Requirement Management as a Key Area in e-PLM

PLM Solution RoadShow 2009
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III. 요구사항 관리 솔루션 (DOORS) 소개

IV. DOORS - PLM 솔루션 Integration

V. DOORS 적용 기대 효과
- Product Complexity is Increasing
- Shorter Product Lifecycles

- Product Development is Fragmented
- Complex Development Organizations
Product Development Improvement Goals

Accelerate Product Time to Market

Improve Product Quality

Reduce Product Development Costs

Design Chain Collaboration

Regulatory Compliance

New Product Innovation
Complex systems require more types of people working together

Market Planning
- Product Management
  - DOORS

Concept
- Systems Engineering
  - DOORS/TAU
- Software Engineering
  - Synergy/TAU

Design
- Electrical Engineering
  - Cadence
- I.C. Engineering
  - Mentor
- Mechanical Engineering
  - Catia/UG

Traditional ALM Domain
- Change Requests
Traditional PLM/PDM Domain
- Impact Analysis
- Requirements Visibility

Future PLM Domain

Complex systems require a ‘holistic’ view of data
Key Problem: Vertical Silos

- **Inconsistent rules and processes**, that are not being followed by all stakeholders

- **Isolated information** reduces the productivity of the entire team -> Problems occur at integration stages late in lifecycle

- **Limited traceability** of artifacts and business objects

- **Minimal reuse** of artifacts and minimal process control

- Reliance on **document-centric communication**

- **Lack of visibility** into total development status

![Diagram](image-url)
Most PLM Environments today do not have the required level of process, data and application integration.
IBM Software Group – Product Lifecycle Management

Extended PLM Solutions to Meet Customer’s Objectives

1. Design Chain Management
   - Customer Processes: NPI, ECM, CM…

2. Requirements Engineering
   - Offerings/Tech: Rational Requirements Engineering

3. Software Development
   - Customer Processes: Software & Embedded Software Dev…
   - Offerings/Tech: Rational Software and Systems Delivery Platform

4. Electrical & Electronics Development
   - Customer Processes: Logic Design, Layout, Routings…
   - Offerings/Tech: Systems Verification

5. Mechanical Development
   - Customer Processes: Prod Auth, PDM, Prod Sim, Dig Mfg, CPD…
   - Offerings/Tech: CATIA, ENOVIA, DELMIA, Simulation & Analysis

6. Portfolio & Program Management
   - Customer Processes: Product Mgt, Portfolio Mgt, Part Commonality & Reuse, Part Repair/Replacement, Aftermarket Part Sales
   - Offerings/Tech: Decision Support & Collab (Portal), Asset & Resource Mgt (Maximo), Commonality & Parts Reuse (WPC)

7. Systems Engineering
   - Offerings/Tech: Rational Model Driven System Dev & Engineering,
**PLM Goes Integration:**

IBM Product Development Integration Framework (PDIF) to enable a SOA based PLM process integration

**People Collaboration - Role-based PLM Workplace (Portals)**

**Business Process Modeling - E.g., Portfolio Planning, Engineering Change, Part Reuse**

**Information Federation - Management of PLM Enterprise Information Relationships**

**Product Development Integration Framework**

IBM SOA Foundation

**Application Specific Local Data Mgmt**

**Authoring Applications**

- MCAD 1
- MCAD n
- ECAD 1
- EDA n
- SW 1
- SW n
- CAPP 1
- CAPP n
- CAE 1
- CAE n
- Maint n

**System View**

**Servers**

**Software**

**Storage**

**Enterprise PDM**

**ERP**

**Parts Mgmt**

**SCM**

**CRM**

**PPM**

**Req. Mgmt**
Four key areas are part of IBM Extended PLM (ePLM) and the PDIF framework:

1. Enterprise Integration - Management of PLM and Enterprise Information
2. Enterprise Process Management - Cross-application processes
3. Enterprise Collaboration - Portals and dashboards to Applications
4. Product Development Integration Framework (PDIF)

- Requirements Management
- Program and Portfolio Management
- Mechanical Authoring
- Electrical Authoring
- Software Authoring
- Analysis & Simulation
- Software & Systems Development Platform

IBM SOA Foundation

Other Enterprise Applications

ERP

EAM

Enterprise PDM

Integrated Product Change Management

Integrated Product Development / Engineering

Model Driven System Development / Engineering

Requirements Engineering
The Rational Core Solution Set for Extended PLM

Integrated Product Change Management
Automation of change management across the product development domains by integrating the Software and Systems Delivery Platform (including Rational ClearCase and ClearQuest) with key PLM vendors such as PTC, Siemens PLM, Oracle Agile, Dassault Enovia.

Software and Systems Development Platform
An end-to-end, open, extensible, standards based platform for software lifecycle management including products and services for modeling, testing, building and delivering software, with an emphasis on meeting the unique requirements of A&D and Auto customers such as DoDAF/MoDAF, DO-178B, AUTOSAR, MISRA, etc.

