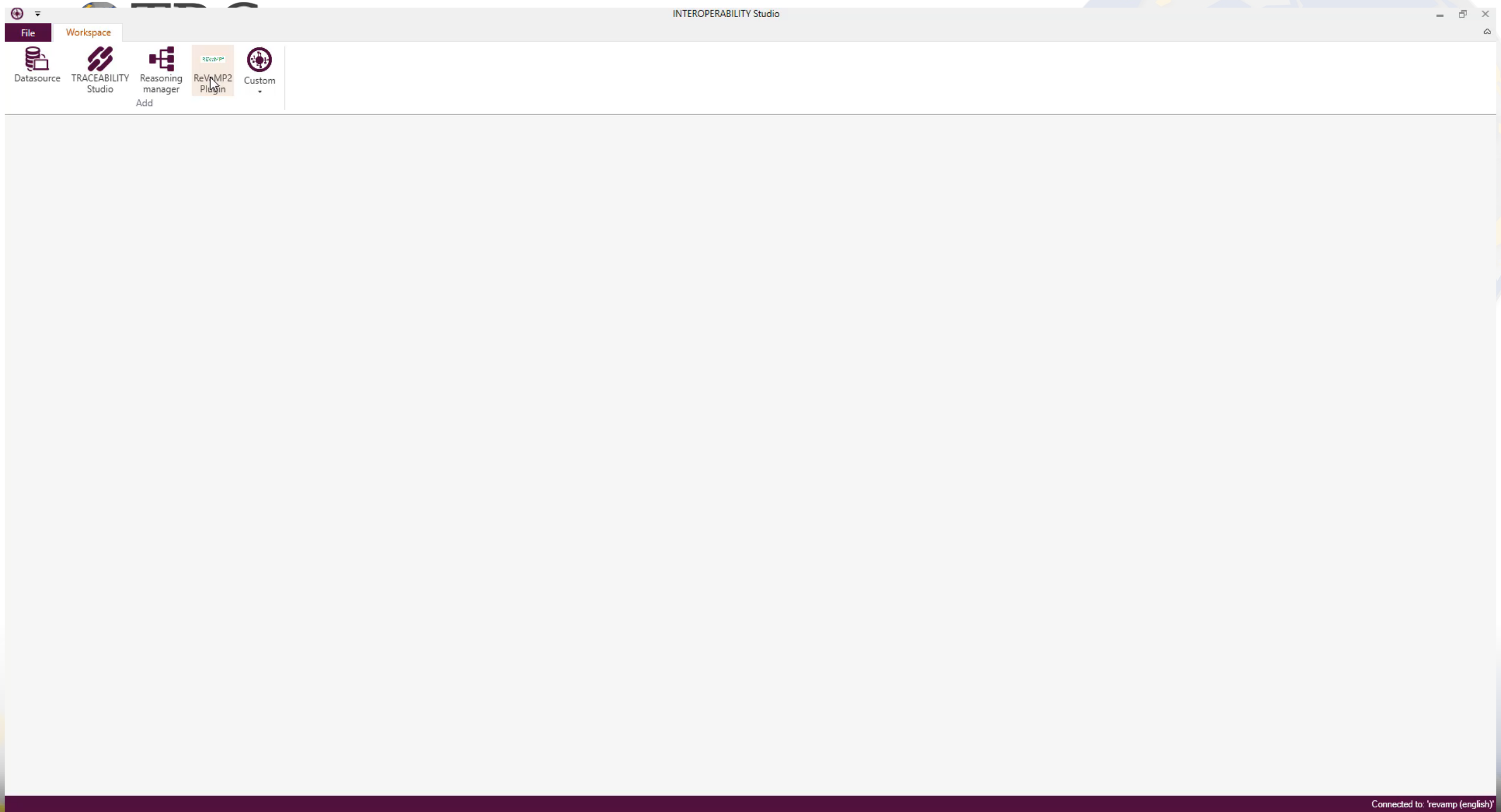
Enhance Requirements **writing** engineering skills and ensure **CCC** based on the organizational **know-how**

