Integrating Requirements and Models at P&G

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Motivation

REQUIREMENTS are the reason for FAILURE

When errors are introduced vs. when they are discovered during the system life cycle

- Requirement Phase: Defect Introduced - 70%
- Design Phase: Defects Discovered - 20%
- Test Phase: 8%
- System Acceptance Phase: 9%
- Operational Phase: 1%

Source: IBM Business Research 2017

Cost to Extract Defects
- 3-6x
- 20-100x
- 500-1000x

Operation through Disposal
- 95%
- 85%
- 70%

Production and Test
- 50%

Source: INCOSE SE Handbook V4
Systems Model Context for Requirements

William Schindel (of ICTT) is the creator of this canonical model called “Systematica”
Structuring Requirements: Semantic Integration

Model

Common Semantic Workplace

Requirements

Behavior
Purpose/Context

Behavior
Constraint

The Engine shall...

The Engine shall...
Structuring Requirements: Purpose, Context & Anatomy of a Requirement

Bill Schindel (of ICTT):
“Requirements are Transfer Functions”
Structuring Requirements (Transfer Function)

When subject to <Vacuum Picker Moment A>, Hinge AB transmits Score Stiffness Moment AB in accordance with attribute table (Scoreband_K_value.xlsx).
Structuring Requirements  
(Transfer Function)

When subject to **Vacuum Picker Moment A**, **Hinge AB shall transmit** **Score Stiffness Moment AB** in accordance with **attribute table: Scorebend_K_Value_Table**.

|“When subject to” <Trigger> | Trigger Condition| **,”the/The” <functional role(s)> “shall”**<action> <flow>“in accordance with” <constraint that references attributes>.

**Machine readable and understandable requirement statement**
When subject to **Vacuum Picker Moment A**, the **Hinge AB** shall transmit **Score Stiffness Moment AB** in accordance with the attribute table: **Scorebend_K_Value_Table**.
A practical Implementation: Smart Authoring
Rhapsody/RAT/DOORS Integration Demo

Demo Video Placeholder
Verification of Requirements

Systems Engineering

- **Feature**
  - Logical System 1
    - Attribute
    - Attribute
  - Logical System 2
    - Attribute
    - Attribute

- **Interaction**
  - Requirement 2.1
    - Physical Thing A
      - Attribute
      - Attribute
    - Physical Thing B
      - Attribute
      - Attribute

- **Requirements Monitor**
  - Logical System 1
    - Attribute
    - Attribute
  - Logical System 2
    - Attribute
    - Attribute

- **Semantic Alignment**
- **Test Orchestration**

- **Simulation**
  - Logical System 1
  - Logical System 2
  - Physical Thing A
    - Attribute
  - Physical Thing B
    - Attribute

- **Requirements Editor**

- **Canonical Requirements Statement**
  "When subject to a" <flow> [condition], "the/The" <system> "shall" <key word> "a" <flow or attribute> "in accordance with the" <constraint> "constraint".