Requirements Quality with Logical & Physical models and Ontologies

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
- 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
Presenters’ profile

- Borja López
  - Rich Authoring Tool Architect

Borja López
borja.lopez@reusecompany.com
TRC WEBINARS 2018

- Description of The Reuse Company
- Requirements Management and Modelling
- An ecosystem full of tools
- Knowledge Interfaces
- Quality Assessment based on External Knowledge
- Demo
- Q&A
WEBINARS 2018

- Description of The Reuse Company
- Requirements Management and Modelling
- An ecosystem full of tools
- Knowledge Interfaces
- Quality Assessment based on External Knowledge
- Demo
- Q&A
Brief description of The Reuse Company

Trace + Retrieval + Quality (Reuse)
Aiming to Improve Project performance

By means of a: Knowledge Centric Approach
SQA – System Quality Analyzer
Global Quality Management

RAT – Rich Authoring Tool
Smart text authoring

SKM – System Knowledge Manager
Management of System Knowledge Libraries

SIM – System Interoperability Manager
Tailorable Interoperability Platform
- R+ Manager
  Managing requirements transformations
  Managing models transformations
- T+ Manager
  Managing traceability
- Reasoning Manager
  Task based environment

Systems Knowledge Base (SKB)  Systems Assets Store (SAS)
Aerospace and Defense

Automotive

Energy

Consulting

Banking

Other industries

Health care
Description of The Reuse Company

Requirements Management and Modelling

An ecosystem full of tools

Knowledge Interfaces

Quality Assessment based on External Knowledge

Demo

Q&A
Requirements Management

- **The development process** is affected by a fast-changing environment:
  - Technology issues
  - Changing needs
  - Unidentified risks

- **Requirements Engineering** becomes central for organizations
  - Reducing the development cycle (time to deploy the technology)
    - Time to Market …
    - **Time to Market with the right Product**

- **Requirements** become the base
Requirements Management

- Importance of writing **High Quality Requirements**

---

**Cumulative LCC**

- **Concept**: 8%
- **Design**: 15%
- **Development**: 20%
- **Production and test**: 50%
- **Operation and disposal**: 100%

- **Committed cost**: 70%
- **Cost to extract defects**: 3-6x
- **500-1000x**
- **95%**

Source: INCOSE Handbook
Requirements and Modelling

Relationship between **Requirements Management** and **System Modelling**

- Modelling supports the design activity
- Modelling helps decompose the requirements into the next level down
- Models never say everything about a system
  - Requirements can cover not modelled aspects

*Source:* Requirements Engineering, Third Edition
Requirements and Modelling

- Models assist the requirements engineers in analyzing the requirements
  - Improve understanding of the system
  - Presence of desired emergent properties (and absence of undesirable ones)
  - Help determine how to satisfy requirements among different layers

Source: Requirements Engineering, Third Edition
Requirements and Modelling

- Important to analyze the quality of the requirements
- Requirements are not isolated artifacts:
  - Are they Correct?
  - Are they **Consistent** with the models?
  - Are they **Complete** regarding the information stored in the models?
WEBINARS 2018

Description of The Reuse Company
Requirements Management and Modelling
An ecosystem full of tools
Knowledge Interfaces
Quality Assessment based on External Knowledge
Demo
Q&A
Different tools for different purposes:
- Requirements Management
- Modelling
- Traceability
- Simulation
- Quality Management
- …

**KCSE Suite → Interoperability**
- Key: Not to model everything in KM, but dynamically load the knowledge on real time
- This way, SQA will perform quality assessment with all this knowledge
Quality Assessment based on a Knowledge Base

- Knowledge is the Core
  - Systems Knowledge Base (SKB) → Ontology
    - Terminology layer (Vocabulary)
    - Thesaurus layer (System Conceptual Model)
    - Patterns layer (Boilerplates)
    - Reasoning layer (Decision Making)

- Knowledge Manager allows the user to model the domain (knowledge) into an ontology
Quality Assessment based on a Knowledge Base

Dynamic Knowledge Base
Requirements and Modelling

Use Case: Completeness checking of a Rhapsody model

Are the transitions of the State Charts well defined in the requirements specification?
Requirements and Modelling

Use Case: “Communication System” defined in Protégé

Is the Communication System specified in the requirements?
Requirements and Modelling

- Use Case: Components defined in Simulink

Are the requirements specifying properly the Simulink components?
WEBINARS 2018

- Description of The Reuse Company
- Requirements Management and Modelling
- An ecosystem full of tools
- Knowledge Interfaces
- Quality Assessment based on External Knowledge
- Demo
- Q&A
Modelling Knowledge into KM

- KM allows the user to model the information into the SKB (e.g. Rolling Stock Components of a Rhapsody model)

- A Product Breakdown Structure (PBS) can be modelled to represent the decomposition of the Rolling Stock Components
  - Different structures (relationship types) for the different elements of the model

- Cons:
  - Manual or Semi Automatic work is needed
  - Duplicated knowledge (Rhapsody & KM)
Knowledge Interfaces for SKB Extensibility

- What if … the SKB (System Knowledge Base) was dynamically fulfilled?
  - No human effort in exporting / importing glossaries, taxonomies, etc.
  - No need to maintain / update the SKB.