RQA - Quality Management

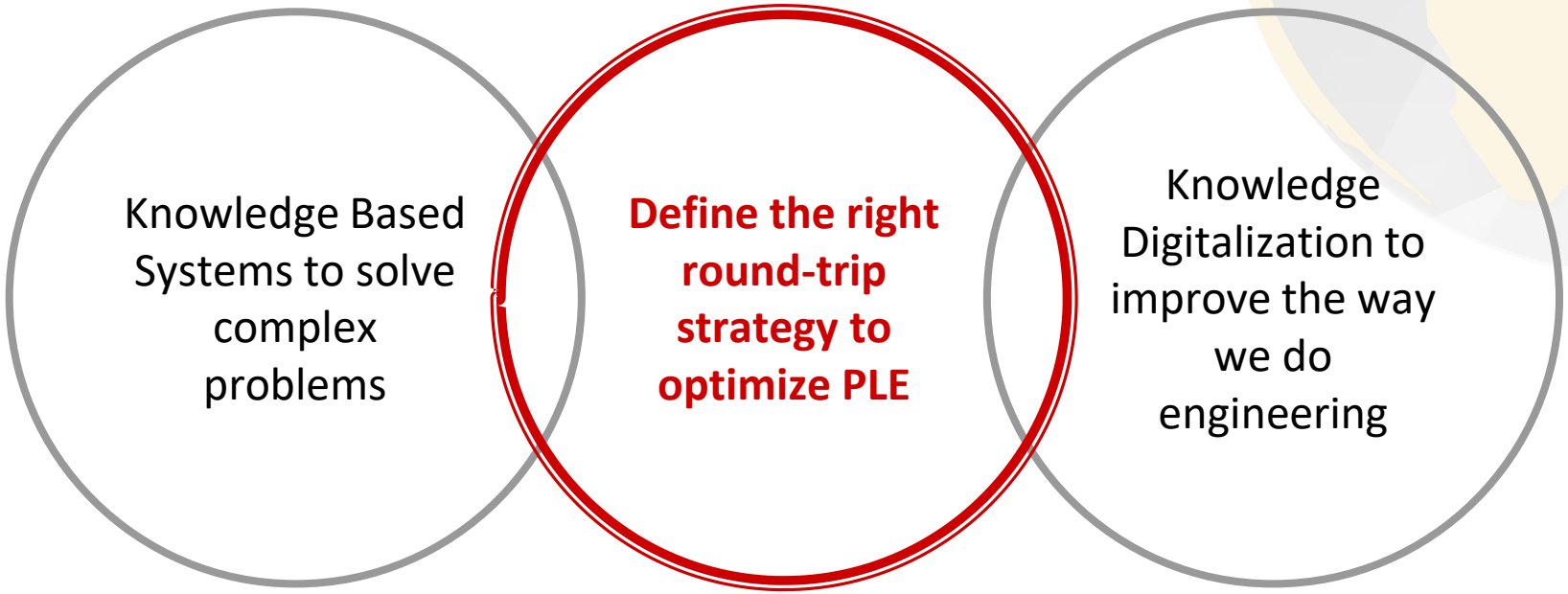
Define, implement and perform **measures** to meet the **quality priorities** that satisfy the **verification** of any engineering element

CCC: Correctness, Completeness and Consistency

22


INTEROPERABILITY Studio
File
Workspace
Datasource
TRACEABILITY Studio
Reasoning manager
ReVAMP2 Plugin
Custom
Add
Connected to: 'revamp (english)'

And all this to conclude…



24

Thank you!

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Q&A

Next webinar

- **Topic:**
  - **A Practical Way to Implement ISO 15288 V&V Processes: The V&V Studio**
  - The Verification and Validation processes of the ISO15288 describe in a general way how to perform V&V for a complex system. However, the standard also suggests the need to apply V&V not only to the right side of the V-Model but also to the requirements, architecture and design processes outcomes, along the left side of the V-Model.
  - **Dates:**
  - Beginning of 2020


Q&A

contact@reusecompany.com