REQUIREMENTS QUALITY MANAGEMENT
WITHIN THE AIRBUS GROUP
WHY AIRBUS PROMOTES RE?

Correlation between Project Performances and Requirement Engineering Capability

Cost and schedule overruns lessen with increasing SE effort.
Variance also lessens with increasing SE effort.

Figure 2-7 Cost and schedule overruns correlated with systems engineering effort
http://www.incose.org/SECOE/DIC3/DIC3results.htm
The Problem

- **70% of defects** are introduced during requirements phases
  - It is important to write effective Requirements

- Experiences show that about **25% of system Requirements are critical and can be improved (re-written)**
  - No Shall: 8 to 10%
  - Forbidden words: 10 to 15%
  - Subject, multiple objects, design: 15%
  - Incorrect grammar: 50%, ...

- Requirements **error costs are high**
  - Fixing requirements after delivery may cost up to **100 times** the one for fixing a requirement error

- Training, best practices and **verifying requirements by reviews** can help to get complete and consistent requirements:
  - But the process is **costly and time consuming**
The Goal was

- Increase and improve the requirements quality control process to produce better (Correct – Consistent – Complete) requirements Specifications.

- Reduce the number of iterations of the internal review processes

- Reduce the number of iterations between System Engineers and sub-contractors and improve the verification activities

- Promote requirements quality management during authoring (before control activities)
  - Produce CCC requirements “right the first time”
A FIRST ANSWER: AUTOMATE REQUIREMENTS QUALITY CONTROL

METRICS: CCC Support

Correctness (individual metrics)

Consistency (semantic)
Consistency (inconsistent units)

Completeness (missing reqs.)
Completeness (missing links)

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IMPLEMENTATION USING:
A REQUIREMENTS QUALITY ANALYSIS TOOL

- **Quality Analysis Tool Selected**
  - Completely linked with DOORS Tool
  - Focusing on Syntactic analysis and Semantic analysis

- **Tool evaluation**
  - Airbus Group Innovations
  - Airbus Defense and Space
    - Close cooperation with Tool vendor in order to improve the tool

- **Tool deployment**
  - Limited in Airbus Defense and Space
    - R&T project focusing on how to improve the requirements quality analysis process
  - Operationally deployed in Airbus (Commercial Aircraft)
    - A320neo Cabin Flex
AIRBUS DEPLOYMENT SCENARIO:
Provide End Users (requirements authors) with the capability to improve their requirements quality.

Context:
- A320neo: around 250 users (100 Requirements Modules)

Constraints:
- No additional trainings for end users

Request:
- All information available in IBM DOORS environment.

Our retained solution:
- Tool used in batch mode, on weekly basis for instance.
- Results of analysis available in DOORS modules thanks to specific views and a detailed report available outside DOORS.

Our next expectation:
- **Real time analysis** of the Requirements quality in DOORS environment.
- **Real time support** to elicit a requirement
PROS & CONS of Requirements Quality Analysis

Tool Set
- Good tool (Airbus feedback) but quite complex to use and parameterize

Process Approach
- Improve Tools integration with existing ones
- Simplify complex loop (writing → checking : traceability & quality → updating)

Needs for future
- Switch from a posteriori quality analysis to instant checking
- Implement on-the-fly process allowing requirements capture & checking, to be performed simultaneously
- Assume tools evolution, tools integration
- Imply teams adherence and specially the quality teams → Not so easy!
- Define standard requirements patterns per domain to be used as statement based templates by the writer to compose his/her system requirements (boilerplates)
CURRENT SITUATION: From Requirements Management to Requirements Authoring

Requirements Writing:
Working with requirements inside DOORS

Requirements Quality Control:
Huge review effort for quality verification

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CURRENT SITUATION: From Requirements Management to Requirements Authoring

Requirements Writing:
Working with requirements inside DOORS

Requirements Quality Assurance:
Authoring “right the first time” on top of DOORS

Requirements Quality Control:
Huge review effort for quality verification

Requirements Quality Control:
Smaller review effort for quality verification

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CONCLUSION - KEY MESSAGES

- Requirements Quality: A key element in product development
  - The need for Quality Analysis of Requirements in Product Development is no more questionable, feedbacks on relevancy and efficiency are clear.

- Requirements Quality: An activity at operational level today
  - Within Airbus (A320neo regularly)
  - Within Airbus Defense and Space (Avionique X)

- Moving from “a posteriori check” of Requirements to “on the fly check” (real time) of Requirements
  - Engineers will be guided in real time for Requirements Authoring to write well structured, consistent and pertinent Requirements

- A new role called “Knowledge Manager” to build and maintain Ontologies is emerging
  - Setting up and maintaining Ontologies need to define a new dedicated role in the Engineering Competencies

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