Model Driven Systems Development / Engineering
Products and services that leverage Rational capabilities for modeling and best practices for systems engineering and model driven development across multiple design domains (software, hardware, and electronics).

Requirements Engineering
Products and services to extend requirements engineering beyond the software development domain (e.g. the systems engineering and EDA domains).
Requirements Are Everywhere
What is requirements management?

“The purpose of requirements management is to establish a common understanding between the customer and the … project … This agreement with the customer is the basis for planning and managing the … project.”

The Capability Maturity Model for Software® (CMMi) from the Software Engineering Institute at Carnegie Mellon University.
- www.sei.cmu.edu/cmm

“Analysts report that as many as 71 percent of software projects that fail do so because of poor requirements management, making it the single biggest reason for project failure—bigger than bad technology, missed deadlines or change management fiascoes.”

- CIO Magazine, November 2005
What drives Requirements Management opportunities?

- Need to align IT or systems development with business goals / customer needs
- Deliver systems and software faster but with higher quality
- Control costs & improve global operational efficiencies
- Ensure regulatory compliance

- In-house development
- Outsourced development
- Packaged applications
- Systems

*Systems and software delivered must support business objectives and meet customer needs*
RM is a lifecycle activity

- Portfolio Planning
- Concept Development
- Product Design
- Production & Testing
- Sales & Service
- Retirement & Disposal

- Requirements Management & Traceability Tools
- Documentation Tools
- Project Management Tools
- Configuration/Change Management Tools
- Metrics Tools
Telelogic DOORS

- **DOORS:** Dynamic Object Oriented Requirements System
- **DOORS:** 요구사항 관리 도구

Gathering/Expressing/Organizing/Tracing/Reviewing
Agreeing/Changing/Validating

- like Word
- like Excel
Import All Your Data & Create Documents

- Direct Entry
- MS-Word
- RTF
- OLE
- ASCII
- Spreadsheet
- MS-Project
- Tool Integrations*
- FrameMaker

Print

Microsoft
- Word
- PowerPoint
- Excel
- Outlook
- HTML
- RTF
- ASCII
- Spreadsheet
- MS-Project
- Tool Integrations*
- FrameMaker

ASCII
Spreadsheet
MS-Project
Tool Integrations*
Microsoft Word import

- Start in Word
- Simply import into a DOORS document
Use your corporate template to export a document
DOORS Database & Document View

Organize your projects

Everything you need in one window!

Unlimited hierarchy of Projects/Folders supports scalability

Improves productivity, reduces errors, increases quality
The usual way of traceability without DOORS?

1. Capture design and related information
   - Input electronically formatted data
   - Reference external information sources

2. Identify and tag design information as unique “design elements”
   - Organize by Design Control Guidance Element
   - Organize by inter-relationships

3. The plans shall be reviewed as design and development evolves.
   - Identify the source of the user need
   - Profile the expected patients

4. Design Input Requirements
   - The procedure shall include a mechanism for addressing incomplete requirements.
   - The procedure shall include a mechanism for addressing conflicting requirements.
   - The approval, including the date and signature of the individual(s) approving the requirements, shall be documented.

5. Traceability Reports
   - Identify the source of the requirement
   - Identify the associated user need
   - Capture acceptance criteria

6. Impact Reports
   - Procedure Attribute
   - Milestone Attribute

7. Change Decision Objects (Mark all that apply and make complete change history available)
   - Decision Attribute
   - Change Design Object Traceability Link on Milestone Attribute
   - Change Design Object Impacts Link to linked design elements

8. Cross Reference
   - Work Space

User Reqs
Technical Reqs
Design HW/SW
Test Cases
Traceability; drag-and-drop linking

Drag-and-drop to link within a document . . .

. . . or from document to document
IBM Software Group – Product Lifecycle Management

Traceability view

User Reqts

Technical Reqts

Design

Test Cases

End-to-end visual validation in a single view!
Traceability verification or “completeness”

Increases customer confidence

Orphan reports & traceability reports show “missing” links

Creation and deletion of links is recorded in history
Traceability taking you outside of DOORS

- Everybody should understand the importance of requirements and be able to demonstrate that they meet requirements.
- By extending traceability to go beyond the boundaries of DOORS, more people are encouraged to work against requirements.
- Create links from DOORS to elements stored within applications outside of DOORS.

![Edit External Link - DOORS](image)

Right click the link indicator

Tool Tip on link indicator
URLs bringing you back in to DOORS

- Insert links into other applications that connect back to requirements stored in DOORS
- Security controls still apply
- Authentication still required
- URLs can also take you to a DOORS database, Project, Folder, Module or Object
DOORS Discussions

1 Overview

1. Join Frankie and his friends as they serve the community, solve problems and have fun! Miguel makes a few mistakes and decides he doesn't want to be a postman anymore.