- KCSE v18 Feature → **Knowledge Interfaces**
  - Connectors to external sources of knowledge (OSLC-KM).

- Changes on the source artifacts (e.g. SysML Rhapsody Model) → **The SKB gets updated.**
Managing connectors in Knowledge Manager
Knowledge Interfaces for SKB Extensibility

- Filling out the SKB in a dynamic way
TRC WEBINARS 2018

- Description of The Reuse Company
- Requirements Management and Modelling
- An ecosystem full of tools
- Knowledge Interfaces
- Quality Assessment based on External Knowledge
- Demo
- Q&A
Using Knowledge Interfaces - Overview

- Knowledge Interfaces are fully integrated on SQA and RAT
  - Native support of UML/SysML (classes, blocks, actors, etc)
  - Available for quality assessment
    - Quality Metrics can be configured with the content of Knowledge Interfaces (e.g. state charts coverage)
  - Available for pattern-based authoring
WEBINARS 2018

- Description of The Reuse Company
- Requirements Management and Modelling
- An ecosystem full of tools
- Knowledge Interfaces
- Quality Assessment based on External Knowledge
- Demo
- Q&A
Integrating a Rhapsody Model and a Simulink file to assess requirements quality
- KM to connect the Knowledge Base to the Rhapsody Model + the Simulink file
- SQA to define a set of quality metrics
- SQA to perform quality assessment
- RAT to create some missing requirements

Integrating a Protégé ontology for the Communication Subsystem assessment
- KM to connect the Knowledge Base to the Protégé Ontology
- SQA to define a set of quality metrics and perform quality assessment
THANK YOU
Next webinar

- **Topic:** Can script based languages, like DXL, hack Natural language Processing?
- **Content:**
  A recent blog post by our esteemed college Christer Fröling has sparked a tidal wave of interest and his paper “NLP beats DXL (DOORS scripting) every day of the week” has been distributed widely. But can his claim be substantiated?

Dr. Simon Wright will investigate this claim during a webinar and examine the evidence. As someone who has been involved in improving requirements quality for over 20 years and as a DXL programmer for over 10 years he is ideally placed to referee this match, DXL verses NLP.

- **Dates:**
  - Tuesday 10th APR 2018 at 5.00 pm CET
  - Thursday 12th APR 2018 at 9.00 am CET

---

### WEBINAR DATES

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRCW-01</td>
<td>Requirements Quality along the supply chain</td>
</tr>
<tr>
<td>TRCW-02</td>
<td>Managing the quality ecosystem: DOORS, Rhapsody, Simulink and Modelica</td>
</tr>
<tr>
<td>TRCW-03</td>
<td>Ontologies Configuration Management</td>
</tr>
<tr>
<td>TRCW-04</td>
<td>Can script based languages, like DXL, hack Natural Language Processing?</td>
</tr>
<tr>
<td>TRCW-05</td>
<td>Procuring systems: PQS for SMARTer acquisition</td>
</tr>
<tr>
<td>TRCW-06</td>
<td>The SMARTER way to improve your requirement specifications</td>
</tr>
<tr>
<td>TRCW-07</td>
<td>Knowledge and Quality management milestones in a SE organization</td>
</tr>
<tr>
<td>TRCW-08</td>
<td>Automatic checking of quality metrics for logical and physical models</td>
</tr>
<tr>
<td>TRCW-09</td>
<td>Following standards patterns in KCSE: An application to EARS patterns in RAT and SKM</td>
</tr>
<tr>
<td>TRCW-10</td>
<td>Tracing system work products: T+ Manager</td>
</tr>
<tr>
<td>TRCW-11</td>
<td>Defining your own quality rules in KCSE: A one-hour practical approach</td>
</tr>
<tr>
<td>TRCW-12</td>
<td>The KCSE approach in a nutshell</td>
</tr>
<tr>
<td>TRCW-13</td>
<td>Requirements Transformations</td>
</tr>
</tbody>
</table>