Improving the Exchange of Requirements and Specifications between Business Partners

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An international client base from different industries:
Accenture, Alcatel-Lucent, Audi, BMW, Bosch, Conti, Daimler, Denso, Diehl, Ford, Hyundai, IBM, JCI, MAN, Porsche, Siemens, Telefonica o2, Thales, Valeo, Zeiss, ZF

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Agenda

- Motivation: Collaboration in RE
- Exchanging Requirements
  - Principles
  - RIF
  - Industry Examples
- Summary
Why collaboration?

Traditional

- Isolated processes
- Manual data exchange
- Rework, inconsistency, no reuse, inefficiency

Organically grown tools

<table>
<thead>
<tr>
<th>Project mgmt</th>
<th>Design</th>
<th>Configurations</th>
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<tbody>
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<td>Req. Spec.</td>
<td>Impl.</td>
<td>CAD, Code, modelling</td>
</tr>
<tr>
<td>Unit test</td>
<td>Integration</td>
<td>ERP, Wikis, File systems</td>
</tr>
</tbody>
</table>

PLM

- Combination of processes with support tools and clear responsibilities
- Efficiency, consistency, quality, cost reduction

Persons

- Strategy
- Leadership
- Technology understanding
- Customer relationship management

Processes

- Project management
- Supplier management
- Requirements management
- Change control, configuration management

Tools

Challenges in the development process

Cost pressure and increasing integration of business processes across the boundaries of enterprises will dramatically change requirements engineering

- Closely connected process and tool chains
- Increased networking of product functions
- Efficient internal change and negotiation processes
- Efficient collaboration with development partners
- Systematic reuse
- Complexity management (functions, variants, plattforms, product lines)
- Transparency of development progress and product maturity
**Case study: RE collaboration (1)**

- **Goals**
  - New RE Tool, to create and access specifications in a distributed development setting
  - Standardized tool solution
  - 10% cost reduction

- **Approach**
  - Setup of project team with internal users under supervision of IT
  - Consideration of external stakeholders
  - Tool selection and acquisition
  - Initial business case, but no specific measurement of effort and errors
  - Configuration of workflows based on available tool functionality
    - Top-down-Initiative
    - Standardization
    - Goal is to generic
    - Stakeholder involvement
    - Tool-oriented without process focus
    - Artificial processes, based on tool capabilities

**Case study: RE collaboration (2)**

- **Implementation**
  - Estimation of benefits: Effort for specification creation with and without tool support
  - Data migration
  - Training for users
  - Use of support tool is mandatory

- **Result**
  - Savings are not achieved
  - Developers work in two parallel worlds: the familiar file system and the new tool
  - Overhead instead of improvement

**Can it be done better?**

- Mandatory guidelines
- Estimation of potentials
- Training is not sufficient for change
- Cost saving goals were not achieved
- Discontent
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Vision: Effective process coupling and collaboration

Concept
- Improve process then focus on the tool
- Negotiate goals with internal and external stakeholders

Implementation
- Requirements exchange and collaboration scenarios under realistic conditions
- Process and tool adaptation according to specified needs
- Organizational change management: validation, piloting phase, coaching, training, power-users, measurements
Challenge: Many different interfaces for RE collaboration

Strategy | Concept | Market Entry | Development | Evolution
---|---|---|---|---

- Project management, Risk management
- Supplier management
- Architecture, Design, Implementation
- Validation, Integration
- Change Management, Configuration Management
- Quality Management, Quantitative Management

Approach: Collaborative Requirements Engineering

Distributed RE

Requirements Development (Contractor) | Analysis (Supplier)
---|---

Systems and software engineering | Change / configuration management
Methodology: Requirements Interchange Format (RIF)

- De facto standard to exchange requirements documents (already requirements lingua franca in automotive requirements exchange, standardization ongoing via ProSTEP)
- Open, tool independent XML schema
- Alternative to MS-Word, CSV, PDF and vendor-specific dialects (e.g., DOORS) with mutually agreed syntax to exchange requirements
- Currently deployed in Automotive, Rail, and Medical Industries.

Language: The RIF format

Example requirement specified in a COTS RE tool

The same requirement “translated” to RIF
- Requirements are detailed as SpecObjects in XML
- XHTML for formatting
- GUID for unique reference
- Requirements (or elements) can be (hierarchically) grouped in SPECGroups
- Files for exchange
Interworking: Different tools speak one language

Collaboration: Requirements exchange in the supply chain
History: Requirements exchange with change history

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Results: Improved Performance of the Supplier

Approach
- Six Sigma process analysis
- Systematic requirements engineering process for the supplier
- Formalized commitment on agreed requirements
- Change management
- Single source for all requirements

Results
- Change rate has been reduced from 70% to ca. 15%
- Win-win partnership
- Performance improvement by 1/3
- Efficiency improvement for supplier and contractor

Collaborative requirements engineering improves performance and reduces change rate.

Source: Alcatel-Lucent, Vector, 2008

Summary (1/4): Strong push towards innovative RE

Cost pressure and increasing integration of business processes require **RE collaboration along the supply chain**

- Integrated linking of artifacts across the supply chain (e.g. requirements, specifications)
- Efficient collaboration beyond enterprise boundaries (e.g. OEM and Supplier)
- Consistent data management across versions and variants and suppliers (e.g. requirements, specifications, calibration data, references to acceptance test)

Coming together is a beginning. Staying together is progress. 
Working together is success.

— Henry Ford
Summary (2/4): Requirements Interchange Format (RIF)

Requirements Interchange Format (RIF) has been established and is increasingly used in different industries

- Version 1.2 active and released
- Three levels of exchange anticipated (Level 1: ASCII text, Level 2: embedded Files, Level 3: Multimedia and semantics) and currently in review
- Supported by tools vendors (e.g., IBM, Vector)
- Independent translation tools available (e.g., Extessy Excerpt)
- Standardization ongoing via ProSTEP
- More Details: http://prostep.org/rif

Summary (3/4): Change management is biggest challenge

Coupling heterogeneous process and tools is an enormous challenge which demands organizational change management

- Define the business process of supply chain management
- Embed a suitable RE process architecture either bottom up (i.e., supplier to clients) or top-down (i.e., customer to suppliers)
- Adopt transparent interfaces, systematic exchange rules, and one requirements exchange format (syntax + semantics!)
- Adjust tools and templates (e.g., mapping of database fields and content across tools)
- Pilot the bi-directional exchange (hint: use a tool like Extessy Excerpt as a reference to check clean, bidirectional exchange)
- Learn and further improve towards more efficient collaboration
Summary (4/4): Tangible benefits from better collaboration

**Improved supplier management**
- Single source concept of requirements across organizational boundaries
- Exchange of traceability and change information between different parties reduces defects and misunderstandings

**Improved efficiency**
- Speed in exchanging information and collaborating on solutions
- Less manual exchange where small adoptions must be continuously maintained for consistency

**Reduced product life-cycle cost**
- Consistency across different requirements artifacts
- Less rework from insufficient change handling
- Reduced dependency on proprietary tools, thus ensuring a future-safe investment into your requirements base

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Thank You for Your Attention.

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