Spelling corrections (Closed)
1) Richard Watson on 26/03/2008 12:12:09
US spelling should be used throughout.
Version: New folder/User Requirements (while current)
Date timestamp: 28/02/2008 12:10:33
Status: Open

2) John Smith on 26/03/2008 12:15:41
OK - amended spelling.
Version: New folder/User Requirements (while current)
Date timestamp: 28/02/2008 12:10:33
Status: Open

3) Richard Watson on 28/03/2008 12:18:38
That's fine now, thanks.
Version: New folder/User Requirements (while current)
Date timestamp: 28/02/2008 12:10:33
Status: Closed (Changed)

Justification required (Open)
1) Richard Watson on 28/02/2008 12:14:00
I'm not sure that this is a valid U - it looks more like a solution to me. Can you re-frame it in the form of a specific use case?
Version: New folder/User Requirements (while current)
Date timestamp: 28/02/2008 12:10:33
Status: Open

2) John Smith on 28/02/2008 12:16:36
Not sure how I can make this more specific?
Version: New folder/User Requirements (while current)
Date timestamp: 28/02/2008 12:10:33
Status: Open

3) Richard Watson on 28/02/2008 12:25:33
Neither am I. Nevertheless, here's an example: Everyone is enjoying a ride
Differentiating Change Management

- **Lifecycle Change Management**
  - Telelogic Change for multiple, configurable processes
  - Flexible process, user definable states
  - Integrated into full lifecycle change process
  - Multiple approvers

- **DOORS Change Proposal System - CPS**
  - Providing a built in change process for requirements
  - Predefined process
  - Grouped changes ensure requirements consistency
How Can I Find Changes Easily?

... a change by this user here...

... shows up as a warning flag to this user here.

If documents are linked...

[Image of a computer screen showing a document with highlighted changes.]

'User Requirements' current 2.1 (2008) in /Sports utility vehicle 4x2/Requirements (Formal module)

4.1.5 Safety

- Users shall be able to travel at the same level of safety as provided by the best 10% of cars being developed to be built in 2010.

4.1.6 Noise levels

4.1.6.1 Interior
- Users shall be able to hear only a very low level of noise inside the car.

4.1.6.2 Exterior
- Users shall be able to generate only a very low level...
History and Baselines

Current Version

Previous Baseline

Change History
Printing with standard layouts
What is DOORS/TraceLine?

- DOORS/TraceLine is a DOORS extension for managing and visualizing information and its traceability in DOORS
  - Browser based environment
  - Requirements visualisation
  - View, navigate and edit content
  - Arrange information in task or viewpoint-specific views
  - Create graphical and textual content or traceability reports
  - Plug-in your own DXL functions
  - For non-technical users, increase productivity, and reduces training

All specifications subject to change without notice
What Does DOORS Web Access Look Like?

[Image of DOORS Web Access interface with annotations]

- **Navigation Area**: Contains links to various sections and documents.
- **Document Area**: Displays stakeholder requirements and system requirements.
- **Details Area**: Provides specific details like user requirements and progress percentages.

**Slateholder Requirements**
- Users shall be able to travel 80 kilometers without the need for any additional fuel.
  - Percentage cost: 0.256%
  - Progress: 50%

**System Requirements**
- 12.4 Control of direction
  - 12.4.1 Straight line

[Diagram with specific data points and visual representations]
DOORS - Teamcenter Integration View

DOORS Baseline Project

IMPORT

Temporary Location
(HTML Format)

DOORS DOCS

HTML

DOORS/Teamcenter Modules

IMPORT

EXPORT

Teamcenter

PDM Structure

VAULT

Current Data

Updated Data

IMPORT

Updated Data

DOORS Items, Attributes & Links

Synchronize

DOORS HTML Files

HTML Files

DOORS Items, Attributes & Links

Temporary Location
(HTML Format)
DOORS - MatrixOne Integration View

To the MatrixOne Document

To the MatrixOne Object

DOORS URL
## Key DOORS Customers

<table>
<thead>
<tr>
<th>Communications</th>
<th>Aerospace/Defense</th>
<th>Automotive</th>
<th>Finance, IT and more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung</td>
<td>Agency for Defense Development</td>
<td>Hyundai</td>
<td>Standard Chartered</td>
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<td>LG</td>
<td>KAI</td>
<td>Autojet</td>
<td>SC Capital Partners</td>
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<td>LIG Nex1</td>
<td>SIEMENS</td>
<td>American Financial</td>
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<td>Liberty Mutual</td>
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<td>Honeywell</td>
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<td>Lockheed Martin</td>
<td>General Motors</td>
<td>Procter &amp; Gamble</td>
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<td>Siemens</td>
<td>Raytheon</td>
<td>Porsche</td>
<td>St. Jude Medical</td>
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<tr>
<td>Texas Instruments</td>
<td>Thales</td>
<td>Volvo</td>
<td>UBS</td>
</tr>
</tbody>
</table>
Telelogic DOORS:

- Non-integrated project data is imported,
- structured, linked and traced,

...to produce reports of managed information...
As much as a 200:1 cost savings results from finding errors in the requirements stage versus finding errors in the maintenance stage of the software lifecycle.

56% of all bugs can be traced to errors made during the requirements stage

Boehm ‘76, 88
감사합니다.